

**CHARACTERISING ACTION POTENTIAL
IN VIRTUAL GAME WORLDS
APPLIED WITH THE MIND MODULE**

Volume 1

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Declaration

While registered as a candidate for the degree of Doctor of Philosophy the author has not been registered for any other award with any other university or institution.

No part of the material in this thesis has been submitted for any degree or other qualification at any other institution by the author or, to the best of her knowledge and belief, by any other person. The thesis describes the author's original work. Other persons assisted in transcribing interviews, conducting experiments and proof reading.

Abstract

Because games set in persistent virtual game worlds (VGWs) have massive numbers of players, these games need methods of characterisation for playable characters (PCs) that differ from the methods used in traditional narrative media. VGWs have a number of particularly interesting qualities. Firstly, VGWs are places where players interact with and create elements carrying narrative potential. Secondly, players add goals, motives and driving forces to the narrative potential of a VGW, which sometimes originates from the ordinary world. Thirdly, the protagonists of the world are real people, and when acting in the world their characterisation is not carried out by an author, but expressed by players characterising their PCs. How they can express themselves in ways that characterise them depend on what they can do, and how they can do it, and this characterising action potential (CAP) is defined by the game design of particular VGWs.

In this thesis, two main questions are explored. Firstly, how can CAP be designed to support players in expressing consistent characters in VGWs? Secondly, how can VGWs support role-play in their rule-systems? By using iterative design, I explore the design space of CAP by building a semiautonomous agent structure, the Mind Module (MM) and apply it in five experimental prototypes where the design of CAP and other game features is derived from the MM. The term *semiautonomy* is used because

the agent structure is designed to be used by a PC, and is thus partly controlled by the system and partly by the player. The MM models a PC's personality as a collection of traits, maintains dynamic emotional state as a function of interactions with objects in the environment, and summarises a PC's current emotional state in terms of 'mood'. The MM consists of a spreading-activation network of affect nodes that are interconnected by weighted relationships. There are four types of affect node: personality trait nodes, emotion nodes, mood nodes, and sentiment nodes. The values of the nodes defining the personality traits of characters govern an individual PC's state of mind through these weighted relationships, resulting in values characterising for a PC's personality. The sentiment nodes constitute emotionally valenced connections between entities. For example, a PC can 'feel' anger toward another PC.

This thesis also describes a guided paper-prototype play-test of the VGW prototype World of Minds, in which the game mechanics build upon the MM's model of personality and emotion. In a case study of AI-based game design, lessons learned from the test are presented. The participants in the test were able to form and communicate mental models of the MM and game mechanics, validating the design and giving valuable feedback for further development. Despite the constrained scenarios presented to test players, they discovered interesting, alternative strategies, indicating that for game design the 'mental physics' of the MM may open up new possibilities.

The results of the play-test influenced the further development of the MM as it was used in the digital VGW prototype the Pataphysic Institute. In the Pataphysic Institute the CAP of PCs is largely governed by their mood. Depending on which mood PCs are in they can cast different 'spells', which affect values such as mental

energy, resistance and emotion in their targets. The mood also governs which ‘affective actions’ they can perform toward other PCs and what affective actions they are receptive to. By performing affective actions on each other PCs can affect each others’ emotions, which - if they are strong - may result in sentiments toward each other. PCs’ personalities govern the individual fluctuations of mood and emotions, and define which types of spell PCs can cast. Formalised social relationships such as friendships affect CAP, giving players more energy, resistance, and other benefits. PCs’ states of mind are reflected in the VGW in the form of physical manifestations that emerge if an emotion is very strong. These manifestations are entities which cast different spells on PCs in close proximity, depending on the emotions that the manifestations represent. PCs can also partake in authoring manifestations that become part of the world and the game-play in it. In the Pataphysic Institute potential story structures are governed by the relations the sentiment nodes constitute between entities.

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Abbreviations

AA Affective Action

AOE Area of Effect

AI Artificial Intelligence

CAP Characterising Action Potential

CGI Common Gateway Interface

CM Compound Manifestation

DLL Dynamic-link library

DPE Dynemotion People Engine

XP Experience Points

EIS Expressive Intelligence Studio

XML Extensible Markup Language

FFM Five Factor Model

GM Game Master

GED Garden of Earthly Delights

GK Gate Keeper

HR Human Resource

HGO Högskolan på Gotland (Gotland University)

IRB Institutional Review Board

IPeRG Integrated Project for Pervasive Gaming

IPIP-NEO International Personality Item Pool Representation of the NEO PI-R

LARP Live-Action Role-Playing

MMO Massively Multi-player Online

MMORPG Massively Multi-player Online Role-Playing Game

MMRO Massively Multiplayer Reaching Out

ME Mind Energy

MMS Mind Magic Spell

MM Mind Module

MR Mind Resistance

MUD Multi User Dungeon

MIDI Musical Instrument Digital Interface

NPC Non-Playable Character

GLUT OpenGL Utility Toolkit

OCC Ortony, Clore, and Collins

PI Pataphysic Institute

PC Playable Character

NEO PI-R Revised NEO Personality Inventory

RP Role-Playing

RPG Role-Playing Game

SWIG Simplified Wrapper and Interface Generator

SSM Single Sentiment Manifestation

TTRPG Table-Top Role Role-Playing Game

TCGL The Confused Guest Lecturer

TGE Torque Game Engine

UML Unified Modeling Language

UCSC University of California Santa Cruz

VE Virtual Environment

VGW Virtual Game World

VR Virtual Reality

WoM World of Minds

WoW World of Warcraft

Contents

Declaration	ii
Abstract	iii
Acknowledgements	vi
Abbreviations	ix
1 Introduction	1
1.1 Virtual Game Worlds	1
1.2 Research Questions and Main Concepts	6
1.3 Research Approach	7
1.4 Structure of the Thesis	11
2 Story Construction in Virtual Game Worlds	15
2.1 Introduction	16
2.2 Fundamental Terms and Concepts	18
2.2.1 Story, Narrative and Discourse	18
2.2.2 Narrative Potential, Agency and Story Construction	18
2.2.3 Constructors and Realisers of Narrative Potential	19

2.3	Text Levels in Virtual Game Worlds	22
2.3.1	Code Level	23
2.3.2	Story Level	25
2.3.3	Discourse Level	35
2.3.4	Narrative Level	36
2.4	The Open narrative Structure of Virtual Game Worlds	37
2.4.1	Goals and Motivations	38
2.4.2	Enlarging the Paradigm of Virtual World Game Design to Accommodate Varieties of Goals	40
2.5	Summary	41
3	Characterising Action Potential	43
3.1	Introduction	44
3.2	The Playable Character - focus, focaliser and concentrated mirror of a world.	46
3.3	Characterisation and True Character	46
3.4	Role-play and Game-play	48
3.5	Second Selves and Identity	50
3.6	Immersion, Presence and Persona	52
3.7	Characterising Action Potential	56
3.8	Characterisation in VGWs	57
3.8.1	Character Creation	58
3.8.2	Observable Characteristics	59
3.8.3	Expression through Dialogue and Emotes	61
3.8.4	Observation of Behaviour	63

3.9	True Character in VGWs	64
3.9.1	Faces of a Thousand Heroes	65
3.9.2	The Player’s Journey as a Route to Self-Knowledge	66
3.9.3	True Character	67
3.9.4	Supporting Expression of True Character via Game Mastering	68
3.9.5	Supporting Expression of True Character via the Framework of Game Rules	70
3.10	Summary	72
4	Challenges in the Design of Virtual Game Worlds	73
5	The Mind Module	78
5.1	History	79
5.2	Related Work	81
5.2.1	Believability and Expressive AI	81
5.2.2	Emotion Modelling	82
5.2.3	Narrative	83
5.2.4	Personality Traits	84
5.3	The Mind Module	88
5.3.1	Spreading Activation Network	88
5.3.2	Affect Nodes	89
5.3.3	Personality Trait Nodes	92
5.3.4	Emotion Nodes	95
5.3.5	Mood Nodes	100
5.3.6	Sentiment Nodes - Emotional Attachments	103

5.3.7	The Mind Module Compared to the Dynemotion People Engine	104
5.3.8	The Mind Module compared to Ortony et al.'s Model	106
5.4	Summary	108
6	Early Experimental Prototypes	110
6.1	Ouroboros	111
6.1.1	Early Sources of Inspiration for the MM	113
6.1.2	The Playable Character Greyhowl	116
6.2	Garden of Earthly Delights	119
6.2.1	Game Design	121
6.2.2	Play testing	127
6.2.3	Guided Paper Prototype Play-Test	128
6.3	Mind Music - The Soundtrack of your Mind	134
6.3.1	Background and Related Research	135
6.3.2	Design Considerations	137
6.3.3	Requirements	139
6.3.4	Implementation	140
6.3.5	Adaptation of the Mind Module for the Mind Music Application	141
6.3.6	Mind Music Composition	142
6.3.7	The Composition for the Mood Scales	142
6.3.8	The Composition for the Emotions	143
6.3.9	System Integration	144
6.3.10	Conclusions on Mind Music	145
6.4	Later Experimental Prototypes	147
6.4.1	World of Minds 1	147

6.4.2	World of Minds 2	148
6.4.3	Pataphysic Institute	149
6.5	Summary	149
7	Game Design	151
7.1	Background	153
7.2	Game Design Overview	155
7.3	Core Game Mechanics	157
7.3.1	Mind Energy and Mental Resistance	157
7.3.2	Summary of Mind Magic	158
7.3.3	Mind Magic Spells	159
7.3.4	Affective Actions	160
7.3.5	Mood Aura	161
7.3.6	Formalised Social Relationships	161
7.3.7	Character Creation	162
7.3.8	Character Development	164
7.3.9	Entity Types	165
7.3.10	Display of Mind Module Information	166
7.3.11	An Example Event and Possible Consequences	168
7.4	Back-story of the Pataphysic Institute	170
7.4.1	Introducing the Back-story to Players	173
7.4.2	Non-Playable Characters	173
7.4.3	Dialogue	175
7.5	Formalised Social Relationships	176
7.5.1	Friends	177

7.5.2	Protectors, Protégés and Departments	181
7.5.3	Acquaintances	183
7.5.4	Authored relationships	183
7.5.5	Design Notes about Social Relationship Features	183
7.6	Mind Magic Spells	184
7.6.1	Spell Types	184
7.6.2	Emotion Spells	185
7.6.3	Mind Energy and Mind Resistance Spells	186
7.6.4	Mood Requirement for Casting Spells	186
7.6.5	Personality-based Area of Effect Spells that Affect Mental En- ergy and Resistance	190
7.7	Affective Actions	191
7.7.1	Prerequisites and Success Criteria	191
7.7.2	Design and Test Process of the Affective Actions Feature	194
7.7.3	Specific Affective Actions	195
7.7.4	Design Consideration of Affective Actions Economy	197
7.7.5	Learning Affective Actions and Spells	198
7.8	Single-Sentiment Manifestations	199
7.8.1	SSM Properties	199
7.8.2	Exclamations	201
7.8.3	Specific SSMs	202
7.9	Compound Manifestations	203
7.9.1	Properties	204
7.9.2	Example of an Authored Compound Manifestation	205

7.9.3	Free Form Manifestation of CM	207
7.9.4	Manifestations of Curses and Blessings	208
7.10	Characterising Action Potential	212
7.10.1	Summary of Interrelated Elements Governing the Characterising Action Potential	213
7.11	Summary	215
8	Play-Test of World of Minds	217
8.1	Rationale	218
8.2	Research Questions and Aims	219
8.3	Method	221
8.3.1	Research Ethics	222
8.3.2	Play-Test and Survey Design	223
8.3.3	Participants	226
8.3.4	Materials	227
8.3.5	Procedure	233
8.3.6	Data Analysis	234
8.4	Discussion: Player’s mental models of the system	236
8.4.1	Effects of Personality Factors	238
8.4.2	Extraversion and the design risks of Five Factor Model	240
8.4.3	Emergent Game-Play	241
8.5	Discussion: Individual Differences	243
8.6	Discussion: Implementation Focused Design Evaluation	244
8.6.1	Sentiments in the Play-Test Scenarios	244
8.6.2	Survey and Interview Results Regarding the Sentiments	247

8.6.3	Deep Structure and Sentiments	250
8.6.4	Affective Actions	252
8.6.5	Spell Abilities	256
8.7	Conclusions: Design Implications Relevant to the Pataphysic Institute	259
8.7.1	Sentiments and Attributing Meaning to them	260
8.7.2	Agency and Co-creation	262
8.7.3	Core Game Mechanics	263
8.8	General Conclusions	264
8.9	Summary	267
9	Conclusions	268
9.1	Summary	268
9.2	Challenges in the Design of Virtual Game Worlds	274
9.3	Concluding Discussion	275
9.4	Limitations	285
9.5	Conclusion	289
	Glossary	291
	References	297
	Appendices	316
A	Mind Module UML	318
B	Game Design Documentation	320
B.1	Learning New Abilities	320

B.2	Playable Character Personality Templates	324
B.3	Non-Playable Character Mind Module-Properties	330
B.4	Single-Sentiment Manifestations	333
B.5	Back-story	353
B.6	Dialogue of Non-Playable Characters	358
B.7	The Gate Keeper’s Book	368
B.8	Dialog System	380
C	World of Minds Play-Test	391
C.1	Overview of Qualitative Data Analysis Processes	391
C.2	Presentation to Participants	393
C.3	Request for an Exemption from IRB Review	398
C.4	Approval of an Exemption from IRB Review	402
C.5	Research Consent Form	404
C.6	Video Taping Agreement	407
C.7	Script for the Guided Prototype Play-Test of World of Minds	409
C.8	Questions asked to the participants of the World of Minds play-test	419
C.9	Transana Collection Report of Question 2 in Interview 2	428
C.10	Summarising Survey Reports	433
C.11	Response Text on Question 6 in Survey 2	449
C.12	Response Text on Question 2 in Survey 3	451
C.13	Response Text on Question 3 in Survey 4	453
C.14	Response Text on Question 6 in Survey 4	455
D	Publications	457

D.1 Eladhari 2003	457
D.2 Lindley and Eladhari 2003	464
D.3 Eladhari and Lindley 2003	481
D.4 Eladhari and Lindley 2004	496
D.5 Lindley and Eladhari 2005	514
D.6 Eladhari et al. 2006	524
D.7 Koivisto and Eladhari 2006	533
D.8 Brusck and Eladhari 2006	542
D.9 Eladhari 2007	559
D.10 Eladhari and Sellers 2008	589
D.11 Eladhari and Mateas 2008	598
D.12 Eladhari 2009	607

List of Tables and Figures¹

2.1	Creation of Narrative Potential in VGWs.	20
2.2	Text Levels in Virtual Game Worlds	22
2.3	The Code Level	23
2.4	Story Level	26
2.5	Greimas' actants	27
2.6	An actant model in simple scenario	28
2.7	Character arc adapted from Freeman	32
2.8	Discourse Level	35
3.1	Choosing heritage group and profession in Asheron's Call	58
3.2	Character Description Screen in Star Wars Galaxies.	60
3.3	Screen from Star Wars Galaxies showing the user interface for choice of mood for the PC.	62
3.4	Two PCs taking a break while doing a quest in Star Wars Galaxies. .	63
5.1	Traits from IPIP-NEO used by the Mind Module.	86
5.2	Affect Node Types	89
5.3	Moffat's illustration of how emotion may relate to personality.	90

¹In this thesis, figures and tables share the same list and its enumeration.

5.4	The two-dimensional affect plane of the MM.	91
5.5	Weights between trait nodes and emotion nodes in the MM.	93
5.6	Emotions/Affects used in the first iteration of the MM.	96
5.7	How the mood scales are affected by emotions in the second version of the MM.	98
5.8	Emotions/Affects used in the third iteration of the MM, and their relations to the Mood Nodes	99
5.9	Mood co-ordinate system	101
5.10	Mind Module Summary.	109
6.1	Screen image from the Ouroboros prototype.	113
6.2	Freudian concepts of id, ego and super-ego conceptually mapped to a PC in a VGW.	115
6.3	Greyhowl, a PC in Ouroboros	117
6.4	Concept art for Greyhowl and Jorme in Ouroboros	118
6.5	Conceptual picture used for presentation of the MMRO work package	119
6.6	Conceptual picture aiming to illustrate that both the virtual world and the real world were used as play environments in GED.	120
6.7	The visual presentation of the players who are in different play modes. <i>Note.</i> The rows state the mode in which the player is and the columns state the mode in which the other players are.	123
6.8	Different information is provided about the GED game world depend- ing on whether the player uses the virtual world client or the cell phone to play in the physical world.	124

6.9	Screens of play modes in the digital prototype of GED. <i>Note.</i> From the left: dreaming (3-D client on computer), mirror (cell phone client) and astral projection (cell phone client).	125
6.10	Physical prototype used for play testing a simplified version of the MM.	126
6.11	Functional test of GED using a physical prototype.	128
6.12	From left: a player, storyteller, and ‘computer’. The ‘manual’ is taking the picture.	129
6.13	The paper prototype of the virtual play mode.	130
6.14	Participants in the play-test.	132
7.1	Fluctuations of Mind Energy and Mind Resistance	157
7.2	Regeneration of Mind Energy and Mind Resistance	158
7.3	Mood co-ordinate system, MR and ME regeneration rates, and usable spells	159
7.4	Mood Aura in PI.	161
7.5	IPIP NEO in the Pataphysic Institute.	163
7.6	Screen in PI for choosing to either take a personality test or to pick a personality template.	163
7.7	Entity types and abilities in PI.	166
7.8	Display of Mind Module information in the PI client	167
7.9	An example of how an amusing action is interpreted by the MM . . .	169
7.10	PI Login Page	173
7.11	Screen of dialogue in PI when Karl tells the PC Emil that he can Dull Pain.	176

7.12	To the left: The PC Emil’s friend list. To the right: The PC Neurotica’s friend list.	178
7.13	The mind window of the PC Emil in PI when he is standing next to his friend Neurotica, which gives him a proximity effect of Belonging.	180
7.14	Protectors, Protégés and Departments.	182
7.15	Spells affecting the values of emotion nodes in targets.	185
7.16	spells affecting mind energy or mind resistance of target.	186
7.17	mood spaces in the mood co-ordinate system governing availability of MR-ME spells.	187
7.18	MR-ME spells that are available when the caster is in neutral mood. In the figure, text in the neutral mood-space signifies that the spell is available for use.	188
7.19	availability of MR-ME spells vary with mood. From the left: Glad mood, Cheerful mood and Jubilant mood. The text in mood-spaces is the same as in Figure 7.17.	189
7.20	MR-ME area of effect spells.	190
7.21	The PC Emil unsuccessfully performs the AA Calm Down on the PC Neurotica.	192
7.22	Spaces in the mood co-ordinate system used by the AA system.	193
7.23	Affective Actions	195
7.24	Affective Actions continued	196
7.25	threshold values in SSM emotion nodes that trigger exclamations.	201
7.26	threshold values of MR and ME of SSMs and the exclamations triggered.	202
7.27	Concept art for the SSM Sail of Sorrow.	202

7.28	The SSM Sail of Sorrow in the PI client.	202
7.29	Spells that the SSM Sail of Sorrow casts, and a spell it is vulnerable to.	203
7.30	Exclamations that the SSM Sail of Sorrow makes at certain threshold values of its emotion node Sorrow.	203
8.1	Mind Sheet used in play-test of WoM.	222
8.2	End state of the Mind Sheet of a PC in a WoM play-test session. . .	224
8.3	When all five scenarios were traversed most game-play elements were visible on the table.	230
8.4	Windows in the video analysis tool Transana.	235
8.5	Participants assumptions about effects of personality on other elements.	237
8.6	Participants hypothesising about personality factors.	239
8.7	In the fourth scenario players pick up the spell Laser Pen of Clarity to help Teresa overcome the Colossus of Confusion.	242
8.8	The board with a goal and sentiment objects that players navigated in the third scenario of the play-test.	246
8.9	Guided paper prototype play-test. A player is using an AA by pointing the note representing the AA at the paper figure representing Teresa.	253
8.10	The first set of AAs introduced to participants of the WoM play-test.	254
9.1	Semiautonomy	278

Chapter 1

Introduction

Contents

1.1	Virtual Game Worlds	1
1.2	Research Questions and Main Concepts	6
1.3	Research Approach	7
1.4	Structure of the Thesis	11

1.1 Virtual Game Worlds

The first virtual game world (VGW), Multi User Dungeon (MUD), was text-based (Bartle & Trubshaw, 1978).¹ In the eighties, smaller communities developed and inhabited VGWs, but it was not until the mid-nineties, when worlds with 3-D graphics became available, that VGWs reached larger audiences (Meridian 59, (1996); Ultima Online, (1997); EverQuest, (1999); Asheron’s Call, (1999)).

¹VGWs are often called Massively Multiplayer Online (MMO) games or Massively Multiplayer Online Role Playing Games (MMORPGs), but in this thesis the expression VGW is used. The term VGW is considered more representative because not all VGWs feature role-playing elements, nor always cater for several thousands of players, which is what is meant by ‘massive’.

VGWs are realised by networked computers that simulate environments. In these worlds, players have graphical representations, playable characters (PCs), often called avatars or player characters, that represent them in the world. All interaction with the world and with other players is done through the PC. The interaction in the world is in real time and the world is persistent, that is, the world is still there even though a particular PC is not active in the world. Currently, the most popular VGW in the US and in Europe is World of Warcraft, which in the end of 2008 had 11.5 million subscribers (Blizzard Entertainment, 2008); this figure illustrates how widespread the inhabitation of VGWs is at present.

As a genre, VGWs have a set of more or less general features that control the types of game activity that are available. In 2003 I described these features based on a study of 172 VGWs (Eladhari, 2003). There are a few aspects that are striking about VGWs that make them unique and different from other forms of art. One of these aspects is how the openness of the story structures inherent in VGWs makes it possible for players to add their own goals, which results in added narrative potential in the world. Another aspect concerns characterisation, the core of good story telling. In VGWs players characterise their own PCs. This may be compared with how literary authors sometimes see their characters ‘come to life’, driving the story in new directions; in VGWs there is a similar situation, but the stories are driven by *real* people rather than authored characters. How players can contribute to the narrative potential and how they can characterise their PCs in VGWs depend on the action potential of their PCs, that is, what they can do in the VGW at a given moment.

Despite the large resources and effort spent in designing and producing contemporary VGWs the experience of the narrative is seldom the main source of enjoyment

for players. In story-driven single-player games, such as the Final Fantasy series of games, players experience a narrative. The motivating factor is for many players to experience the next part of the story, to get an answer to the question ‘What happens next?’. In this type of game, the story is already there, embedded in the artefact, pre-authored and ready for players’ discovery and interpretation.

In table-top role-playing games (TTRPGs), such as Call of Cthulhu, a game master together with a small group of players uses the rule set and the pre-written back-story, provided by the role-playing game book, to drive a sequence of events that emerges from their application of the rule set and of their narration.

In both single-player computer role-playing games and in TTRPGs there are other motivating factors, besides answering the question ‘What happens next’, that define if the game is played and how it is played. Perhaps the most important of these is character development, in other words, individual courses of actions and choices that let players define the skills and properties of their PCs in ways that lead to possibilities for players not only to refine the PCs in terms of how efficient they are within the rule set and possibly identify with them, but also incrementally to choose and refine play style within the specific rule set. Character development is paramount for players dwelling in VGWs - generally much more so than immersing in epic narratives or creating their own narratives through role-play with others. VGWs can initially be disappointing to players experienced with other game genres. Players favouring single-player story-driven games might say: ‘I somehow found myself not caring about the back story.’ The live action role-player and the table top role-player might say: ‘I signed on to a role-playing server, but there was no role-play going on!’

One reason regarding the perceived lack of back story is that most VGWs apply

the same format for story telling as single-player role-playing games do. All players go on the same quests and the environment does not change as a result of their actions. Once a villager is saved from an evil foe, the world state immediately goes back to the state it had before the quest. The foe resurrects, and the villager is again in peril, ready for being saved by the next PC who passes by. Furthermore, on a VGW server populated with some thousands of PCs it is impossible to have them all as the main protagonists — it would be like having several thousands of Luke Skywalkers in Star Wars.

For the lack of role-playing (RP) there is a similar issue. RP in commercial VGWs is seldom supported by the game mechanics. The game-play is based on rule-sets following design paradigms established in the 1970s (Gygax & Arneson, 1974; Bartle & Trubshaw, 1978), which encourage instrumental game-play rather than RP. RP in VGWs mostly rely on meta-game rules since RP is hard to capture in a system. In fact, Copier (2007) described a specific MMORPG play-style as characterised by negotiation of principles of these meta-game rules. The typical game mechanics of contemporary VGWs, which - in turn - date from the MUDs of the eighties, do not generally support RP where players weave their own stories together. Dedicated role-players do use commercial VGWs as platforms for play, but it requires dedication and effort which only a small percentage of close-knit groups keep up on a regular basis. It is an exception rather than a rule. It is common that groups for their role-playing sessions choose to ignore the core game-play mechanics of the world. The VGW is used as a platform that allows for embodied representations of the characters rather than played as a game, a play strategy described by Sveinsdottir (2006).

Players of VGWs may expect two types of narrative: the impositional type, where

the player is *told* a story through the narrative cues given by the environment, or the emergent collaborative type of narrative where players *co-create*, weaving story-lines and enacting scenarios by role-playing together. Neither of these types of narrative are generally supported by VGWs to date.

These shortcomings have, however, not hindered the growth of the genre, neither in the number of VGWs developed and technical platforms for VGW development, nor in the number of players spending time in the VGWs. It can be argued that the ‘lack of narrative’ and lack of role-playing elements are perceived problems, not actual ones, that the ‘problems’ have instead sprung from expectations imposed on the VGW genre to be something that it is not. As Bartle (2003) stated, VGWs are not narratives, instead they are places where narratives may exist. As mentioned, one of the driving factors for play in VGWs is players’ development of their PCs. The PCs are the players’ representations in a VGW, and often become, in Bartle’s words, ‘an extension of a player’s self, a whole personality that the player dons when they enter the virtual world.’ (p. 155)

Caillois (1958, 2006) distinguished between playing in the mode *paida*, characterised by ‘fun, turbulence, free improvisation and fantasy’ without computable outcome, as opposed to in the mode of *ludus* which dominates sports, board games and other achievement oriented activities. Ryan (2006, p. 198) makes the observation that ‘It is perhaps the major contribution of the computer to human entertainment to have allowed a combination of *ludus* and *paida* within the same game environment — a combination that Caillois thought impossible: for him games were either rule-based or invitations to make-believe’. Ryan recognises the domain of textual architecture and users’ involvement as the domains that ‘open truly new territories

for narratological inquiry' (2006, p. xxi).

1.2 Research Questions and Main Concepts

The driving force of the research reported in this thesis has not been to solve a perceived lack of narrative in VGWs, but to explore how PCs can be built in ways that enrich the experiences for players in VGWs. I approach questions regarding role-playing and the construction of narrative potential from the perspective of what VGWs 'could' be rather than what they 'should' be. Since interesting and complex characters are essential for the creation of good stories in media such as novels and screen-plays it could be assumed that this might be the case for VGWs as well.

A starting point for this research was the assumption that characterisation of 'round' PCs is essential for creating emergent narratives in VGWs. The expression 'round characters' (Forster, 1927) concerns characters who are complex and realistic, representing a depth of personality which is imitative of life. A PC in a VGW can be seen as a combination of a person playing a game and a fictive person whose identity is continuously developed. Bartle (2003) suggests that the player and the PC become one when a player is deeply immersed in a VGW: 'One individual, one persona: identity.' According to Bartle the importance of PCs and their identities cannot be underestimated (p. 159): 'The celebration of identity is the fundamental, critical, absolutely core point of virtual worlds.' Another central concept in this work is story construction, which is to provide players with building blocks and functionalities that form the narrative potential in the world, and can be used by players for creating experiences and traversals of events that are individually potentially meaningful and

dramatic.

In VGWs the protagonists of the world are real people, and when acting in the world their characterisation is not carried out by an author, but expressed by players characterising their PCs. The action potential of a character is what it can do at a given moment with it all the circumstances inherent in the context taken into account. The *characterising action potential* (CAP) defines what a character can do at a given moment that characterise it, both in terms of observable behaviour and in expression of true character as defined by McKee (1997) — a character’s essential nature, expressed by the choices a character makes.

In research reported in this thesis PCs are considered to be semiautonomous agents, partly controlled by their players, and partly controlled by context-sensitive action potential and expression possibilities as well as by varying degrees of autonomous reactions to in-game situations specific to the VGW they inhabit.

Two main questions are explored in this thesis. Firstly, how can CAP be designed to support players in expressing consistent characters in VGWs? Secondly, how can VGWs better support role-play in their rule-systems?

1.3 Research Approach

Mateas and Stern (2005, p. 8) have described game design as a wicked problem:

For a wicked problem such as game design, exploring design space consists of navigating the complex relationships and constraints among individual design features, while at the same [time] discovering or inventing new features and approaches that expand the design space. All existing games

form tiny islands of partially understood regions of design space; all around these islands lies a vast ocean of unexplored potential design space waiting to be brought into existence through the invention of new features and approaches, and mapped out through the hard empirical work of exploring a variety of designs.

The phrase ‘wicked problem’ is used in social planning to describe problems where every attempt at producing a solution changes the understanding of the problems. Mateas and Stern (2005) further argued that even though studying existing games can lead to deeper understanding it is essential to also *build* them (p. 2):

[...] if game studies is limited to analysing existing games and design spaces, it can be problematic to imagine or theorise about potential game features outside of these design spaces. Models about the nature of games and their features run the risk of being incomplete or wrong, simply because certain design spaces have not yet been explored.

In relation to the questions addressed in this thesis this quotation is particularly relevant. Many identity-related questions can be studied through observing existing VGWs and players’ behaviour in these, but for experimenting with techniques not present in existing games independent development efforts are required.

Experimental research and evaluations of rules and game mechanics in VGWs are rare in the academic realm due to the large effort required for the development. Researchers are often constrained to using existing platforms that enforce traditional game mechanics. One example is the level-design tools of *Neverwinter Nights* (Bioware, 2002) that enforce the D&D rule set, used for research projects by

among others Castranova (2008) and Tychesen (2007). For exploration of truly innovative game mechanics it is essential to take into consideration type of game-play to which an underlying engine and framework lends itself. Choices that seem convenient in the development process are risky for the design of innovative (digital) game experiences — the conventions in the rule sets can ‘kill’ the innovation.

The wicked design space explored in this thesis is the CAP of PCs in VGWs. The aim of the navigation of the space has been to find ways to facilitate players’ characterisation of consistent characters and role-play in VGWs. The main method used for exploration of this space is iterative design as described by Salen and Zimmerman (2001, p. 11):

Iterative design is a play-based design process. Emphasising play-testing and prototyping, iterative design is a method in which design decisions are made based on the experience of playing a game while it is in development. In an iterative methodology, a rough version of the game is rapidly prototyped as early in the design process as possible. This prototype has none of the aesthetic trappings of the final game but begins to define its fundamental rules and core mechanics. It is not a visual prototype but an interactive one. This prototype is played, evaluated, adjusted and played again, allowing the designer or design team to base decisions on the successive *iterations* or versions of the game. Iterative design is a cyclic process that alternates between prototyping, play-testing, evaluation, and refinement.

I built a semiautonomous agent architecture, the Mind Module (MM), that can be used as part of PCs in VGWs. The MM gives PCs personalities based on the Five Factor Model (McCrae & Costa, 1987), and a set of emotions that are tied to objects in the environment by attaching emotional values to these objects, called sentiments. The strength and nature of a PC's current emotion(s) depends on the personality of the PC and is summarised by a mood. The MM consists of a spreading-activation network of affect nodes that are interconnected by weighted relationships. The values of the nodes defining the personality traits of characters governs an individual PC's state of mind through these weighted relationships, resulting in values characterising a PC's personality.

Among the most challenging tasks in this work has been to design and build experimental prototypes in which the MM has been used. The prototypes were necessary for seeing to what extent the MM adds to the playing experience. The MM has been used in five experimental prototypes. Each prototype in which the MM has been used has given pointers towards what can be explored and improved for the next iteration.

Early in the process of the work reported in this thesis I was curious to establish what effect the MM could have, if added as an extra feature to a 'typical' VGW. As the research developed it seemed more meaningful to create VGW prototypes where the game mechanics were increasingly based on the MM. Having started out with the aim to find general solutions to questions regarding story construction and characterisation for typical VGWs with the use of psychology-inspired AI-applications this research has developed towards more and more specific solutions.

The mechanics of the MM would not have any effect unless the VGW mechanics accommodated the MM. For each new VGW prototype that has been developed,

the game design and the MM has been reiterated to address the refinement of the questions that the results of the previous prototype have yielded. From this work, which can be labelled AI-centred game design, the ‘mental physics’ of the MM has emerged.

1.4 Structure of the Thesis

In Chapter 2, VGWs are discussed as spaces for construction of narrative potential. Terms used in this thesis are introduced, including story, narrative, discourse, narrative potential, agency and story construction. Expressive agents and semiautonomous agents, created and controlled by developers, in-game creators and players, are introduced as constructors and realisers of narrative potential. A four-layered model of text levels in VGWs is described, which has been useful during the development of the prototypes described in this thesis. The open story structure of VGWs is discussed by providing examples showing that the narrative potential is affected by a multitude of goals, many of which are derived from motivations outside the narrative potential authored by the worlds’ creators.

In Chapter 3, the importance of the PC is stressed, and the concept of CAP is described in detail. Role-playing, self-playing and identity construction in VGWs is discussed as well as immersion, presence and Bartle’s concept of persona. Also, tools available for players for characterisation of PCs in contemporary VGWs are discussed.

Chapter 4 serves as a bridge between the theoretical discussions in the previous chapters and the later chapters, which focus on the development of the MM and the prototypes it is used in. The concept of the bleeding circle is introduced as the situation where strong interpersonal relationships seep between VGWs and the ordinary world. A number of design questions which I find important for the evolution of VGWs are presented, with the reservation that some of them may be ‘holy-grail questions’, that is, questions that there may be no answer to but are important to ask because they provide the driving force to navigate wicked problem spaces.

Chapter 5 describes the MM, giving an account of the sources of inspiration that have been used in its construction: spreading-activation theory, trait theory, affect theory and Moffat’s model (1997) of how emotion can relate to personality. The approach used in the design of the MM is compared to the approach of Dynemotion People Engine (Eladhari & Sellers, 2008) and to that of the OCC model (Ortony *et al.*, 1988). Chapter 5 also provides a brief history of the development of the MM as well as an overview of related work in the areas of believable agents and expressive AI, emotion modelling, applications for story construction and related work which uses trait theory when constructing autonomous agents.

Chapter 6 describes early prototypes, where the MM was used as part of the implementations. In Ouroboros an important focus was to explore the use of expressive gestures of 3-D characters. Different gestures were available for use depending on the state of mind of the PCs and were consistent with their personalities. In relation to this, early sources of inspiration for the implementation of the MM are described.

Ouroboros was developed at the Zero Game Studio, part of the Interactive Institute in Sweden.

Garden of Earthly Delights (GED) was the demonstrator of the work package Massively Multiplayer Reaching Out (MMRO) of the Integrated Project for Pervasive Gaming (IPeRG). The focus of MMRO was to explore ways to integrate massively multiplayer gaming with the play via cell phones with geographical location data. A guided paper prototype play-test was conducted where issues of player-control of the semiautonomous PC was discussed and which showed that players with live-action role-playing experience were particularly positive towards the MM derived game-play in the test. The Mind Music application, also a part of MMRO, focused on how music can be used to express complex states of mind to players, communicating mood and emotions of their own PC.

In Chapter 7, the game design of the prototypes World of Minds (WoM) and the Pataphysic Institute (PI) is described. A background to the practical work of developing the prototypes and an overview of the game design is given and the main features of the design are described in detail. While the Ouroboros prototype focussed on expression of character performed to other players through gestures, and the Mind Music prototype explored expression of their own PC to players themselves, the focus of PI and WoM is on expression of character — to both self and others — through fluctuations of CAP and of manifestations of a PC's mental state that become part of the game world.

Chapter 8 describes a guided paper-prototype play-test of WoM, in which the game

mechanics build upon the MM's model of personality and emotion. In a case study of AI-based game design, lessons learned from the test are reported. The participants in the test were able to form and communicate mental models of the MM and game mechanics, validating the design and giving valuable feedback for the digital prototype PI. Despite the constrained scenarios presented to test players, they discovered interesting alternative strategies, indicating that the 'mental physics' of the MM may open up new game design possibilities.

The last chapter concludes this thesis by a summary of the previous chapters and a concluding discussion. Also, limitations and future areas of research are identified and described.

Chapter 2

Story Construction in Virtual Game Worlds

Contents

2.1	Introduction	16
2.2	Fundamental Terms and Concepts	18
2.2.1	Story, Narrative and Discourse	18
2.2.2	Narrative Potential, Agency and Story Construction	18
2.2.3	Constructors and Realisers of Narrative Potential	19
2.3	Text Levels in Virtual Game Worlds	22
2.3.1	Code Level	23
2.3.2	Story Level	25
2.3.3	Discourse Level	35
2.3.4	Narrative Level	36
2.4	The Open narrative Structure of Virtual Game Worlds	37
2.4.1	Goals and Motivations	38
2.4.2	Enlarging the Paradigm of Virtual World Game Design to Accommodate Varieties of Goals	40
2.5	Summary	41

This chapter concerns virtual game worlds (VGWs) as spaces for construction of narrative potential.¹ Terms used in this thesis are introduced, and a four-layered model of text levels in VGWs is presented.

2.1 Introduction

A lot has been written about narrative in interactive media. In the area of games, classification spaces have been offered. Comparisons have presented similarities to other media and differences have been pointed out (e.g. analyses of interactive media from a cultural-studies perspective, including Aarseth (1997), Murray (1997), Juul (1999), and Ryan (2001)). Publications by authors with backgrounds in screenwriting and film-making often refer to the Hero's Journey (Campbell, 1949; Vogler, 1993), and to the restorative three-act structure of drama, described by Danzyger and Rush (1995). Texts published by game designers frequently refer to the Koster-Vogel Cube (Koster & Vogel, 2002), while publications in more technical venues on the issue of narrative often refer to The Oz Project (1989 - 2002) and to the Façade Project (Mateas & Stern, 2002 - 2005). Prominent traditions of narrative analysis include the structuralist perspective beginning with Propp's morphology of the folk tale (1968) and Greimas' actant theory (1966), as well as the tradition of hypertext theory (Bolter, 1991; Landow, 1992), that is, systems for causal interactive relationships between story elements in multi-linear stories. In the light of these different traditions that have had an impact on the field of interactive narrative, Richard Bartle (2003, p.

¹An early version of the text in this chapter was published in the paper 'Story Construction and Expressive Agents in Virtual Game Worlds' at the conference 'Other Players' (Eladhari & Lindley, 2004).

661) states that that:

Virtual worlds are places, not stories. You can have a story about New York, or a story set in New York, and New York can have a history, but New York is not itself a story.[...] Trying to impose a story on the inhabitants of a virtual world is as sensible as trying to impose a story on the inhabitants of New York. You can impose events, but not stories; people make their own stories.

Virtual worlds are places and narrative elements are part of those places. On the scale of authorship ranging from single to shared authorship the full scale coexists in these worlds, from pre-scripted story lines to narrative arcs that are entirely created by players, more or less despite the world's mythos and the original intentions of the world's creators. When Lisbeth Klastrup (2003) presented a possible poetics of virtual worlds, she introduced the concept of 'worldness' as a metric of the particular traits that constitute the experience of a virtual world.

In these worlds a more pressing issue than 'Who is the author?', a common exercise in literary studies, is who *owns* the world (Bartle, 2003; Reynolds, 2003). Who has the right to create content, and how persistent is this created content? Does it become a part of the world's history? The world's history is in some cases created outside the game world, for example by guild leaders who document the story of their guild on web sites.

Another intriguing question is that of the role of players: are players a part of the world, designed into it, becoming a part of the creation of the game design teams, or should players be viewed as artists within an artwork, expressing themselves through the tools given by the designers?

2.2 Fundamental Terms and Concepts

2.2.1 Story, Narrative and Discourse

When the word *story* is used in this text it means a fixed temporal sequence of events and the actors that take part in these, that is, the content that a narrative is about.² Events in narratives are not necessarily told about in the order in which they have happened. In multi-linear narratives readers or players can often choose when to be told about a certain event, but the order in the sequence of events as such does not change — only the sequence of experiencing them, or being told about them. A *narrative* is a story the way it is told. *Narration*, or the art of story telling, concerns how to tell a story.³ As players do one thing after another in a world the sequence of events that emerge is what I, in this text, call the character's *discourse*, a concept borrowed from Seymour Chatman (1978).

2.2.2 Narrative Potential, Agency and Story Construction

In multi-user virtual game worlds (VGWs), being places, there is generally little to no story telling in the design of the world in the traditional sense. Instead, there are elements in the world that have *narrative potential*, a term used by Laurel (1994) and described by Fencott (2001) as the integration of agency and narrative. Fencott

²The use of the terms story and narrative in this text conforms to Genette's theoretical framework for narrative analysis. Genette's definition of *histoire*, or in the English translation, *story*, reads as follows (1983, p. 27): 'I propose [...] to use the word story for the signified or narrative content'. Slomith Rimmon-Kenan uses Genette's definition in her book *Narrative Fiction*, but accentuates the chronological aspect of the concept: "Story" designates the narrated events, abstracted from their disposition in the text and reconstructed in their chronological order, together with the participants in these events.'

³When Genette uses the word *narrative* he means 'the signifier, statement, discourse or narrative text itself' (1983, p. 27). The French word Genette uses for *narrative* is *récit*.

elaborates on narrative potential in (2003) as the ‘accumulation of meaningful experience as a result of agency — allows participants to construct their own appropriate narratives. Narrative potential thus arises from agency but is not determined by it.’ The term *agency* was defined by Murray in (1997, p. 126) as ‘the satisfying power to take meaningful action and see the results of our decisions and choices’.

Koster (Meadows, 2003) distinguishes between impositional and expressive forms of interactive narrative in VGWs. The impositional form is used in choose-your-own adventure books, adventure games and other fixed multilinear narratives. The expressive form relies less on a sequence of events and behaves more like an architecture. The view of story construction as a type of architecture in VGWs is shared by Jenkins (2003): ‘in the case of emergent narratives, game spaces are designed to be rich with narrative potential, enabling the story-constructing activity of players. [...] it makes sense to think of game designers less as storytellers than as narrative architects.’

The act of creating narrative potential in a VGW, whether it is done by the team of world designers, members of a live team (developers maintaining a VGW when it is populated by players), game masters, guild leaders or ordinary players is an act of *story construction*, not story telling. That is, a story is constructed by game-play where the VGW and its inhabitants are providing material for potential narratives as tellings of the story.

2.2.3 Constructors and Realisers of Narrative Potential

Figure 2.1 outlines possible roles that the story constructors of a VGW may have; in the top of the figure the roles outside the game world are noted; players, the game developers as world creators, and in-game creators, which is persons who have the

authority to make more persistent marks on the game world than players, but less than the developers.

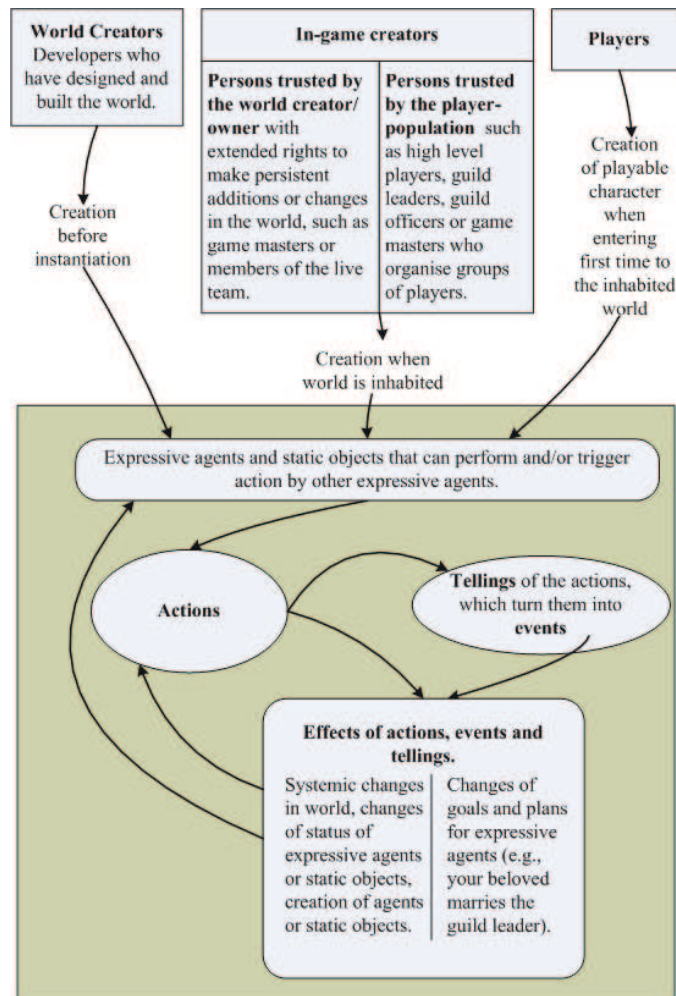


Figure 2.1: Creation of Narrative Potential in VGWs.

The authority to affect the game world can either be given by the developers through a role of moderator or game master, or can be a result of being trusted by other players to the degree that one person’s actions resonate through the world via a multitude of actions taken by others as a result of it. Independent of role outside the game, inside

the game world, ‘in-game’ everyone communicates and expresses via signifiers which can be either static objects or dynamic entities and through performing actions. Actions affect other entities, which in turn can lead to the performance of further actions. In such a manner narrative potential in VGWs is both constructed and realised.

Mateas (2003, p. 1) coined the expression expressive artificial intelligence:

AI-based art and entertainment constitutes a new interdisciplinary agenda linking games studies, design practice, and technical research. I call this new interdisciplinary agenda *expressive AI*. In the context of game analysis and design, expressive AI provides a language for talking about ‘readable’ behaviour, that is, behaviour that a player can read meaning into.

Following Mateas, the term *expressive agents* is in this text used to refer to dynamic entities in virtual game worlds that in their functional set-up carry possibilities for creating narrative potential. In this sense, they embody foundational narrative potential in their design. This term encompasses non-playable characters (NPCs), playable characters (PCs) and other dynamic entities.

Playable characters are expressive agents but also *semiautonomous agents*. They are partly controlled by their players, and partly controlled by context-sensitive action potential and expression possibilities as well as by varying degrees of autonomous reactions to in-game situations specific to the VGW they inhabit.⁴

⁴For example, in World of Warcraft (2004), a PC who is afflicted by the spell ‘Fear’, runs for a few seconds while it is impossible for a player to stop the PC running, do anything else, or even control the direction of the running. The triggering of the fear-reaction in a PC may be done by another PC or by an autonomous character in World of Warcraft.

2.3 Text Levels in Virtual Game Worlds

When discussing story construction in the context of computer-based systems such as VGWs, it is useful to divide story and narration into different levels as shown in Figure 2.2. This way it is easier to communicate where in the structure something may be implemented, and what implications a new feature may have, e.g., for authoring rights and persistence. For instance, few designers would give creation rights to players on the code level because a change on that level would change the rules of the whole game world. Note that these levels refer to different layers of text, not to software architecture design.

Table 2.2: Text Levels in Virtual Game Worlds
Story Construction

Designed narrative potential		Played narrative potential	
Code level	Story level	Discourse level	Narrative level
Engines, framework and game programming. These together manifest the geographic structure as well as the conditions for the deep structure of the narrative, the overall story and its construction.	The overall story or back/story The deep structure consisting of the individual expressive agents and static story elements. At the discourse level manifest the overall story, possible side-stories and separate independent stories.	The continuum of play. The current dynamic states, experienced events, movements and actions of the expressive agents that result in sequences of events: the actual story, or discourse.	The narratives told about the actions and events in the game world. The narratives are told both in-game and out-of-game.

Practically, these different text levels, and thus the narrative potential of the world are usually created by persons having different roles as shown in Figure 2.1: the code level is written by software engineers, the story level by game designers and

writers, while the discourse level and the narrative level are performed by players, game masters and sometimes live teams.

2.3.1 Code Level

The code level itself can generally be divided into three software layers as shown in Table 2.3. The bottom layer is the engine which consists of very general functions such as network and communication systems, the rendering of the system's interface, the sound system, the interface for animation, the handling of the terrain, the dialogue system, the media storage, and the physics system, which governs gravitation, forces, collisions and collision response.

Table 2.3: The Code Level

Scripting	Detailed programming/scripting of individual objects specific to a game.
Framework	- Abstracted model of a game world and system. - The glue between scripting and engine(s.)
Engine	May include: - physics system; - graphic rendering system; - dialog system; - media storage; - communication layer.

Above this there is the framework of the game, a layer of abstract representations of the game's structures such as classes of game agents, classes of behavioural control and systems for action control and communication. The engine is usually general and may be used in various game genres, but the framework tends to be more specific for its genre, implementing a generic game system.

Above the framework there is the scripting, that is the specific game programming,

which mostly consists of data and the instantiated definitions specific to the given game. These layers are co-ordinated to bring forth the media that become visible and audible to players, such as environments, characters, dialogues, music, sound effects and graphical user interfaces. In terms of MUD-based virtual worlds, the engine layer, the framework and the scripting layers are often called driver, mudlib and world model (Bartle, 2003, p. 44). There are a number of major code-bases that have been developed for creating textual virtual worlds. Each of these represent a certain game-play paradigm and has historically provided both game designers and players with norms of how a virtual world is ‘supposed to function’. Bartle (2003) describes the code-bases and what types of game-play they may result in, in terms of combat, common mythos and persistence of player-created content. It is important to be aware of the implications that a certain code base have for resulting game-play and the conditions for creating narrative potential in a game world.

The divisions of layers within the code level are very general, the details being different from architecture to architecture. Sometimes the layers can be derived from the production team structure: a game-engine group is assigned to create the engine layer, another group writes the framework and undertakes game programming. In many virtual worlds, players take an active part in game programming by scripting behaviours for objects they are responsible for. This is the case in many text-based virtual worlds, one of the most famous of these being LambdaMOO. Cherny (1994) shows an early example from LambdaMOO of how players program personal and characteristic behaviours for their avatars that can be triggered by keywords typed by other players. This is usually referred to as scripting, which has been developed much

further in later graphical virtual worlds, most notably in the social virtual world *Second Life* (Linden Lab, 2003) and the VGW *Star Wars Galaxies* (Lucas Arts, 2003). In text-based VGWs, players are in many cases granted more freedom to script, that is, they are able to build features that have a larger impact on the rest of the virtual world. This happens because many of these worlds are non-commercial and build upon common efforts from players and developers (which may be the same persons) for survival. To illustrate the relationships between the different layers in the code layer one can compare the building of virtual game worlds with the construction of the physical world. Game engines are then the equivalent of the physical laws that are common to different planets. On each planet the framework is analogous to local conditions providing the foundation for the biotope on that planet. The individual classes in the framework or in the descriptions of the object types are the equivalent of genetic codes. At the level of programming games these genetic codes are combined with data specific to individuals, comparable to individual DNA sequences.

2.3.2 Story Level

At the story level, summarised in Table 2.4, are the deep structures of the potential stories. At this level, the individual expressive agents as well as the dynamic and static story elements are designed. This can include driving forces, goals and specific abilities under certain circumstances for each individual entity. At the discourse level, these entities manifest actual stories via performed actions.

The story level also includes back-story, the explicit storytelling by the game designers. The back-story often has a branching structure where parts of it can be mandatory for the player to traverse through in order to progress in the game world.

Table 2.4: Story Level

Story Elements	The specific setup of expressive agents and static story elements that are to be instantiated
Conditions	Causal dependencies governing relations between specific agents and objects
Goals, driving forces	Wills, motives, aspirations, driving-forces and goals of the specific expressive agents

The sometimes mandatory nature of what a player needs to experience is in Koster's terms a type of impositional narrative, which was juxtaposed towards the expressive narrative. The impositional stance is used most strongly in single-player adventure games and hypertext narratives, where the overall story and its content is fixed, even though, when experienced, there can be variations in the chronology and quantity of the sequences that make up the story. In VGWs there is often a mix of different story construction techniques. Both Asheron's Call 2 (2002) and Star Wars Galaxies (2003) are good examples of game worlds that contain mixed strategies, from the totally linear to the emergent, that is, from the impositional to the expressive.

In Asheron's Call 2 there is a linear story arc which is mandatory for players to go through in order to be able to get to new geographic areas in the game world. The VGW Star Wars Galaxies is an example of a world where players can perform quests that are implemented as linear narratives, but they are not mandatory for the development of PCs. In general, VGWs mix impositional and expressive story construction, the expressive stance being inherent, deriving from the code level and implemented in the story level, giving dependencies, constraints and affordances in the world that govern what agents and PCs are allowed to do depending on their states. It is in this way that expressive agents are inhabitants in the world.

The Deep Structure

Even if not all games contain a story as films, plays and novels do, they all contain a deep structure. Games like chess and solitaire contain deep structures; there are goals, driving forces and constraining rules for achieving the goals. In these examples though, the goals that drive the mechanics of game-play are part of the predefined conception of the game. This is not always the case in VGWs, where the players may define their own goals that are not always be foreseen by the designers.

The concepts of deep structure and surface structure are used by Greimas (1966) and summarised by Rimmon-Kenan(1993):

Whereas the surface structure of the story is syntagmatic, that is, governed by temporal and causal principles, the deep structure is paradigmatic, based on static logical relations among the elements.

Greimas' Actant Theory models static relations as relations among actants. Actants are entities that accomplish or submit to an act. The number of actants is six in Greimas' model, see Figure 2.5.

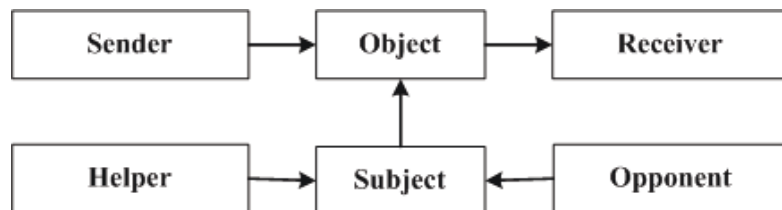


Figure 2.5: Greimas' actants

In a story where a PC meets a wizard who wants a scale from a dragon, the actants would be divided as shown in Figure 2.6. The model is presented from the PC's perspective, who thus becomes the subject of the model. The PC receives a quest

to bring the scale of a dragon to the wizard, who is an NPC. The PC asks a friend (another PC) for help to slay a nearby dragon, and the pair sets out to defeat it. When the dragon is slain the PC grabs a scale from the body and gives it to the NPC Wizard. The PC is rewarded with a small sum of money and experience points. The overall game design paradigm of virtual game worlds — to receive points to develop their own PC might be the goal of the player. The player helping out though might have different reasons for partaking in the activity; it can be altruistic, to return a favour, or maybe the expectation that the helpful act may be reciprocated in the future. The goal of the wizard is scripted into the scenario, that is, to receive a dragon’s scale, while for the dragon it would be not to be killed. These ‘goals’ of the NPC and the dragon are not as faceted as those of the PCs, and from a systemic point of view they are rather programmed conditions that facilitate the actions by the players. Actants can, just as expressive agents, include non-human beings, but actants can also be what can be called static story elements, such as inanimate objects (e.g., a magic ring) and abstract concepts such as ‘destiny’.

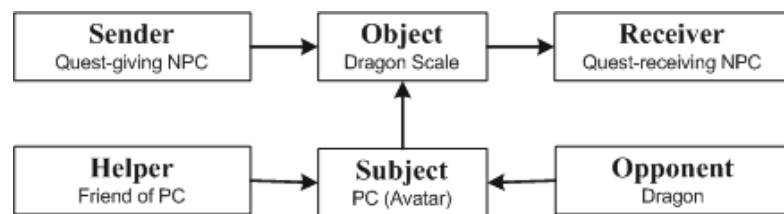


Figure 2.6: An actant model in simple scenario

In *Fundamentals of Story Logic*, Therese Budniakiewicz (1992) points out that the position of the object in the model has a double function:

The positional value of the Object is doubly defined by the convergence

of the actantial axes: both as an ‘object of desire’ and as an ‘object of communication’.

Budniakiewicz reminds us that for Greimas the actant model and the actant grammar are foremost ways to extrapolate syntactic structure.

How can this be of use when discussing story construction in VGWs? Actant theory is a conceptualisation that breaks down the parts of a story into the force fields that make it possible for the narrative to come into existence. By applying this way of looking upon expressive agents and static story elements it is possible to more clearly define the forces that, in Greimas words, make up ‘the semantic syntax’ or the micro universe that a game world and the overall narrative consist of.

This perspective becomes especially interesting when applied to live-action role-play (LARP) and VGWs. In LARPs and VGWs the discourse is made up of an execution of these interacting forces. This can also be said about BRUTUS, a storytelling machine, a system which functions as a sophisticated narrator and uses a formal model of betrayal; this system does, however, not accept user-input (Bringsjord & Ferrucci, 1999). Starting with this model it is possible to break the larger units into smaller components with clearly defined functions. Budniakiewicz writes of two large classes:

The two big classes which make up the ‘semantic syntax’ are the actants and the predicates; they combine with each other to form the semantic and thematic kernel or nucleus of a textual micro-universe. The predicates are divided along the static vs. dynamic binary opposition: Function [...] designates the dynamic predicate and Qualification [...] the static predicate.

In terms of story construction for VGWs the semantic syntax would be translated into what functions are possible for a certain class, or type of agent, and what state or states the agent must be in to execute each function. If this way of thinking is applied to the text layers previously sketched in Section 2.3.1 at the code level, it would be manifested in the framework layer as well as in the scripting layer. In the framework, agent-type properties and functions are defined. The conditions for use of the functions can be defined both in the framework layer and in the scripting.

Typical for a story-driven computer game is that players perform a series of quests which are added one by one to the PC's story discourse when it has been performed. Most single-player story-driven games that have an overall story have a similar structure to that of the folk tales systematised by Vladimir Propp (1968). Usually a story starts with something in the game's microcosm being out of balance. The hero of the story, or the subject, is given a quest and is thereby contracted to either solve the overall lack of balance in the world, or to take the first step on that path. Usually the hero is also put through a qualifying test to prove his worth in recreating balance. After this, the hero may perform a number of minor quests before finally performing the main quest that restores the balance. In many story-driven games this last quest consists of defeating the main antagonist in the fictional world, the entity threatening the balance. This is often called the final boss-fight, where 'boss' is a powerful enemy that is difficult to defeat. After the final fight the microcosm of the game world is saved, the hero has succeeded in performing the overall quest and the PCs, and supposedly also the player's, motivations are neutralised.

Vladimir Propp's pioneer work *Morphology of the Folktale* explains that the typical Russian folk tale is built around seven types of person (or more specifically; spheres

of action corresponding to performers), namely:

- The Villain
- The Donor
- The Helper
- The Princess (and her father)
- The Dispatcher
- The Hero
- The False Hero

The names of the people who contain these functions differ from tale to tale, but the actions they perform are always the same. A function can, in Propp's words, be 'understood as an act of a character, defined from the point of view of its significance for the course of the action.' The fixed number of possible functions is thirty-one. Not all of these are necessary in the same story, but where they occur they always have the same sequential order.

The restorative three-act structure used in motion pictures also follows a chronological sequence of events, focussed around the main character in the tale (Danzyger & Rush, 1995). The narrative is seen to be divided into three acts, where the first is the set-up of the drama, the second contains a confrontation and the third involves a resolution. Each act rises to a point of crisis, a plot point. It is the central character who gets into conflict and needs to make a choice. The restorative model is based upon the Hero's Journey. Also, here is a strict chronological sequence of events, and a concentration around the main character, the hero. The true character and development of the hero are shown by a series of situations where the hero is acting under

pressure. The hero is said to have a character arc, which corresponds with the expression individual story discourse. Figure 2.7 shows Freeman’s interpretation (2003, p. 121) of Luke Skywalker’s character arc in the screen play *Star Wars*, Episode IV.

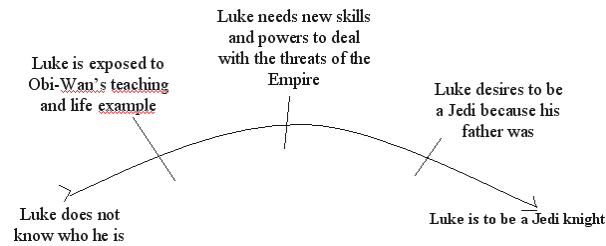


Figure 2.7: Character arc adapted from Freeman

The other characters in the narrative also have character arcs, but their main functions are to have a function for the hero, not for themselves. The roles are called character archetypes and are as follows:

- The Hero
- The Mentor
- The Higher Self
- The Allies
- The Shape Shifter
- The Threshold Guardian
- The Trickster
- The Shadow
- The Herald

In multiplayer games it is not possible to have meaningful game-play for all participants if they all have the role of the hero, nor if they are all merely functions for a single hero. This is discussed further in Section 3.9.

Action, Event, State and Antecedent Driving Forces

In the context of story construction it is necessary to make clear distinctions between action, event and state, and in this way to be able to distinguish what implications an action has for one or several states. What states are affected depends upon an action's direction and sender. Greimas (1990) defines the distinction between action and event in the following way:

Whereas action is dependent only on the subject concerned with the organisation of his activity, event can be understood only as the description of this activity by an actant external to action.

An action is, according to these terms, dependent on the subject that performs the action or activity. An event, on the other hand, is a description of the same event when the description is performed by an actant standing outside of the performed action. A state is held by an agent and is a result of all actions performed by the agent itself and by the actions performed by other agents aimed directly or indirectly at the first agent.

Budniakiewicz (1992) asks what it means when someone says that 'we do' something. She means that verbs are 'unpacked' to make descriptions of antecedent states when someone contemplates an expression of 'something done'. Even though Budniakiewicz, just as Greimas, primarily studies syntactical structures, this terminology is useful in the current context. Budniakiewicz puts it in the following way:

These antecedent states are the wants, the goals, and plans of the agent which are interconnected in a peculiar pattern of reasoning used by the agent both before and during the performance of action, when the agent

is said to ‘be doing’ something. The reasoning has been named in traditional Aristotelian commentary a practical syllogism or inference.[...]

Let us look at what a schema of this kind works out:

Major premise: N wants to do O / bring about O.

Minor premise: N considers that he cannot do O unless he does P.

Conclusion: Therefore, N sets himself to do P / does P.

It is worth noting what an application of the example with the wizard and the dragon would look like in these terms. The reward from the wizard is experience points that a player can use to further develop and refine the PC - an overall goal in the generic VGW. N (the player) wants O (reward from wizard). N realises that he cannot get O if he does not do P (kill the dragon). Therefore N decides to do P.

The PC’s antecedent driving-force consisting of a will to get further in the game results in a quest structure where he or she decides to kill the dragon. The concept of antecedent driving-force differs from the current state in that the antecedent driving-force represents the expressive agent’s initial driving-force, while what is generally called state is a result of the conditions stored in the agent during the progression of the game that limits, gives freedom to act and possibly adds new driving-forces to the agent.

Ragnhild Tronstad (2001) discusses what constitutes a quest and how only after its completion it becomes a story. For her, what constitutes the motivation for solving a quest is the search for its meaning:

To do a quest is to search for the meaning of it. Having reached this meaning, the quest is solved. The paradox of questing is that as soon as

meaning is reached, the quest stops.

In a VGW the PCs who perform quests within the rules of the game are governed by the antecedent driving-force constituted by their long-term goals, plan or will. Tronstad argues that when the goal is reached, or the plan is carried out, or its will is satisfied, the driving-force of the agent is neutralised.

2.3.3 Discourse Level

Discourse, in the context of virtual game worlds, is the sequence of experiences (expressed by signifiers in the game world) that an expressive agent, whether it is a PC or an autonomous agent, goes through. The individual story discourse emerges simultaneously with an agent's activity and movement in the world.

Table 2.8: Discourse Level

Individual Story Discourse	The past of the expressive agent, a chronological sequence of the actions performed and the events experienced. This is the actual story of a specific expressive agent.
State	The state of the expressive agent in the moment of play, defined by the construction of the class the agent is instantiated from, and from the agents individual story discourse.

It is in the discourse level, summarised in Table 2.8, that the state of the expressive agent evolves. A class (in terms of software) describing the type of the agent also describes what types of action are possible for the agent to perform and the possible basic obstructions against performing them. This constitutes the *action potential*

of the agent. When the agent is instantiated for the first time, it contains its first conditioned state. The state of the agent changes depending on its own actions, what actions are aimed at it by other agents and objects. The state can also change depending on influences by other elements specific to a VWG.

2.3.4 Narrative Level

The narrative level consists of tales told about events and actions in the world. An example would be a player telling someone about something that has happened during play. This narrative does not necessarily need to be told in the VW. In fact most of these tales can be found through channels that support the game, such as web forums. Most VGWs' live teams write regular newsletters about what is happening in the world and have official web sites where this history is gathered and edited. It is common that the official web sites of VGWs have sections dedicated to players' narratives that in some cases are fictional or narratives about what a player has experienced via her character, told from the character's point of view. The most massive resource of documentation of the history of a world is the players' diaries and forums on the web sites of different guilds. It is also common for whole guild histories to be written by the most active players in a guild, highlighting marriages, wars that have been won and other important happenings.

The developers of the social virtual world Second Life, Linden Labs, hired the journalist James Wagner, who since 2003 has reported on trends and happenings that were taking place in the virtual environment (Wagner, 2003 - 2009). Lisbeth Klastrup has in her project 'The Death Stories Project' (2006) chosen one of the most dramatic events that can happen to a game character: death. Through a web form

she gathers narratives from players where death experiences are described. Part of the goals of the project is to find suggestions that may help designers to ‘become better at designing worlds which give players experiences they want to tell stories about.’

In some virtual worlds it is possible to leave individual marks which become part of the world’s history. One example is *A Tale In The Desert* (2003) where players of the first version of the game built monuments that will bear the players’ marks in the second version of the world.

2.4 The Open narrative Structure of Virtual Game Worlds

In comparison to single-player story-driven games, VGWs have a more open narrative structure because players are more free to act according their own motivations and formulate their own goals. Single-player adventure and role-playing games, movies, novels, and multilinear interactive narratives have in common that they are closed narrative systems in the meaning that the plot, the goals, and the antecedent driving forces are fixed, their nature having been decided by the creator(s) of each work. This is also the case for systems that generate narratives, such as BRUTUS, the story-telling machine described by Bringsjord and Ferrucci (1999); the antecedent goals and driving forces are set before story generation starts.

VGWs are different by being open narrative systems in the sense that players can add external goals and driving forces to the world. These goals can be both inspired from the world fiction, or have another origin, such as personal preferences.

2.4.1 Goals and Motivations

It can be argued though that goals can also be seen as motivations. I want money. Therefore, I have the goal to earn 10 million credits in Star Wars Galaxies that I can sell on Ebay. Or, I want to go travelling to participate in tournaments. Therefore, I have the goal to become very skilled at playing a particular game. Motivation is a broader and more intangible concept than goals deriving from motivations. Richard Bartle's (1996) four player-types (the achiever, the socialiser, the killer and the explorer) and Nick Yee's (2002a) five facets of player's motivations (relationship, immersion, grief, achievement and leadership) provide guiding principles for major player-motivations that can be regarded as sources that define goals for individual players and groups of players. There is a risk of mixing up motivation, preferred type of activity and goal-setting. Taylor (2003) shows that dynamic goals set by an individual player often lead to a very diverse set of activities. For example, it is difficult to be successful in a massively multiplayer game as a lone achiever or explorer — a high level of success is dependent on a large social network and good reputation. One cannot take for granted that goals are achieved by in-world achievement. For instance, suppose that a motivation is to have the status of a hero and the goal is to be a Jedi in Star Wars Galaxies. To be a Jedi in Star Wars Galaxies means true hero status and as such it also has monetary value. Without going into issues of meaning, value or cheating, clearly the goal of becoming a Jedi can be achieved by out-of-game activities that provide money, which in turn can be used for instant achievement in a virtual world. The remainder of this section gives a few examples of common goals that are *not* derived from the fictional content of a VW.

Power levelling

Taylor (2003) proposes the power gamer as a specific player type. Based on ethnographic studies and interviews done in EverQuest she describes dynamic goal-setting as one of the distinguishing features of the power gamer. For example, a player might aim to reach level 50 in three weeks.

Guilds with a cause

Sometimes guild leaders and players who organise other players formulate, together with a larger group of players, more long-term goals, such as waging wars on another guild. This is the case in Lineage, for example. In Star Wars Galaxies it is not uncommon for a guild to decide to help one player to become a Jedi, which is a more powerful type of PC (in terms of the game rules in the world) than the PC that all players create when they start playing a game. In order to acquire a Jedi-type character a lot of effort and time needs to be invested. In World of Warcraft (2004) a common goal for guilds is to successfully do raids. Groups of up to 40 players enter an instance, to face difficult challenges. The term instance comes from each group or party having a separate copy or instance of an area, complete with their own enemies to defeat and their own treasure or rewards.

These goals, formulated by individuals, are most often inspired by the fiction and the rules of the specific game world, but indirectly. When these goals are being formulated, agreed upon and striven for they are adding to the narrative potential in the world.

Real Money Trading

The goals of individual players are not always inspired by the game world itself. High-level PCs, rare items and game specific currencies ('game money') are possible to sell and buy using real money. For some players it is a purely economic interest in achieving certain goals.

Professional Gaming

Another type of goal inspired by circumstances outside VGWs is that of professional gaming in the form of competing in tournaments. This occurs mostly in multi-player games in the first person shooter genre. Pedersen (2002) shows that one of the dreams of being a professional gamer is to travel and compete in tournaments.

Bartle's and Yee's player and motivation types are mostly concerned with activities that are within the domain of the VWs, but those motivations and goals - depending on factors outside the VGWs - are just as important, because the actions performed achieving them become part of a VGW just as all other actions.

2.4.2 Enlarging the Paradigm of Virtual World Game Design to Accommodate Varieties of Goals

No matter what comes first for players when they dynamically sets goals, preferred activity or motivation, no matter if those derive from the world design or from motivations outside the game world, it can be argued that narrative systems in a VGW are open to goals defined by other persons than the originators of the worlds. This is, from the aspect of story structure, the feature that most distinguishes virtual game

worlds from other types of media where narrative is a prominent aspect.⁵ Virtual worlds as places support the emergence of stories. Emergence in this context means the emergence of a higher-level structure from the interaction of many simpler, lower-level primitives. In this case, emergent narrative can be understood as a system in which lower-level elements interact to result in the emergence of a pattern of events that may be told about in ways conforming to a specific higher-level pattern of narrative structure. The originators of the high-level narrative in these cases are people active within the world, especially those who take part in planning long-term goals or plans that result in sequences of events that lead to the achievement of the goal or fulfilment of plans, such as players, live teams, game masters and guild leaders.

VGWs are also open to narratives in different forms in the way that the history of the world is told in various ways and from many perspectives as mentioned in Section 2.3.4. Examples include accounts from journalists participating in the world, developers' additions to the back-story of the world, and diaries of PCs, written by their players.

2.5 Summary

In this chapter VGWs have been discussed as spaces for construction of narrative potential. Terms used in this thesis have been introduced; story, narrative, discourse, narrative potential, agency and story construction. Expressive agents and semiautonomous agents, created and controlled by developers, in-game creators and players, were introduced as constructors and realisers of narrative potential. A four-layered

⁵Another distinguishing feature of VGWs is that players characterise their own characters, with the means provided by a VGW, rather than being characterised by authors or developers. This is elaborated upon in the next chapter.

model of text levels in VGWs was described, where the Code Level and the Story Level were recognised as the levels where the designed, or authored, narrative potential is created. The played narrative potential is created at the Discourse level and the Narrative level. The story construction is performed at the Story level and the Discourse through persons using expressive agents for signification. Finally, the open story structure of VGWs was discussed by providing examples showing that the narrative potential is affected by a multitude of goals of which many are derived from motivations outside the narrative potential authored by the worlds' creators.

Chapter 3

Characterising Action Potential

Contents

3.1	Introduction	44
3.2	The Playable Character - focus, focaliser and concentrated mirror of a world.	46
3.3	Characterisation and True Character	46
3.4	Role-play and Game-play	48
3.5	Second Selves and Identity	50
3.6	Immersion, Presence and Persona	52
3.7	Characterising Action Potential	56
3.8	Characterisation in VGWs	57
3.8.1	Character Creation	58
3.8.2	Observable Characteristics	59
3.8.3	Expression through Dialogue and Emotes	61
3.8.4	Observation of Behaviour	63
3.9	True Character in VGWs	64
3.9.1	Faces of a Thousand Heroes	65
3.9.2	The Player's Journey as a Route to Self-Knowledge	66
3.9.3	True Character	67
3.9.4	Supporting Expression of True Character via Game Mastering	68
3.9.5	Supporting Expression of True Character via the Framework of Game Rules	70
3.10	Summary	72

This chapter discusses characterisation in games with a special focus on the conditions for character and identity development in virtual game worlds (VGWs), of the type massively multiplayer online role-playing games (MMORPGs).¹ Also, the concept of characterising action potential is discussed.

3.1 Introduction

As mentioned in the introduction of this thesis, there are a few aspects that are striking about VGWs, making them unique and different from other forms of art. The previous chapter discussed how the openness of the story structures inherent in the form makes it possible for players to add their own goals to game worlds, which results in added narrative potential in the world. This chapter focuses more closely upon characterisation — the core of good storytelling. In a VGW, playable characters (PCs) are in effect characterised by different persons who play. This may be compared with how, in fiction literary authors describe how their characters when ‘come to life’ driving the story; in VGWs there is similar situation, but the characters *are* alive, controlled by real people — players.

Characterisation is one of the tools that students in any narrative art form learn about in the very start. This, however, is about describing *other* characters to an audience, viewer, player or reader. In VGWs it is different — all players characterise their *own* PC, that is, in-game representations of themselves, or of authored characters performed through role-playing.

¹An early version of this text was published as the chapter The Player’s Journey in the anthology Digital Gaming Cultures and Social Life (Eladhari, 2006).

While much has been written about development of identity in virtual game worlds (e.g., Bruckman (1992), Turkle (1995)) there is so far not much material approaching the development of own fictional identities - PCs - from a poetic-aesthetic perspective. It is necessary to recognise not only the creation of VGWs as an art, but also that playing is an art in itself, providing performances both for individual players and for the virtual society of the specific game world.

Can one talk about characterisation at all if it is not a performed identity or role, but instead a real identity expressed within a fictional setting? Can one talk about 'true character' when the character in question is a real person, set in a fictional world, expressing an identity which may or may not be fictional, who may or may not be role-playing while performing it? This chapter draws upon thoughts from Bartle about the concept of persona (2003), from McKee about the notion of true character (1997), from Campbell's concept of the Hero's Journey (1949), from Fine's thoughts on role-playing versus gaming (1983) and of Schubert's (2001) approach to presence for exploration of these questions. Particular focus is set upon possible ways to use characterisation to create more meaningful dramatic experiences and to deepen the possible immersion into a game world via closer identification with a player's PC. Methods for game-mastering may be one way, and evolved rule-sets and possibly autonomous functions for PCs may be another.

3.2 The Playable Character - focus, focaliser and concentrated mirror of a world.

In a VGW, PCs are not only vehicles for movement or characterisation of the PCs, they are also the functional cores of each individual play experience. PCs are both the focus and the focalisation point, that is, the point to focus from.

Players see the world through the ‘eyes’ of their PCs - their focalisation point. When other players look upon a PC it is the representation of a player they focus on. Furthermore, the state and nature of a PC that controls what a player can or cannot do at any given moment. From a design and engineering point of view, a PC represents all effort to build the whole game world system, all of its functionality boiled down to be used by one super- or base class that is the one the player will use. For players, the properties of their own PCs set the perspective on the execution of the whole piece, how the world is set into moving, living, changing, to add to its society, its dramas, its norms, its webs of social networks, its layout and architecture and to the world soul that is the synthesis of all pieces functioning together.

A PC is a concentrated mirror of the world — a small mirror that reflects the whole world. It is not only an interface; the whole action potential of the PC is a reflection of the game world system. How PCs are engineered and what possible states, abilities and properties they can have is wholly dependent on a VGW’s mechanics.

3.3 Characterisation and True Character

Characters and characterisation are central in VGWs. But what is characterisation in VGWs? McKee (1997, p. 100) distinguishes between *characterisation* and *true*

character in screen plays, defining characterisation as what is merely observable:

Characterisation is the sum of all observable qualities of a human being, everything knowable through careful scrutiny: age and IQ; sex and sexuality; style of speech and gesture; choices of home, car, and dress; education and occupation; personality and nervousity; values and attitudes-all aspects of humanity we could know by taking notes on someone day in and day out.

All these things mentioned in McKee's text applied to a game would be what there is to see and note about another PC or about a non-playable character (NPC) fairly easily by having a few conversations and perhaps teaming up once or twice for common causes, like hunting or questing. True character, on the other hand, would not be perceived so easily. According to McKee (p. 101):

[...] true character is revealed in the choices a human being makes under pressure-the greater the pressure, the deeper the revelation, the truer the choice is to the character's essential nature.

In order to see the true character of another PC inhabiting a VGW, a deeper long-term relationship is needed. In most cases these are friendships, but they can also be love relations, curious obsessive enmities, or other relationships that are more than acquaintances. In relation to us as humans it is not uncommon to ask oneself what one would do in a critical situation. Would I deceive my friends under pressure of losing my own life? If I am in an immediate life-threatening situation, would I panic or would I act with rational urgency? Persons who have been in critical situations often reflect upon their behaviour afterwards and feel that they gain more knowledge about

themselves when they know how they have reacted. It is not uncommon to receive information about this via media in the reporting of dramatic and tragic events such as when the ship Estonia sank in the Baltic Sea, when the Titanic sank or when the twin towers in New York were destroyed.

3.4 Role-play and Game-play

In the context of VGWs, a question that arises is whether the true character shown in a VGW is the true character of a PC or of a player. At most times what is shown is probably the true character of a player. The reason for this is that most players of VGWs do not role-play, they rather play themselves in another world than playing a fictive character.

Gary A. Fine conducted a sociological study of players of pen-and-paper role-playing games in the early eighties (1983). Fine distinguished between two types of players: *gamers* and *role-players*. A gamer plays the game as himself, while a role-player plays a character, wishing to lose himself in the fictional fantasy.

According to Fine, the gamer uses gaming as an extension of self, motivated by the question ‘Would I survive under these circumstances?’ A role-player makes a conscious effort to characterise the character he or she is performing, in a similar way that an actor would, except that there is no audience to make an impression on apart from fellow role players. This *conscious* act of characterisation of the PC is by role-players seen as a vital part of the experience role-players create together.

A gamer, as defined by Fine, does not make a conscious act of characterising his PC, but from a systemic point of view uses the same tools for expression as a role-player. The gamer’s play tends to be more oriented to succeeding in the game

scenario than in the role-playing. In Fine's study it was younger, less experienced players who played as 'themselves'. For role-players the emphasis on the role was much greater, to the point of players claiming to be 'another person' or 'schizoid'.

Players of contemporary VGWs mostly play as 'themselves'. This does not mean, as it was in Fine's study, that they are less experienced as players. VGW players often use places in VWGs as local pubs, or in Oldenburg's sense 'third places' (1989), spending on average 20 hour per week (Yee, 2002b) in their VGW of choice, in company with other players. Role-playing requires a conscious effort from the player, and few have the energy to role-play all the time, unless they only enter the VGW for that specific purpose. Players who wish to role-play in a VGW usually do it in 'sessions' — that is, a group of players plan for times and locations in the VGW where they meet to role-play, often in line with a theme or a story-line written by members of the group (Sveinsdottir, 2006).

In VGWs the act of role-playing and characterisation of a fictional PC is part of a shared agenda agreed upon by a group of players. If the shared agenda and agreement of creating a common role-playing experience would be taken away, and a player would role-play, this might be seen as acting with pretence and even lying. Player who are not role playing still make impressions via their PCs and are probably conscious of how other individuals perceive them.

Copier (2007) noted that role-play in current VGWs mostly relies on meta-game rules because role-play is hard to capture in a system. In fact, Copier described a specific VGW role-play style as characterised by negotiation of principles of these meta-game rules.

3.5 Second Selves and Identity

We may in the real world, in Goffman's (1959) sense, consciously create certain appearances to make a certain impression, but we do not talk about characterisation. Characterisation is a concept strongly tied to pre-authored fiction. Methods for characterisation are taught in contexts of learning to characterise characters in screen plays, novels and games. It is possible to argue that VGWs are fictional, and therefore all types of expression of information about a certain PC must be seen as characterisation. However, many players see the time that they spend in a VGW as a parallel reality. Especially the relations with other players are perceived as 'real'.

For many players spending time in a VGW becomes a part of their everyday life. Oldenburg (1989) describes three types of social place, where the home is number one, work is number two and the local pub or village square is 'the third place'. People go to the third place to socialise with other people. According to Oldenburg, this has many good effects for the individual and the community, but the primary reason for going to 'the third place' is not to do something useful, but to have fun and relax. In contemporary societies not everyone has a natural place such as a local pub or village square to go to. For many, VGWs contain such third places.

How different is it to get to know someone in a VGW compared getting to know someone in the real world? In the real world, people are constrained and defined by the properties they were born to, such as gender, appearance, health and conditioning by social class, culture, environment, family and numerous other circumstances. In VGWs players are instead constrained by rules and mechanics and of the norm systems that have emerged in them. It is possible to compare this to moving to another

country in the real world. Old constraints can be exchanged for new ones. In *Life on the Screen* (1995) Sherry Turkle describes how she felt like a different person when she lived in France. She became the ‘French-speaking Sherry’ who (p. 209):

[...] was not unrecognizable, but she was her own person. In particular, while the English-speaking Sherry had little confidence in being able to take care of herself, the French-speaking Sherry had to and got on with it.

Fine (1983) stated that a role-player aspires to ‘lose himself to the fantasy’, and that this great emphasis on the role leads to a point where the player can claim to be ‘another person’.

VGWs have for a long time been considered as arenas for experimentation with one’s own identity. In the early 1990s Turkle (1994) studied how players could use MUDs for identity construction, stating that (p. 158):

There is an unparalleled opportunity to play with one’s identity and to ‘try out’ new ones. MUDs are a new environment for the construction and reconstruction of self.

Bartle, co-author of the first MUD (1978), stated that ‘Virtual worlds enable you to find out who you are by letting you be who you want to be’ (2003, p. 160). In Bartle’s view, which I share, development of identity is the core point of VGWs (2003, p. 159):

Celebration of identity is the fundamental, critical, absolutely core point of virtual worlds.

In VGWs, characterisation of one's own PC and development of identity are interconnected. Identities - the concept of identity means 'one' — is in VGWs often expressed through several roles, through several virtual bodies. Just as the multitude of roles we have in the off-line reality due to differentiation in contemporary society the online roles and second selves of players can be many.

3.6 Immersion, Presence and Persona

The level of immersion and presence in a game world is an important aspect of the identity via which the world is experienced. Bartle has described the representation of a PC in terms of levels of immersion from avatar, to player character, to the highest level of immersion where the representation is a persona — a state where the player does not make a difference between himself and the character (Bartle, 2003). In Bartle's taxonomy players would have *avatars* if they only use them as puppets to control as their *representatives* in the world. Players who regard the objects that they control as their *representations* in the world would have *characters*. The characters are extensions of players' selves, whole personalities for players when they enter the game. According to Bartle, most players play at this level and often have several characters. In the most extreme state of immersion the object that a player controls is not seen as a representation; the player has the experience of *being* the object (Bartle, 2003, p. 155):

A persona is a player, in a virtual world. That's in it. Any separate distinction of character is gone-the player is the character. You're not role-playing a being, you are a being; you're not assuming an identity,

you are that identity; you're not projecting a self, you are that self. If you're killed in a fight, you don't feel that your character has died, you feel that you have died. There's no level of indirection, no filtering, no question: You are there.

Players who have a sense of really *being there*, in the game world have, in Bartle's terms a *persona*.

Whether players role-play or play as themselves does not necessarily have any bearing on whether they develop a persona or not. For example, a role-player may develop a persona, and a player who plays herself can sometimes experience having a persona or role-playing. Common for these modes of play is that *players* are the ones who carry out both the characterisation of and the expression of the true characters of their avatar/PC/persona in a VGW.

The concept of immersion is tightly connected to that of presence. These terms are central in the research field of virtual reality (VR). As a psychological phenomenon *presence* is defined by Slater and Wilbur (1997, p. 605) as 'a state of consciousness, the (psychological) sense of being in the virtual environment.' *Immersion* is in this field described as 'the extent to which the computer displays are capable of delivering an [...] illusion of reality to the senses of a human participant' (Slater & Wilbur, 1997, p. 604). In studies of players' experiences of digital games the term immersion is often used in a meaning close to that of presence; Ermi and Mäyrä, for example, prefer it 'because it more clearly connotes the mental processes involved in gameplay' (2005, p. 18).

Schubert et al. (2001) state that presence often is seen as a direct function or outcome of immersion. Immersion is in VR research often measured by making user tests in laboratory settings and retrieving feedback from the users by the use of questionnaires. By the use of common categories for measurements immersion is seen to be objectively quantifiable. The more ‘real’ the environment appears to users, the higher degree of immersion the user would experience. Schubert et al. stress (2001) that presence is, compared to immersion, a *subjective experience*, and not always in a one-to-one relationship to the degree of immersion.

By conducting several studies Schubert were able to show that presence involves (at least) two components: the sense of being located in and act from within the VE, and the sense of concentrating on the VE and ignoring the real environment. The experience of presence results, according to Schubert, ‘from the interpretation of the mental model of the VE, which is the outcome of the cognitive processes’ (2001, p. 268). Schubert argues, following Glenberg (1997), that ‘a virtual environment, like every other environment, is perceived and understood by mentally combining potential patterns of actions’ (p. 268) The representation of users is understood by what actions are possible to perform in the environment. Glenberg and Schubert call this process the construction of meshed sets of patterns of actions. Two types of pattern are distinguished: *projections from the environment, and memory*. The first type, the projections from the environment, are actions that follow the bodily constraints afforded by a virtual environment (VE). Schubert offers the example of walking over a narrow bridge, a bridge that the user is told can break. The act of walking over a narrow bridge is provided by the VE, while the potential act of walking carefully is provided by the prior knowledge, the memory, of having been told that the bridge

can break.

In VGWs, the action patterns projected from the environment are realised mostly through work done in the engine layer, and to some extent of that in the scripting layer in the code level described in Section 2.3.1. The action patterns projected from memory may be derived from the game-play mechanics affording potential actions based on the nature of individual PCs, something which in VGWs mostly is defined in the framework layer of the code level, but also to some extent in the scripting layer.

Schubert notes that ‘When users are present in a VE, the outcome of the cognitive processes can be conceptualized as a special type of mental model of the virtual space [...]’ (2001, p.267). In VGWs, where the nature of the action potential is based on the nature of PCs, the mental models of the world are likely to be highly individualised.

I propose that the nature of the *action potential* of PCs, as constructed meshed patterns of actions resulting in individual mental models of the VGW, is crucial for characterisation and the expression of true character in VGWs. Perhaps the expression of true character would help players to develop a persona — and thereby get a deeper and more meaningful experience of playing in and inhabiting a VGW.

Persona development could be considered as a desirable goal for virtual world design. An important step in this process is the first identification with the PC. The fact the PC creation is done by players themselves creates a sense of ownership from the beginning, comparable with an initiation ritual. Ideally, there is a deepening of the bond and the sense of identification of players with their PC.

3.7 Characterising Action Potential

The action potential of a character is what it can do at a given moment with it all the circumstances inherent in the context taken into account. The *characterising action potential* (CAP) defines what a character can do at a given moment that characterise it, both in terms of observable behaviour and in expression of true character — a character's essential nature, expressed by the choices a character makes. The observable characteristics include visual appearance, what body language it uses, what sounds it makes, what it says, and most importantly, what it does and how it behaves.

Normally in VGWs the foundation of the CAP of PCs is chosen by players in the very beginning of the game, at the character-creation stage, where players choose gender, visual appearance, class and skills for their PCs. It is the choice of class and skills which will limit what the player can do in terms of game-play and what the PC may become particularly good at doing in the VGW. These skills normally define which roles players take in groups where players co-operate. A PC's role in co-operation with others is important since it impacts other players' interactions with a particular PC. Interactions with others become part of the player's journey while creating the identity, possibly second self or persona, that the PC represent.

CAP is the means players have for expressing their personalities, or the character of their PCs, to other players, but it is also via CAP the players get to know and develop their own PCs - a process which is an interplay between players and the game system. The design and architecture of CAP for PCs in VGWs is crucial for game-playing experience from many angles. The nature of the CAP defines what role and what impact a PC can have in the creation and realisation of the narrative potential in a VGW. It is also defining for the progress of the PC in terms of achievement

and role-differentiation in a VGW, as well as for how this process is interpreted by players while potentially constructing alternate identities or second selves. How a PC and its CAP are integrated in the underlying story-construction system of a VGW determines to what extent PCs can make truly dramatic choices as part of the deep story structure of the VGW. If they can, the PCs truly are protagonists in the world. Furthermore the CAP has a profound impact on the role-playing possibilities provided to players — to what extent the role-playing activity is supported. In the next section characterisation in VGWs is discussed, followed a discussion of the expression of true character in VGWs.

3.8 Characterisation in VGWs

The characterisation (as what is observable) in VGWs of PCs is done by players within the game-play framework, that is the game mechanics and rule-set, provided by the developer of a particular VGW.

In this section, the characterisation of a PC is described using the following steps.

1. Character creation: a player's configuration of a PC before entering a particular VGW and possibly also formulation of a fictional background story for the PC
2. Observable characteristics provided in the VGW
3. Expression through dialogue and emotes
4. Observable behaviour

3.8.1 Character Creation

How a character is created depends of the details of the specific game-play framework, but most virtual game worlds let a player choose between a range of different character types, referred to as classes. These are often of different races. An example of choice of profession and heritage group from the VGW *Asheron's Call* (1999) is shown in Figure 3.1.



Figure 3.1: Choosing heritage group and profession in *Asheron's Call*

After having picked a class, most MMOGs let players choose a main profession or skill type. Players may also choose a gender (often there is a neutral gender as one of the options for certain classes) and customise the appearance (e.g., skin-, eye-, and hair colour, height and build). Often different classes are better for certain professions, but usually the choice is free (a freedom that sometimes has a less efficient result for achievement within the game system if a sub-optimal race is chosen for a particular functional class; players refer to 'gimped' characters). The main skills chosen for a PC determine what the PC is especially good at. In a game this gives players a certain role in groups that are formed to do something specific, like a quest or a hunting

session. The groups usually need to be put together so that the group as a whole has the necessary skills and properties to succeed at a certain task. In many games, players can also change the properties of their characters. The properties are the game-specific properties that, for example, define how strong and fast the character is, and this is often combined with skill levels to determine how efficient a certain action is. For instance, if a player creates a character that is going to use a dagger as a weapon in *Asheron's Call*, (1999) he or she will probably choose a high value for the property Quickness. If the player intends to create a character that will use magic in some form he or she will probably put high values on all properties that are related to the mind. These specific examples of using magic and daggers apply to VGWs in the fantasy fiction genre (e.g., *Asheron's Call*, (1999); *Asheron's Call 2*, (2002); *EverQuest*, (1999); and *Final Fantasy XI*, (2003)), but similar types of set-up are found in worlds having other genres, such as sci-fi (e.g., *Anarchy Online*, (2001); and *Star Wars Galaxies*, (2003)). A flaw of the character-creation stage is that players often need to decide on important properties before they have entered the game world, so at the moment of creation they do not know what will be important to them during game-play.

3.8.2 Observable Characteristics

When a player has entered into a game by controlling his or her PC, there are two dimensions to characterisation: firstly, how the PC can be perceived by other players, and, secondly, how the player perceives his or her own player PC. Other players can usually not see all of the properties of another player's PC.

Suppose a PC (A) approaches another PC (B). Things that are visible and audible in close spatial proximity are usually the other character's class, gender, specific physical appearance, motions and possible sound effects. In many VGWs it is also possible to target the character and receive a display of more information. Figure 3.2 is an example from Star Wars Galaxies, showing the screen representing the PC Rhales that is displayed when another player examines him.

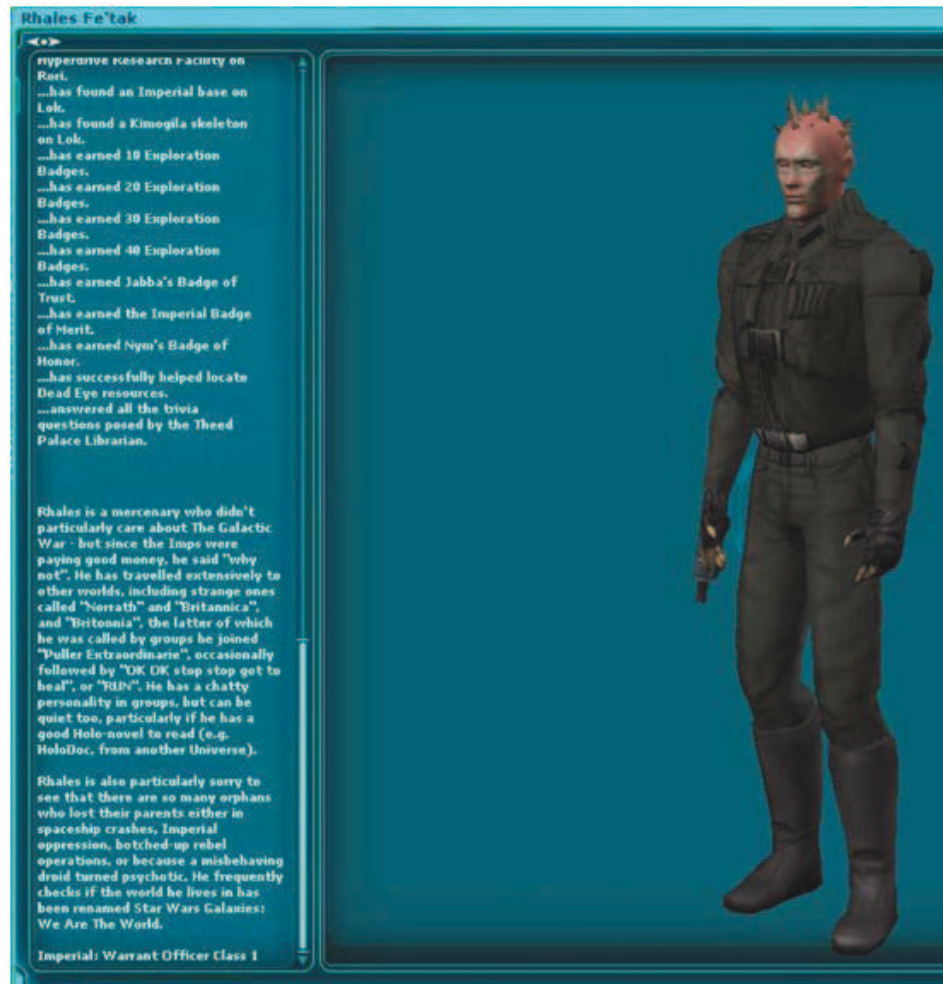


Figure 3.2: Character Description Screen in Star Wars Galaxies.

In some games, the targeted PC (B) receive a text message that another PC (A) is accessing their information. In some games, the amount of information that can be retrieved is dependent on skills in getting information (as in *Asheron's Call*). Usually, information is available about the character's main skill type, level of advancement and the currently wielded weapon. In many cases (as in *Final Fantasy Online*) it is also possible to see whether the PC is interested in joining a group. Based on this information a player can, considering her PC's needs, goals or preferred types of activities, evaluate whether it is worthwhile to interact with the other PC.

3.8.3 Expression through Dialogue and Emotes

Suppose that PC A starts a conversation with the other PC, B. First of all, as in all media, dialogue is a powerful tool for characterisation. Cherny (1994) shows an early example from the text-based VGW LambdaMOO of how players program personal and characteristic behaviours into their PCs that can be triggered by keywords typed by other players. Besides pure dialogue, in conversation it is also possible to use emotes, that is, to add gestures and other type of information about non-verbal expressions the conversation. How much of this that can be animated differs from game to game. For instance, if a player (PC A) types '/smile' in a text-based VGW, generally the result of the action would be that the players in geographical proximity of PC A receive the message 'A smiles.' If PC A would have done the same in a VGW using 3D and facial animations, the PC would instead have displayed a facial animation of a smile.

Emotes are generally available in VGWs. Text-based VGWs often give more freedom of expression to players by allowing them to program behaviours of their

PCs. This is usually referred to as *scripting*, and is something that has become more sophisticated also in later graphical VGWs, most notably in *Second Life* (2003) and *Star Wars Galaxies*.



Figure 3.3: Screen from Star Wars Galaxies showing the user interface for choice of mood for the PC.

Scripting is often used to put together personal and characteristic sequences of emotes that can be triggered by the player in appropriate social situations. In *Star Wars Galaxies* it is possible to set a mood for the character. Figure 3.3 shows a screen where the player has chosen the mood ‘vengeful’ which is reflected through the character’s facial expression. The dialogue system adds comments in addition to the typed dialogue. For example, if PC A has the mood set to ‘wounded’ and types ‘oh’ the

output in the form of text is the following: “oh’ A says, dismay in her eyes’. Another expressive feature in Star Wars Galaxies is that certain words that the player types triggers a PC’s animation sequence. For example, if the player types ‘yes’, an animation shows the PC nodding.

3.8.4 Observation of Behaviour

Suppose that PC A decides to do something together with PC B and that they both have just joined the game world. They decide to do a delivery quest together. A quest of this type has the objective of delivering an item from one NPC to another, a type of quest often given to low-level characters in many VGWs.



Figure 3.4: Two PCs taking a break while doing a quest in Star Wars Galaxies.

Such quests are simple and give players opportunities to see more of the game world while getting used to the interface. While playing together, the players get to know the other characters by interacting — they get an idea about how a specific PC behaves. Figure 3.4 shows two PCs in *Star Wars Galaxies* taking a break while doing a quest.

Character classes — the types of characters players can create as PCs — are similar to each other in different VGWs. There is a large combination space of character properties in VGWs, but within similar rule sets building on a low variety of fictional themes. The variety is greater in terms of tools for the players to express themselves — as themselves playing in another world, or as fictional roles they perform. The similarity of the character classes depends likely on inherited design traditions from the classic D&D system (Gygax & Arneson, 1974) and the different VGW code bases that tend to permeate the designs. Classes are also often similar to each other due to the publishing companies and developers favouring the use of fictional content from the fantasy and science fiction genres (Eladhari, 2003). Nevertheless players are provided with a large range of tools for characterisation in the sense of what can be seen, including a large variety of static properties as well as behaviour and styles of play and expression.

3.9 True Character in VGWs

Development of identity, where part of the process is to change and mature, comes with challenges. We learn about ourselves all the time, but especially in situations that are comparable to those situations where fictional characters show their ‘true

character’ — under pressure, in conflict situations, and in situations that involve difficult choices. Is there a ‘player’s journey’ just as there is a ‘hero’s journey’ (Campbell, 1949; Vogler, 1993) in which such a true character is revealed? And is this the true character of the player’s character, or of the player’s in-game persona?

As described in Section 2.3.2, in the hero’s journey, just as in Propp’s *Morphology of the Folktale* (1968), there is a strict chronological sequence of events, and a concentration around the main character, the hero. The hero is said to have a character arc that is the path of growth that a character undergoes, and the character’s choices in difficult situations reveal his or her true character. The other characters in the narrative also have character arcs, but their main functions are to function for the hero, not for themselves.

3.9.1 Faces of a Thousand Heroes

In multiplayer games it is not possible to have meaningful game-play for all participants if they all have the role of the hero at all times, nor if they are all merely functions for a single hero. This is a recognised fact in live-action role playing contexts, and clearly expressed in the Dogma 99 manifesto (Fatland & Wingård, 2003, p. 20):

3 No character shall only be a supporting part.

It is a challenging for VGW designers to find ways to accomplish heroship for all PCs, while also allowing PCs to play *other* functional roles for *other* PCs in *their* functions as heroes.

The concept of heroism builds upon some central concepts. One concept is that of *singularity*, to ‘be the one’ (who saves the world), that is, to be chosen. Another

central concept is that a particular individual does something admirable and *good* according to a specific norm system. A third central concept is that heroes are the ones whom songs and stories are written *about*. For a hero's sake, this is not anything that happens while the adventure goes on; the hero becomes a hero when the story is told. There is no heroism if there is no scribe, or writer of ballads, and an audience to whom the story is later told. The songs are sung in contexts where the hero is seldom present. There is a part of this happening in virtual worlds — visible on players' pages and guild pages on the Internet, but it is in most cases secondary to the play.² What is probably most important to players is *the journey*, not the tale *about* the journey.

3.9.2 The Player's Journey as a Route to Self-Knowledge

Richard Bartle (2003) compares an online player's journey with the 'hero's journey', step-by-step along the route Campbell described. Bartle interprets the hero's adventurous journey as the player's journey towards mastering two worlds, where the player's goal in the journey within a virtual world is that the virtual self and real self become the same. The player's journey begins in real life, with getting hold of an account that lets the player log on to a virtual world. That is the 'departure'. The 'initiation' stage takes place wholly within the virtual world, while in the 'return' the player is separated from the virtual world but has learned a lot about him- or herself along the journey. There are early documented examples of players expressing their gaming experience as a way to know themselves better. Bruckman (1992, p. 35) gives a transcript from a conversation with the PC Tao. He tells her that he has

²These narratives are part of the narrative layer as described in Section 2.3.4 in Chapter 2.

learned a lot about himself when spending time in the virtual world, for example how to organise people, give orders and going through the difficult experience to serve as a defence council for a friend. ‘These experiences have helped me to know my self better’ Tao concludes.

Bartle’s conjecture is that ‘Playing virtual worlds is a kind of hill climbing activity through identity space’ (2003, p. 440). This is indeed different from the task we are used to heroes doing: saving the world — even though they make characterising choices along the way.

3.9.3 True Character

Suppose that PC A gets along well with PC B who she went on a delivery quest with, that they start doing more things together, and eventually end up joining the same guild, a permanent grouping of players, and thus develop a social network together within the VGW.

There are a lot of tools in current VGWs that provide players with the means to characterise their PCs through visual appearance, information about properties of the PC and expressive emotes, but what about the expression of true character, the, in McKee’s terms ‘the character’s essential nature’? How does A see the true character of B, and how is A’s own true character expressed?

I see two main approaches for supporting expression true character in VGWs: (a) by game mastering and (b) by implementing potential for it in the game-play framework. These two approaches are now discussed.

3.9.4 Supporting Expression of True Character via Game Mastering

In table-top role-playing games the role of the game master (GM) is to weave the player's PC stories together, to create environments in which the players can interact and to control the non-player aspects of the game. The GM also provides interpretations of the rules and moderation. In single-player role-playing computer games there seldom is any similar function present because the game itself provides the stories, rule sets and environments. In VGWs there are sometimes game masters present who organise happenings, but most of the effort of these GMs is to help solving conflicts between players and to provide in-game support.

A controversial example of game mastering in a VGW is the event of the Trader Malaki that was game mastered in *A Tale in the Desert* (eGenesis, 2003). The trader Malaki was said to trade valuable goods, but he 'would not trade with women, and made references to trading /for/ some of them as slaves. This did not go over well at all, and he was eventually hounded out of Sinai, by a small revolt led by the PC Logicritus, after peddling one or two of his wares for some expensive items. He later turned up in Karnak to do the same, with the same result.'³ The event stirred up a lot of emotions and discussions in online forums. To players this was a challenging situation that called for reactions. Some players with male PCs did trade with Malaki, while others refused. Andrew Tepper, creator and owner of *A Tale in the Desert*, commented on the event with the following on the website Slashdot:⁴

Along comes a foreign trader, with shiny new goods, and an attitude that's

³URL: <http://wiki.atitd.net/tale2>, revision 8, verified September 8, 2008

⁴URL: <http://slashdot.org/comments.pl?sid=126745&cid=10604460>, October 22, 2008, verified July 28, 2005

totally offensive, totally out of line with the culture that has developed in our Ancient Egypt. Would you trade with him? Would you put aside your morals, if it meant you'd get an advantage that many people don't have? In real-life, would you patronize a store that had a 'no jews allowed' policy? What if they had *really* good prices? Would you do it and hope nobody saw? Maybe feel guilty?

The best books, movies, television — can provoke a range of emotions. I like books that make me feel happy, enraged, triumphant, guilty, enlightened, sad. I want to have all of those emotions available in an MMO, and emotions occur in players, not characters.

In this particular instance, the riot and the negative reaction *does*, as Tepper says in the quote above, come from the players. Had it been pure NPCs having a norm system as in ancient Egypt, or players strictly role playing to have the norms of the fictional historic society, there would have been nothing strange or notable about the trader's behaviour in that women were discriminated against. The reactions to the event indicate a test of *players'* true character. In role-playing it is common to discuss strong emotional reactions to game events after a playing session and let the in-game events run their course. However, if a player who plays him- or herself is suddenly transported to ancient Egypt, the strong emotions are more understandable. It may be argued though that the players were indeed role-playing considering that the norm system that has evolved in this particular fictional version of old Egypt does not tolerate discrimination of women, supposing that the community of players has such a common norm system. If so, this serves as an example of how game mastering can bring out expressions of true character not only by players, but also PCs.

Even though the world is virtual and the setting is a game, it is not possible to trivialise the emotional impact of events involving players' own characters - Dibbell's story about the rape committed by MrBungle in the text-based virtual world LambdaMOO clearly showed this (1993). Our virtual personas are vulnerable. An even earlier example is van Gelder's (1991) 'The strange case of the electronic lover' which takes up issues of mind-to-mind encounters, gender swapping, deceit and construction of alternative personas, first published in 1985.

3.9.5 Supporting Expression of True Character via the Framework of Game Rules

Besides game mastering, another way of supporting the expression of true character and development of persona might be to extend the functionalities of the PC to reflect an actual personality. The personality would be the distinctive and characteristic patterns of thought, emotion, and behaviour that define an individual's style and influence on his or her interactions with the environment. As an example, a character has a phobia for a certain type of object in the world — how shall a player handle that if an object creates an involuntary reaction of fear for the character? Let us also suppose that this phobia is either chosen by the player him- or herself, or that it is caused by a previous traumatic event within the game world. The reaction to this would also be dependent on the PC's personality — different characters may respond differently to a situation involving specific emotions. There is a danger in implementing systems that make a PC behave or be inclined to behave in a certain way — that too large an amount of control over the PC is taken away from the player, thus alienating the player. But, for the sake of the argument, suppose that it

is possible to modify the design in a way that does not take away control from the player, but that it instead poses a challenge. There are many ways of implementing personality-specific behaviour depending on what types of personality models and game-play framework that are used. There are a number of models derived from research in psychology. Personality is a specialist area in of psychology and there are many specialist psychology journals in this area. Of course it is aslo possible to define game-specific personality models from scratch.

Considering the vast field of theories around personality, affect and temperament, this is a field that allows many different ways of experimenting with concepts of mind, identity and personality in VGWs. The prevalent game-play paradigms derived from previous games are by no means mandatory — even though they have formed both players' and developers' expectations of what a massively multiplayer game should be like. Games having different game-play paradigms, such as *A Tale in the Desert* (2003), which is a non-combat game featuring political violence (metaphoric back stabbing) rather than physical violence (actual stabbing), has still been able to find a stable community of players. A system incorporating the personality modelled and developed by a player into his/her PC may well support both creating and experiencing situations more dramatic and individualised than most VGWs currently provide. Together with game mastering this might be a tool that both expresses the true character of the PC or the persona, and leads to experiencing more presence in the game via closer identification with the PC that the player controls. It may also be a basis for the creation of individual dramatic story arcs. However, it is crucial to bear in mind that even though the creation of VGWs can be an art, playing within them and inhabiting them can also be a performative art form in itself. VGWs may in future

provide systems that support the emergence of true individual story arcs, game mastering that can bring out the true character, and more sophisticated support for the development of personas, but it is the players' task to inhabit them, play them, and maybe develop within them. That is the player's journey.

3.10 Summary

In this chapter the importance of the playable character (PC) was stressed. The concept of character action potential (CAP) was introduced, encompassing both characterisation and true character as defined by McKee, designating what a player can do in a given moment in a VGW that characterises her PC. Role-playing, self-playing and identity construction in VGWs was discussed as well as immersion, presence and Bartle's concept of persona. It was stated that current VGWs have elaborate tools for characterisation of PCs, but few for bringing out their true character. The expression of true character in game worlds could lead to deeper and more meaningful dramatic experiences as well as supporting a higher degree of immersion or presence in a game world via closer identification with a particular PC, which in turn could support the development of a persona. It was suggested that expression of true character in VGWs may be achieved partly by game mastering and partly by developing more sophisticated architectures for CAP.

Chapter 4

Challenges in the Design of Virtual Game Worlds

During the work with the experimental prototypes reported in this thesis there are a number of questions that have motivated my work.

Before listing the motivating questions I would like to point out that the relevance of the questions rely on several assumptions. One assumption is that interesting, complex and surprising characters who undergo dramatic development expressing their very essence are crucial for good storytelling. A second assumption is that this also is the case in virtual game worlds (VGWs) where it is desirable that playable characters (PCs) can be such characters. A third assumption is that identity development is pivotal for VGWs and that the development of persona in Bartle's sense where a player is so deeply immersed that she has the experience of 'being' the PC is desirable for the experience of inhabiting a VGW. A fourth assumption is that the possibility of co-creating and realising the narrative potential of a VGW where one's own character plays a part is important to one's experience. These assumptions are implied in the work presented in Chapters 2 and 3.

An assumption not yet expressed is the importance of interpersonal relationships between players for the experience of inhabiting a VGW. I have, as a player in VGWs, just as most other players, seen countless cases where relationships have become so important to players that they have become part of their ordinary life outside the game world too. Most of the time these relationships are friendships, but sometimes they are enmities for various reasons, and sometimes romantic relationships.

Occasionally, players become so heavily invested and immersed in the VGW and the relationships in it that the ‘real’ world for them seems less real, and bleak in comparison.¹ It is in the VGW they have felt able to be fully themselves, free from the roles they are allotted in the real world and how they habitually are perceived by those around them. It is in the VGW they have felt free to express the true essence of themselves — not as characters, but as humans. Many are the cases when new families have been started, where the partners have met under in VGWs where they have experienced learning to know each other as they ‘really are’.² It is also common that VGW-players play with family members and romantic partners (Yee, 2003a).

I call this situation, where relationships move between the real world and virtual worlds, *the bleeding circle*. I draw from Huizinga’s (1938, 2006) description of *the magic circle* of play (p. 113): ‘We found that one of the most important characteristics of play was its spacial separation from ordinary life. A closed space is marked out for it, either materially or ideally, hedged off from the everyday surroundings. Inside

¹A survey conducted by Yee (2003c) illustrates this, where 27 percent of the players reported that the most satisfying event they had experienced the past month had occurred in a game environment. Thirty-three percent of the players felt that the most infuriating event they had experienced the past month had occurred in a game environment.

²Yee (2003b) reports that almost half of the players in VGWs form close friendship relations with people they meet in VGWs, and that it is also common to start romantic relationships. In the same study, 40 percent of the participants stated that they feel that their online friendships are comparable or even closer (‘better’) than their friendships in the ordinary world.

this space the play proceeds, inside it the rules obtain.’

Through bleeding circles relationships seep between ordinary and virtual worlds. I use the word bleeding because it is the very heart blood that is flowing over the borders. The dramatic associations to the expression are appropriate for the type of processes involved in the situations.

It seems to me that the immense power of interpersonal relationships in VGWs is not used to its full potential in the design of mechanics and systems for story construction. Perhaps the power of interpersonal relationships can be harnessed in order to enhance the game mechanics in VGWs.

The following design challenges are those questions that I find most important to pursue in order to further evolve the design of VGWs:

- In what ways can VGWs be designed to facilitate situations that involve challenges, conflicts and choices that would express the true character — the very essence of a person’s nature — of a player — or a playable character (PC)?
- In what ways can VGWs by their system design and game-play rules further support players’ development of personas to — as Bartle described it — reach the ‘final level of immersion’?
- In what ways can means be provided for all players to be heroes, protagonists, in their own drama, that is, integrated in the very story construction and deep structure of VGWs?
- The role-playing in current VGWs relies on meta-game rules since role-play is poorly supported by rule-sets and game mechanics. In what ways can VGWs

support role-play in their rule systems?

- How can characterising action potential (CAP) be designed to support players in expressing consistent and interesting characters in VGWs?
- Players in VGWs often develop strong interpersonal relationships. Identity construction is affected by individuals' relationships to and mirroring of each other. How can the power of these relationships be harnessed by design of the CAP to make the game mechanics more interesting?

In being so bold as to formulate design challenges for the whole field of VGWs, I feel an immediate need to add a few disclaimers. First of all, there are probably as many lists of important design challenges as there are researchers, developers and designers in the area — this list is just my take on it, dependent on the assumptions mentioned previously. Secondly, to many of the questions there already are good answers in the form of existing VGWs and in VGWs under development. Thirdly, to some of these questions there might be no answer, to others there may be a multitude of answers. Especially the questions of true character, how to help players develop a persona, and how to enable all players to be protagonists (the ultimate story construction system!) seem to me to be holy-grail questions. With holy-grail questions I mean the type of philosophical questions where one, to use a game analogy, goes on a quest for the holy grail. One does not know whether it really exists, or if it is one's strong wish that it *should* exist. Since it is so difficult to find, one does not get proof that it *does not exist* and thus the search can continue in new directions, where one finds more clues. This is what makes the holy-grail questions so important. They fuel the navigation of the wicked problem spaces mentioned in Chapter 1.

CHAPTER 4. CHALLENGES IN THE DESIGN OF VIRTUAL GAME WORLDS77

My personal experience is that in my questing for my holy grail I have ventured on several interesting side-quests, finding valuable treasure and clues on the way. Even if I know that the grail might not exist, the main quest of searching for it goes on, with the glowing mental image of the grail changing nature over time.

It is my firm belief that in pursuing the questions listed here it is *necessary to build and test* the systems that seem to glow like grails in order to get good clues for further pursuit. I also believe that clues to many of the questions listed above can lay in the design of the characterising action potential (CAP) as outlined in Chapter 3.

I built a semiautonomous agent system to explore the CAP of playable characters which I call the Mind Module (MM), described in Chapter 5. In Chapter 6, 7 and 8 I describe the five prototypes I have been involved in developing in order to experiment with design of CAP using the MM in order to further explore the six questions presented here.

Chapter 5

The Mind Module

Contents

5.1	History	79
5.2	Related Work	81
5.2.1	Believability and Expressive AI	81
5.2.2	Emotion Modelling	82
5.2.3	Narrative	83
5.2.4	Personality Traits	84
5.3	The Mind Module	88
5.3.1	Spreading Activation Network	88
5.3.2	Affect Nodes	89
5.3.3	Personality Trait Nodes	92
5.3.4	Emotion Nodes	95
5.3.5	Mood Nodes	100
5.3.6	Sentiment Nodes - Emotional Attachments	103
5.3.7	The Mind Module Compared to the Dynemotion People Engine	104
5.3.8	The Mind Module compared to Ortony et al.'s Model	106
5.4	Summary	108

The Mind Module (MM) is a semiautonomous agent architecture built to be used in a multiplayer environment as a part of playable characters (PCs). The term *semiautonomy* is used because the agent structure is designed to be used by a PC, and is thus partly controlled by the system and partly by the player. It can also be used with autonomous characters provided that functionality for automated behaviour is added. The MM models the PC's personality as a collection of traits, maintains dynamic emotional state as a function of interactions with objects in the environment, and summarises a PC's current emotional state in terms of 'mood'.

The MM provides a game world system with emotional output from an individual character. The MM performs computational operations on input values from a game world, which come from virtual sensors. The MM produces outputs in the form of updated values for emotions and moods. These outputs in turn become inputs to the sensors of the MMs of surrounding entities.

5.1 History

Previous work on the current version of the Mind Module was done in the Zero Game Studio. The Zero-Game Studio was part of the Interactive Institute and was established in 2001 for the purpose of conducting applied research in the area of games. During my work on the thesis *Object Oriented Story Construction in Storydriven Computer Games* (Eladhari, 2002), I started to focus on the importance of the PC in games that include narrative elements. Within the research theme 'The Player Entity' I started to explore how story construction could be improved by the use of semiautonomous agents, combining the structuralist story-construction approach (Lindley & Eladhari, 2002) with methods for creating believable agents (Bates, 1994;

Bates *et al.* , 1989 - 2002), but focusing on PCs rather than fully authored independent characters ('non-playable characters' (NPCs) or autonomous believable agents). The work was realised in the Ouroboros Project during 2002 and 2004 as described in Eladhari and Lindley (2003). The main focus of the Ouroboros project regarding PCs evolved around the visual expression of characters using animations of expression via gestures, facial expressions and postures. The postures, gestures and the walk cycles (animations of characters walking) were produced with motion-capture technology while the facial expressions were animated 'by hand'. At the time, I also modelled a prototype for audible expressions of the emotional states of PCs, but this was not realised until 2006 as described in Eladhari et al. (2006).

In 2004 I moved from the Zero-Game Studio to Gotland University in order to do the PhD project reported in this thesis. In 2004, the work on the MM was set into the context of story construction in massively multi-player games, (see Eladhari and Lindley, (2004); Eladhari, (2004). The design of the MM was reiterated, and the ideas of how to use sentiment-objects were deepened.

In 2005, the work exploring how a semiautonomous PC can be used for the purpose of deeper characterisation and story construction in multi-player games continued in the Integrated project on Pervasive Games (IPerG), a large-scale EU project where several research institutes and companies studied various aspects of games (2004 - 2008). The design of a game called Garden of Earthly Delights (GED), where I had the role of lead-designer, relied heavily on game mechanics where the MM was used. GED was a concept for the extension of conventional massively multiplayer online role-playing game (MMORPG) mechanics to integrate pervasive, mobile and location-based game mechanics. In this project, there was a stronger focus on game

mechanics supporting interacting play modes, where one mode was played via a cell phone and the other mode via a client on a personal computer. In addition to the concept of sentiment objects, the notion of ‘affective actions’, as described in Bruski and Eladhari (2006) was explored. The design methodology relied on Wizard of Oz techniques, focus group discussions and paper prototype testing as described in Koivisto and Eladhari (2006a). The work on prototypes done between 2002 and 2006 is further described in Chapter 6. Between 2006 and 2009 the MM was reiterated for use in the prototypes World of Minds and the Pataphysic Institute, where the entire game design was derived from the MM. These are described in Chapter 7 and 8.

5.2 Related Work

5.2.1 Believability and Expressive AI

When Bates (1994) and his colleagues coined the expression *believable agents*, the idea took a stance in arts, generally in literature, theatre, film and radio drama, but especially in character animation for Disney characters. Bates described the agents as ‘an interactive analog of believable characters discussed in the Arts’ and argued that artists hold similar goals to AI researchers, wanting to create seemingly living creatures where the illusion of life permits the audience’s suspension of disbelief. He argued that emotion is one of the primary means to achieve believability. The area of believable agents has mostly been approached by making applications that, to varying degrees, create believability by using graphics showing facial expressions and gestures, and by using language, spoken dialogue and dialogue in text, most notably within the OZ Project (1989 - 2002) and the NICE project (2002 - 2005).

As noted in Section 2.2.3, expressive AI provides a language for talking about ‘readable’ behaviour in the context of game analysis and design, that is, behaviour that a player can ‘read meaning into’ (Mateas, 2003). Mateas discusses the characterisation of the ghosts in the game Pac Man, expanding the discussion of characterisation of non-player characters (NPCs) to encompass dynamic entities which do not have a humanoid form.

5.2.2 Emotion Modelling

Since Minsky’s *Society of Mind* (1986) was published several implementations of ‘minds’ with personalities and emotions have been made, for example by Egges, Kirshagar and Magnenat-Thalmann at MIRALab (2003; 2004). They primarily made implementations where the emotions were expressed through dialogue and animations. Another notable example is a virtual-reality training environment tool for fire men (El Jed *et al.* , 2004). The Mind Module (MM) described here is yet another model in the same tradition. It builds, as many other applications in this field, upon a personality model derived from the Five Factor Model (FFM) popularly called ‘The big five’ (McCrae & Costa, 1987), on affect theory inspired by Tomkins (1962; 1963), and on the research by Frijda (1994) and Moffat (1997).

Emotion modelling has during the past decades emerged as a separate field of study, where the theory presented by Ortony *et al.* in 1988 proved to be a landmark, now often referred to as the OCC model where the abbreviation is derived from the authors’ names (Ortony *et al.* , 1988). OCC is a purely theoretical psychological model, but several applications in the fields of AI and cognitive science have used it as an inspiration for frameworks for autonomous agents that simulate human emotion.

Work in the area of virtual characters that use *both* the FFM and the OCC as conceptual frameworks include Guoliang et al. (2006), Klesen et al. (2000), Kshirsagar and Magnenat-Thalmann (2002a), and El Jed et al. (2004).

An excellent discussion of the field of virtual characters with personality, emotions and mood can be found in the State of The Art Report *Building Expression into Virtual Characters* by Vinayagamorthy (2006). Emotion modelling is also used as an approach in contemporary games such as *The Sims 2* (2004), where the characters act according to a personality model inspired from astrology and have a summarising state of mind described as mood, which summarises how well a character's needs, such as 'hunger' or 'social' have been fulfilled.

The distinguishing features of the MM is that it is specially designed for use for characters in role-playing games, and that the sentiments, described in Section 5.3.6 can be used to create preferred individual responses made by characters, depending on immediate circumstances in a game world. The sentiments are potentially useful for creation of individual narrative discourses for PCs.

5.2.3 Narrative

An overview of related work touching upon narrative from a theoretical angle was given in Section 2.1. Practical related work includes *The Oz Project* (Bates *et al.* , 1989 - 2002) and the *Façade Project* (Mateas & Stern, 2002 - 2005). Brisson's and Paiva's (2007) system *I-Shadows* used affective characters to, through interactions inspired by improvisation theory, explore the natural conflict between participants' freedom of interaction and the system's control as the participants collaboratively develop a story. Another related project is *Scheherazade* (Elson & Mckeown, 2007).

As it draws upon theoretical work on the morphology of the narrative, semantics are modelled such as time lines, states, events, characters and goals. The system can detect thematic patterns in both the deep structure of the story as well as in the manner of the story's telling. However, maybe the most closely related work is that of Ian Horswill who argues, from a hypothetical perspective, that AI Characters should be 'just as screwed-up as we are' (Horswill, 2007), thus tying in the notion of believable agents (Bates, 1994), and ways of building these (Mateas & Stern, 2002; Klesen *et al.* , 2000; Swartout *et al.* , 2006; Pynadath & Marsella, 2007). Also the work conducted by Marsella *et al.* (Marsella *et al.* , 2004; Rickel *et al.* , 2002), and that done at Miralab (Kshirsagar & Magnenat-Thalmann, 2002b; Magnenat-Thalmann *et al.* , 2005) on the subject of virtual humans have been an important source of inspiration.

5.2.4 Personality Traits

Adopting the FFM, the MM employs a trait-based theory of personality. In analyses of rich and complex characters in novels and screenplays, scholars have argued for the usefulness of defining characters' personalities via traits. Chatman, for example, argues for a 'conception of character as a paradigm of traits', where a *trait* is a 'relatively stable or abiding personal quality', noting that in the course of a story, a trait of a character may unfold or change (Chatman, 1978). Complex trait descriptions make the difference between flat and round characters:

[...] the behaviour of the flat character is highly predictable. Round characters, on the contrary, possess a variety of traits, some of them conflicting or even contradictory [...] We remember them as real people. They seem

strangely familiar. Like real-life friends and enemies it is hard to describe what they are exactly like.

In psychology, trait theory has been developed to describe personality. Trait theory, pioneered by Allport in the 1930s (Allport, 1961), is one of several major branches of theories of personality, where the other branches can roughly be categorised as type theories, psychoanalytic theories, behaviourist theories, cognitive theories, humanistic theories and biopsychological theories. Trait theory mined English language dictionaries for all the adjectives that describe personality. Over the years, an initial list of 17,953 adjectives was eventually distilled into 45 personality traits. Personality tests were developed to rate people along these 45 traits; through factor analysis, five high-level factors organising the traits were identified (Cattell, 1945; Tupes & Christal, 1992). The FFM is now the standard personality trait model in psychology; the clustering of traits via factor analysis into five factors has been repeatedly empirically validated. The most prominent assessment test for the FFM is the NEO PI-R questionnaire, which uses 30 traits (see Table 5.1) (McCrae & Costa, 1987). While the Table 5.1 contains the traits, the five factors can be described as follows.

- Openness - appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity.
- Conscientiousness - a tendency to show self-discipline, act dutifully, and aim for achievement.
- Extraversion - energy, positive emotions, and the tendency to seek stimulation and the company of others.

- Agreeableness - a tendency to be compassionate and co-operative rather than suspicious and antagonistic.
- Neuroticism - a tendency to experience unpleasant emotions easily, such as anger, anxiety, depression.

Table 5.1: Traits from IPIP-NEO used by the Mind Module.

Factor	Facet
Extraversion	Friendliness, Gregariousness, Assertiveness, Activity Level, Excitement-Seeking, Cheerfulness
Agreeableness	Trust, Morality, Altruism, Cooperation, Modesty, Sympathy
Conscientiousness	Self-Efficacy, Orderliness, Dutifulness, Achievement-Striving, Self-Discipline Cautiousness
Neuroticism	Anxiety, Anger, Depression, Self-Consciousness, Immoderation, Vulnerability
Openness	Imagination, Artistic Interests, Emotionality, Adventurousness, Intellect, Liberalism

While the FFM was originally developed to describe the personality of individuals in real life, it has been applied to a number of autonomous characters and conversational agents (Egges *et al.* , 2004; El Jed *et al.* , 2004; Mairesse & Walker, 2007). Like the MM, many of these implementations build upon the FFM, and draw inspiration from theories of emotion modelling such as the OCC model (Ortony *et al.* , 1988) and affect theory (Tomkins, 1962). It is important to acknowledge that by choosing what model of personality to use as bases for constructing agents one makes an implicit statement to the users of the systems about what a personality *is*. While the extensive use of the FFM may result in an unfortunate uniformity, it is beneficial in that it is easier to compare the result of the work conducted in the field of virtual humans than if each

researcher used a different theory of personality as inspiration for the architecture of personality. The MM has been designed flexibly so that the traits of FFM can be replaced with the base of another trait-based model.

Anders Drachen (formerly Tychsen) and his colleagues (Tychsen *et al.*, 2007) used the game engine of *NeverWinter Nights* (Bioware, 2002) to experiment with combining the FFM with a traditional D&D system (Gygax & Arneson, 1974). Personality traits were not implemented as part of the computational system itself but integrated into the personalities of the characters of the players as part of their descriptions. Additionally, personality traits were activated via inter-character relationships and through the game story-lines. Drachen *et al.*'s study supports the idea that players' engagement in a PC is important for enjoyment in a multiplayer computer role-playing game and that highly complex PCs are not necessarily a problem for players. In fact, players tended to use all the features of the PC, despite the complexity. Furthermore, the study showed a strong pattern (in a sample of 51 players) of that likeness between players' own personality and their PCs does not have impact on the gaming experience: based on more than 150 player combinations, it was found that both characters with a personality very similar and very different to their own were equally fun to play and not statistically significantly different.

If these findings are general they may have implications for the design of a game world where the MM is used. Drachen *et al.*'s findings indicate that a system using personality traits from the FFM might be enjoyable for players whether they prefer to play as themselves (self-play) or playing an invented character different from themselves (role-play).

The first iteration of the MM was developed in parallel, but separately, from the first game world it was used in. Though this first iteration got an enthusiastic reception from test players (Koivisto & Eladhari, 2006b), the user-tests showed that a tighter connection was needed between PCs' affordances given by the MM and the game mechanics. The prototype game worlds *World of Minds* and *Pataphysic Institute*, also described in the thesis, were specifically designed to explore the tight coupling between game AI and the game design.

5.3 The Mind Module

5.3.1 Spreading Activation Network

The MM is implemented as a spreading activation network as defined and described by Quillian (1968), Collins and Loftus (1975), and Anderson (1983). The network consists of interconnected affect nodes. The traits, the emotions, the moods and the sentiments described below are all different types of affect nodes that affect each other. When a particular node is activated, nearby nodes are activated as well. As one node is processed, activation spreads out along the paths of the network, but its effectiveness is decreased as it travels outwards. Experimentally, this model can be assessed with run-time studies based on the assumption that 'spreading' of activation takes time – less associated concepts take longer to get to and more associated ones take less time. For highly individualised game-play experiences this type of architecture is particularly appropriate. As Anderson (1983) concluded:

Because activation can sum and varies with associative distance and strength, level of activation of a node is sensitive to the particular configuration of

activation sources.

In the case of the MM, the activation sources are gathered from the individual settings of a particular character's personality as well as by events perceived from the game world.

5.3.2 Affect Nodes

The MM consists of a weighted network of interconnected nodes of four types: traits, emotions, sentiments and moods as shown in Figure 5.2. More details about the architecture of the MM is available in Appendix A which contains a class diagram of the MM expressed in Unified Modelling Language (Fowler, 2003). The documentation of the MM application programming interface is available in html-format on a CD which is provided with this thesis.

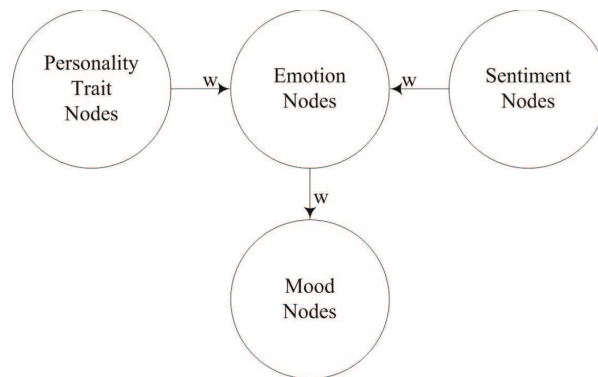


Figure 5.2: Affect Node Types

According to Moffat (1997) *emotions* can be regarded as brief and focused (i.e., directed at an intentional object) dispositions, while *sentiments* can be distinguished as a permanent and focused disposition. Similarly, *moods* can be regarded as a brief and global dispositions, while personality *traits* can be regarded as a permanent and

global dispositions. Moffat clarifies with examples:

An example of an *emotion* might be feeling a gush of affection for someone; while loving someone would be a longer term emotion, or *sentiment*. One could be in a generous affectionate *mood* all day, and if that mood lasts a lifetime, we call it *personality*.

Hence emotion, mood, sentiment and personality are regions of a two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other. Moffat's model (1997, p. 136) is illustrated in Figure 5.3.

		DURATION	
		brief	permanent
FOCUS	focused	emotion	<i>sentiment</i>
	global	<i>mood</i>	personality

Figure 5.3: Moffat's illustration of how emotion may relate to personality.

The categories of affect nodes of the MM are inspired by Moffat's model, both in duration (persistence and briefness) and focus (whether a value of an affect node is dependent of another object in a context or not). The sentiments are not in all cases regarded to be permanent, but certainly long lived, that is, their decay rate is very slow compared to the quick emotions. A value of an affect node in the MM with a fast decay rate, such as an emotion, is non-zero for only a short period of time after a stimulus that causes the value of the node to change, and thus affects the value of other nodes in the network for only a short period of time. The two-dimensional affect plane of the MM is illustrated in Figure 5.4.

If an agent receives information about something happening, for instance that an

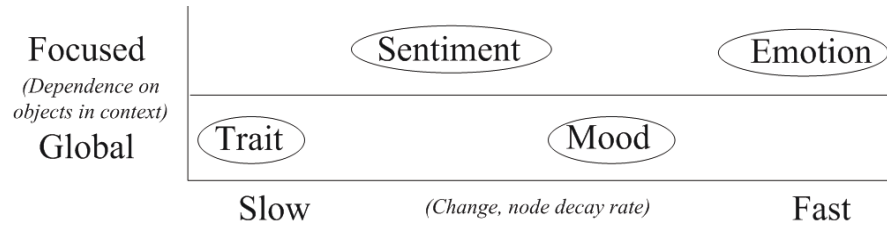


Figure 5.4: The two-dimensional affect plane of the MM.

object is approaching, the following process cycle takes place.

1. The agent retrieves the identity and the type of the entity approaching. Suppose it is a PC named Lena.
2. The agent searches its list of sentiments to see whether it has an emotional attachment towards entities of the type PC, and whether it has an emotional attachment towards the entity Lena. Suppose that the agent has no sentiment towards PCs in general but a sentiment of amusement towards Lena, perhaps due to listening to a fun joke at a prior occasion.
3. The agent looks at its emotion node to see which personality traits may impact the change of the value of the emotion node. The emotion node Amusement is connected to four trait nodes with the following weightings: Cheerfulness: 1.1, Depression: 0.9, Imagination: 1.2 and Emotionality: 1.1. Thus, stimuli that would lead to Amusement will lead to more Amusement the higher the trait values for Cheerfulness, Imagination, and Emotionality, and less Amusement the higher the trait value for Depression (for connections between trait nodes and emotion nodes please see Figure 5.5).
4. The new value for the emotion node is calculated and the value of the node is changed accordingly.

5. The mood nodes check at each cycle of processing whether a significant change in any emotion node connected to them has happened since the last cycle. In this case this would be true in the case of mood node Outer Mood which is connected to the Amusement node with the positive weighting 2.0 (for connections between mood nodes and emotion nodes please see Figure 5.8).
6. The mood node calculates the change of its value based on the change in the emotion and the weight from the emotion and changes its value. In this example the mood node in question is the Outer Mood, calculating it's new value based on the change in the emotion node Amusement and the weight between them.

Each node has a value, that is defined as a norm value; a value that the node changes to over time. For each cycle of the processing of the MM each node, if it is not already at its norm value, moves towards this value. The amount of movement towards the norm value is defined by the decay rate of the node.

5.3.3 Personality Trait Nodes

The personality of a character defines the nature and strength of the emotions a character feels in different situations. The MM gives each PC 30 trait nodes, inspired by the FFM, as shown in Table 5.1. The traits are grouped into five factors, with the value of a factor being a weighted linear combination of the values of the traits. In a role-playing setting for instance this system of traits can define how likely a PC is to react in particular ways in particular situations. For example, a character who has a high value of the trait anger will more easily respond with anger than a character who has a low value. Each personality trait node is weighted towards the emotion nodes with the weights shown in Table 5.5.

Table 5.5: Weights between trait nodes and emotion nodes in the MM.

	emo_amusement	emo_interest_excitement	emo_enjoyment_joy	emo_relief	emo_satisfaction	emo_confusion	emo_surprise_startle	emo_distress_anguish	emo_fear_terror	emo_anger_rage	emo_shame_humiliation	emo_sadness	emo_guilt	emo_desire**	emo_belonging	emo_pride
trait_extro_friendliness*																
trait_extro_gregariousness	1.1															1.3
trait_extro_assertiveness									1.1							1.2
trait_extro_activity_level*																
trait_extro_excitement_seeking	1.1	1.1		0.8												
trait_extro_cheerfulness	1.1	1.1	1.1													
trait_agree_trust					1.1	1.1					1.1					1.1
trait_agree_morality										1.1	1.2		1.1			
trait_agree_altruism		1.05										1.05				
trait_agree_cooperation	1.1															1.1
trait_agree_modesty				1.2												0.9
trait_agree_sympathy	1.05			1.05					1.05		1.05	1.05				
trait_cons_self_efficacy				1.05									0.9			
trait_cons_orderliness	0.95				1.1											0.9
trait_cons_dutifulness			1.1								1.1	1.1				
trait_cons_achievement_striving				0.8							1.1	1.1				
trait_cons_self_discipline			1.1	0.9												0.9
trait_cons_cautiousness			1.1					1.1								
trait_neuro_anxiety					1.05			1.2			1.2	1.2	1.2			
trait_neuro_anger						1.05			1.3							
trait_neuro_depression	0.9	0.8	0.7	0.9		0.9	1.2	0.7	0.8			1.2				
trait_neuro_self_consciousness											1.3					0.8
trait_neuro_immoderation														1.2		
trait_neuro_vulnerability			1.05				1.3				1.1	1.2	1.1			0.8
trait_open_imagination	1.2	1.2				0.9		1.05								
trait_open_artistic_interests		1.1		0.95												
trait_open_emotionality	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
trait_open_adventurousness		1.2						0.9		0.9				1.2		
trait_open_intellect		1.1				0.9		0.9								
trait_open_liberalism											0.9		0.9			

* no weight
 **no weight from emo_desire to inner and outer mood.

Moffat (1997) compared Freud’s, Skinner’s, Maslow’s and Allport’s theories of personality with the aim to formulate a definition of personality that would be applicable to autonomous agents. Moffat favoured the behavioural theories as well as social learning theorists, specifically the theory of Rotter (1972; 1975) which included a model for how to calculate potential behaviour according to certain situations and what reinforcement certain actions would have in these.

Moffat's definition of personality, which is intended for use by modellers of autonomous agents with personalities, reads as follows:

Given an agent with certain functions and capabilities, in a world with certain functionally relevant opportunities and constraints, the agent's mental reactions (behaviour, thought and feeling) will be only partially constrained by the situation it finds itself in. The freedom it has in which to act forces any action to reveal choice or bias in the agent, that may or may not be shown in other similar situations. *Personality* is the name we give to those reaction tendencies that are consistent over situations and time.

Inspired by Rotter, Moffat constructed a prototype emotion model that he compared with several major theories of personality to evaluate it as if it were originally intended to be a personality model. Moffat's prototype, called Will, was an autonomous agent, whom a user could play the mathematical game Prisoner's Dilemma with. The architecture of Will consisted of five modules (Perceiver, Emotor, Predictor, Planner and Executor) which run in parallel, all connected to a central workspace called Memory. In Will the relation of personality to emotion was considered, as well as mood and sentiment, as shown in Figure 5.3. The FFM was the model Will compared least favourably to; Moffat estimated that only 50 percent of the trait theory could be claimed to be implemented in the model. According to Moffat, Will did much better against Rotter's social learning theories, implementing and accounting a greater part of them. Moffat assumes that the results can be explained by the lack of social awareness in Will:

The most obvious weakness in the model is its lack of social awareness,

making those aspects of personality that are to do with how people relate to each other impossible to model.

In the case of the MM, the context of the prototype differs from that of Moffat. The behaviour of the semiautonomous agent that the MM is part of is chosen by the player who uses it, while the social multiplayer aspect of the prototype worlds the MM is used in makes it possible to use game-play mechanics that emphasise social aspects. Through game mechanics such as ‘affective actions’, and ‘mind magic spells’ (described in Chapter 7) emotions are affected by the full range of traits of the FFM. In the prototypes where the MM is used the characterising action potential of the semiautonomous agents is constrained. These constraints depend on both the context and the values of the personality trait nodes of an agent. Within the constrained action potential that governs the potential behaviour, a particular player may choose the behaviour, thus expressing a two-layered personality, where one layer is provided by the agent and the other layer is provided by the player.

5.3.4 Emotion Nodes

In certain situations, events that a particular PC experiences will invoke emotions. What emotions are invoked and how strong they are depends upon personality and on the character’s likes, dislikes, and previous experiences (sentiments). The first iteration of the MM used the emotions listed in Table 5.6.

Table 5.6: Emotions/Affects used in the first iteration of the MM.

Positive	Neutral	Negative
Amusement	Confusion	Distress – Anguish
Interest -Excitement	Surprise	Fear – Terror
Enjoyment – Joy		Anger – Rage
Relief		Shame – Humiliation
Satisfaction		Sadness
		Guilt

Through a mapping of weightings between emotion nodes and trait nodes, the MM defines how much the value of an emotion node fluctuates for each PC. For example, the emotion node Amusement is connected to four trait nodes with the following weightings: Cheerfulness: 1.1, Depression: 0.9, Imagination: 1.2 and Emotionality: 1.1. Thus, stimuli that would lead to Amusement will lead to more Amusement the higher the trait values for Cheerfulness, Imagination, and Emotionality, and less Amusement the higher the trait value for Depression. Systematic information about the effects of personality on emotion from psychological research applicable for the MM is scarce. The weightings between traits and emotion is experimental and is evaluated with the goal to create interesting game-play experiences rather than simulating a set of beliefs of about the workings of the human mind.

The choice of emotions was based on research into affects and affect theory by Tomkins, (1962; 1963); Ekman, (1994); and Nathansson, (1992). The emotions collected by Ekman and others builds upon studies of facial expressions. The emotions, so called ‘basic emotions’, are not only similar across cultures, but also among primates. Design-wise I considered this a benefit. It could mean that a PC or an NPC

which is not given a humanlike graphical representation still might be seen as believable by a player. Choosing a set of emotions to use for the MM has been delicate. Research into basic emotions has shown what emotions that primates and humans *express*, but not necessarily what they *feel*. Definite knowledge of how and individual ‘really’ feels might be beyond the capability of current research in general. Regarding knowledge about someone’s ‘actual’ feelings, the information is limited to active areas (visible in MRI scans for example) of the brain and subjective narrative reports. However, as mentioned, the aim of the work with MM is not to simulate the *actual* workings of the human brain, but for use as a tool for the creation of interesting game-play experiences. It is the aim of believability that governs what parts from psychological research to use as inspiration for the building blocks of the MM.

In the second iteration of the MM the same emotions as in the first iteration were used, but the emotion Surprise - Startle was then, in terms of the MM, defined as positive. The choice was motivated by the design of the prototype WoM. Design-wise the types of surprise which can have a ‘startling’ quality were problematic to use since the architecture of neither the MM or the WoM included a layer of knowledge that could be used to define whether something would be startling to a PC. That is, if there had been information about what type of objects and/or concepts a PC already knows, it would also be possible to assume that a previously unknown type of event or entity might be ‘startling’, especially if it was presented in a sudden way. In the second iteration, the node ‘Surprise - Startle’ was changed to ‘Surprise’. The emotion Confusion was classified, again motivated by design, as negative. The reason for the change was that in the first iteration of MM the Confusion node was still under evaluation (to be used or not), and had not received any weighing towards any other node.

Table 5.7 shows the emotions used in the second iteration of the MM. The values in the columns showing the weights to the mood nodes define whether an emotion has a positive or a negative value affecting the mood.¹

Table 5.7: How the mood scales are affected by emotions in the second version of the MM.

Emotion	Weight to Inner Mood	Weight to Outer Mood
Amusement		+ 2
Interest -Excitement		+ 1.5
Enjoyment – Joy	+ 2	+ 2
Relief	+ 1.5	+ 1.5
Satisfaction	+ 2	
Surprise	+ 1.5	
Confusion	- 1.5	
Distress – Anguish	- 2	- 1.5
Fear – Terror		- 2
Anger – Rage		- 2
Shame – Humiliation		- 1.5
Sadness	- 2	- 2
Guilt	- 1.5	- 1.5

In the third iteration of the MM, three emotion nodes were added: desire, belonging and pride. However, only pride will be added to the original 13 to be part of a possible reaction layer that uses gestural and facial expression thorough graphical

¹The reader may have noted that the weights between trait nodes and emotion nodes presented in Table 5.5 all are positive, ranging between 0 and 2, while the weights between emotion nodes and mood nodes also include negative values. The impact of the weights between traits and emotions affect to what degree the value of an emotion is increased if the emotion node is activated. A weighting with a value lesser than 1.0 result in an increase that is lower than the mid-value (or norm-value) of an increase, while a weight larger than 1.0 results in a higher increase. The weights between mood nodes and emotion nodes governs how the values inner and outer mood are affected. A positive weight results in that the value of a mood node is increased, while a negative value results in a decrease of a mood-node value.

means. Pride is one of the ‘basic’ emotions and would thus be believable as an expression through body language.

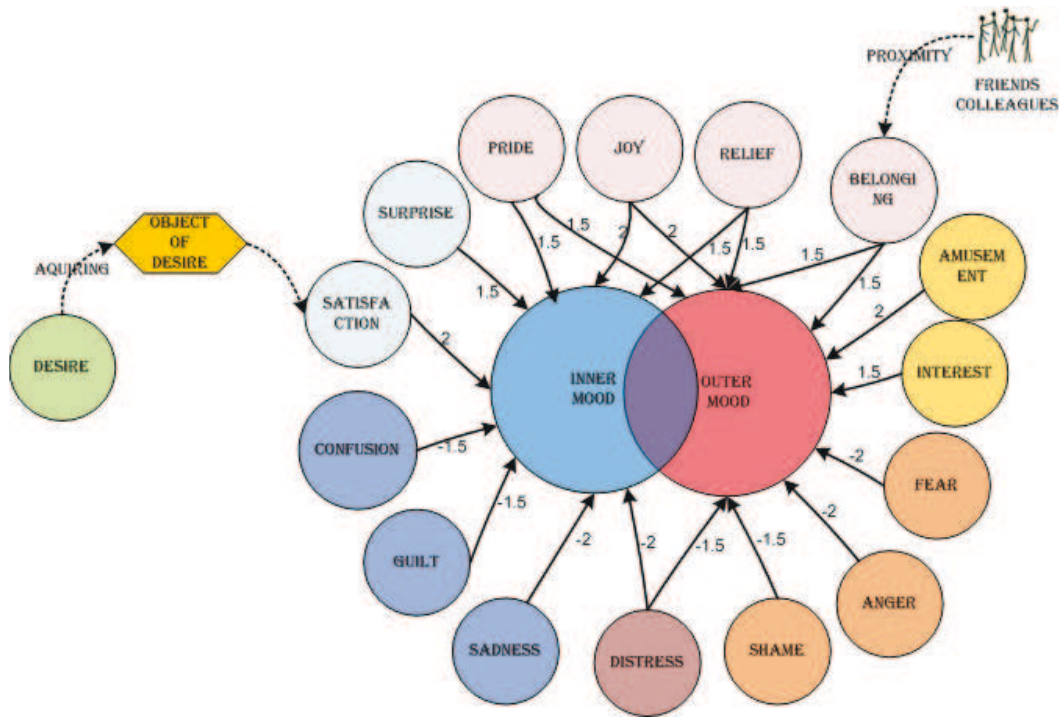


Figure 5.8: Emotions/Affects used in the third iteration of the MM, and their relations to the Mood Nodes

The reason for adding pride and belonging was that the later prototypes, PI and WoM, to a higher degree than earlier prototypes used features inspired by social situations as part of the game-play mechanics. The emotion node Belonging is in PI activated in situations where several players co-operate. The sentiment node Pride is used in situations where players help each other, especially when a more experienced player helps a new player. In those cases, the helping player may get positive emotions of ‘Pride in another’s achievement’ when the player she is helping manage to do something successfully via her PC. Desire was added for use together

with the emotion node Satisfaction. Satisfaction as an emotion proved to be useful in settings of social interactions where Affective Actions are used. This can be regarded as beneficial in those situations, but has the effect that the lack of satisfaction does not become a motivator for players to do other actions where Satisfaction could be a reward for an accomplishment. Therefore, the emotion node Desire was added. This node was added in order to be used for the construction of story-driving sentiment objects, in other words, creations of ‘objects of desire’. Figure 5.8 is an illustration of the emotion nodes used in the third iteration of the MM, and their relations to the mood nodes.

5.3.5 Mood Nodes

While trait theory from personality psychology and affect theory have been used as inspirations for systems that give agents emotions and personality, there is no obvious theory in psychology or cognitive science for modelling what, in daily speech, we call mood. In this text, I use the word mood in this everyday sense, to mean an overall state or quality of feeling at a particular time. Mood changes faster than personality, but typically more slowly than individual emotions. The mood of a person in real life is a complex state. It is temporary and highly contextual, but can linger even if the context changes. It is also individual, in other words, the way mood changes and fluctuates depends on an individual’s personality and internal psychology, not just the context of the moment.

In the MM mood is a state that can be seen as ‘the tip of the iceberg’ of underlying emotions. Characters’ mood depends on their personality and on what they have experienced in particular contexts.

A summarising display of a character’s state of mind is useful both from an authorial perspective and from a user’s perspective. In design, readily understanding a character’s mood is useful for understanding the character’s motivations and interactions. From a user’s point of view, a representation of mood is useful for viewing a concise display of the current state of mind that otherwise might be too complex to understand in a multi-tasking game-world environment.

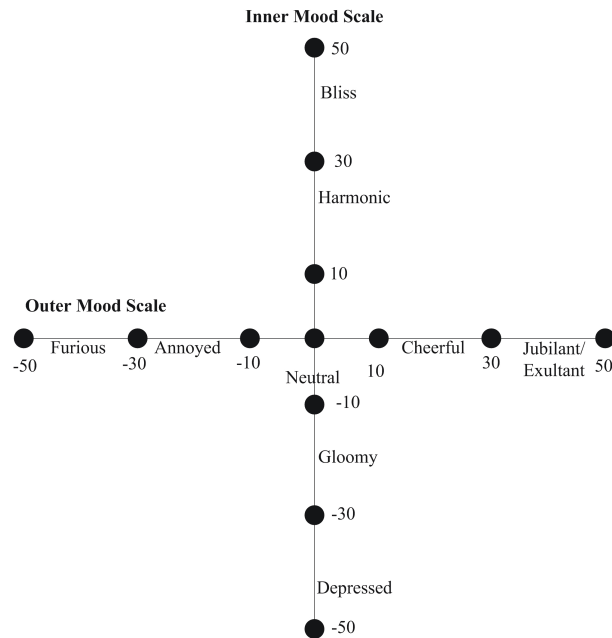


Figure 5.9: Mood co-ordinate system

In the MM, mood is a computed summary of the current state of a character’s mind. The mood of a character is measured on two scales that are independent of each other, an *inner* and an *outer*. Each scale ranges from -50 to +50; this corresponds to the range from Depressed to Bliss on the inner scale, and from Angry to Exultant on the outer scale as shown in Figure 5.9. The reader perhaps associates to Russell’s circumplex affect space (Russell, 1980) that just as the mood scales of the MM

represent polarities on several axes. Russell's circumplex affect space is a representation of humans' conceptualisations of emotional experience comprising two bipolar dimensions of perceived activation/deactivation and pleasure/displeasure. The MM and Russell's model should not be confused. The mood is an implementation-specific interpretation for games on how the emotions in the affect theory may be used in junction to the FFM, and functions along the lines of the research by Frijda (1994) and Moffat (1997), while Russell's affect space representation is a model constructed for understanding of the nature of human affect. Furthermore, the MM's and Russell's dimensions are different.

The *inner mood* node represents the private sense of harmony that can be present even if the character is in an environment where events lead to a parallel mood of annoyance. Reversely, a character in a gloomy mood can still be in a cheerful mood space if events in the context give that result. The nature of the *outer mood* is social, and tied to emotions that are typically not only directed towards another entity but also often expressed towards an entity, such as anger or amusement. The two scales for mood nodes open up the possibility of more complex states of mind than a single binary axis of moods that cancel each other out.

The weightings in table 5.7 were used in the second iteration of the MM, in the prototype World of Minds. Just as with the mapping between traits and emotion, there are few sources in psychology to guide the choice of weighting, and because the purpose of the implementation is to facilitate game-play experiences rather than a true simulation of the human mind, this aspect of the MM was tested and reiterated accordingly. The third iteration of the MM was used in the prototype Pataphysic Institute, where the additions of emotion nodes (see Figure 5.8) were done to better

suit the socially oriented game mechanics. The prototypes are described in detail in later chapters in this thesis.

The real-time, or current, mood of a character is dependent on the nature and strength of the emotions the character has experienced the past hours.² The strength of the emotions is different for different characters depending on their personality traits, which are weighted towards the emotions. The nature of the emotions differs, depending on what sentiment nodes the characters have towards other entities in the context. Hence, two characters going through a similar series of events potentially have different emotional experiences and therefore end up in different moods.

5.3.6 Sentiment Nodes - Emotional Attachments

A PC can have emotions associated with game objects. For example, a character with arachnophobia would have the emotion Fear associated with objects of type Spider. Such associated emotions are called sentiments. These are represented in the MM via sentiment nodes that link emotion nodes to specific objects or object types. Thus, if a player's PC has a sentiment of Fear towards Spiders, and a Spider comes within perceivable range, there will be an immediate change in the value of the Fear node; the exact value of the change will be a function of the strength of the sentiment as well as the values of the traits that modulate the value of Fear.

The MM allows several sentiments of different emotions to be directed towards another entity, thus creating compound sets of sentiments. For example, a character having a sentiment of Fear towards Spiders could also have a sentiment of Anger

²How far back in time different emotion stirring events have an effect on the current mood depends on the strength of the emotion and the decay rate. The effects of an emotional event can linger between half an hour and several days, but typically it lingers for one or two hours.

towards them. In a game world sentiments can be created several ways. The *emergent sentiments* originate from interactions with other entities in the world, thus creating emotional memories. The *authored sentiment sets* have certain pre-set combinations. For example Infatuation is a combination of Interest/Excitement/Amusement and Joy towards another character. The authored sets of sentiments have a longer decay rate than the one's emerging from interaction.

The intensity of the sentiment is in the MM different for each PC depending on the context since the intensity is defined not only by the context in form of sentiment objects in proximity but also via weightings between personality trait nodes and emotion. Thus the intensity of an emotion depends upon the PC's personality, and the nature of the emotion is defined partly by events, objects and agents in the game world and partly by the individual PC's interpretation of her environment in term of sentiments.

5.3.7 The Mind Module Compared to the Dynemotion People Engine

The application which is closest to MM in terms of both functionality and application area is the Dynemotion People Engine (DPE) developed by Online Alchemy. Just as the MM, DPE is developed for use in virtual worlds, and supports characters with personality, emotions and a summarising state of mind comparable with the mood of the MM. The DPE is not primarily a research project and is as such not documented in sources available publicly. However, in co-operation with Mike Sellers at Online Alchemy a comparison between the DPE and the MM was made (Eladhari & Sellers, 2008).

When comparing our systems — the Dynemotion People Engine (DPE) and the Mind Module (MM), we found striking similarities though the systems had been developed without knowledge of each other: both systems are agent-based architectures for characters in multi-player games, and use the Five Factor Model (FFM) as a framework for the personality of the characters. While the emotional system of the MM is inspired by affect theory (Tomkins, 1962) and the OCC model (Ortony *et al.*, 1988) and the DPE uses an original model based on an underlying Maslovian system, neither of us had found applicable theories to draw upon for modelling the summarising state of mood, but both saw the need for such a feature. For this reason, we focused the comparison of our systems on the aspects of mood.

In both systems a character's mood depends on their personality and on what he or she has experienced in its current context. Additionally, DPE and MM have similar solutions for displaying mood: both use the concept of a colour coded co-ordinate system where the mood fluctuates along two axes that allow a high granularity of what the 'mood' is, expanding beyond the binary notions of 'good' and 'bad' mood.

Another application which uses a summarising state similar to mood is an agent structure developed by Guoliang (2006). Guoliang's work includes a factor for an agent's mood, where mood is briefer than a trait, but longer lasting than an emotion (this work also highlights the lack of unified definitions of mood in the literature). In the game *The Sims 2* (2004) characters have a mood represented as a diamond over the head of the character, which changes in colour depending on the mood. The mood in this case is a state that summarises how well a character's needs, such as 'hunger' or 'social' have been fulfilled.

The two scales of the mood co-ordinate systems of DPE and MM are similar despite many differences in the details in the underlying systems. Both create a spatial representation with the extremes of anger, despair, exultation and bliss, though each organises the underlying axes differently. MM differentiates between inner and outer mood, while DPE puts both internal and social emotions in the same mood-space. The DPE's x-axis is called 'Outlook' and measures the overall positive valence to how a character is feeling. 'Affect' is the y-axis of the DPE and depicts the energy of a character. One aspect of modelling emotions and moods that is clear in both cases, and which was pervasive in our discussions, is the lack of clear terminology for referring to qualitative emotion and mood states. This hinders literature comprehension, design, and comparison between models.

5.3.8 The Mind Module compared to Ortony et al.'s Model

In this section the features of the MM are compared with the framework of the OCC model in the hope of clarifying the approach to emotion modelling taken in the development of the MM. Ortony et al. (1988) argued that the notion of 'basic emotions' was vague. They presented 14 theories of basic emotion that all list *different* emotions as basic, each theory with different bases for selection. Some of these theories use the concept of having mixed states (Plutchik, 1962) or compounds (Averill, 1975). Ekman opposed the notion of the definitions of basic emotions being 'vague' in 1990 (Ekman, 1992) and successfully defended his standpoint of defining certain emotions as 'basic'. When discussing emotion modelling, it is, however, important to bear in mind that what is referred to as emotions and sets of emotions are based on the

expression of emotion. This is because there to date is little other data to rely on, which makes it problematic to refer to a ‘definite’ set of emotions in an absolute sense, as discussed in Section 5.3.4.

Ortony et al. proposed a hierarchical structure of emotion where the top level is a distinction of positive/negative valence and where the in total 22 emotions are valenced towards either an event, an action committed by self or another agent, or towards an object. The emotions vary in intensity depending on different factors, among them the sense of reality, proximity, unexpectedness and arousal. The appraisal of objects, events and actions is done in terms of desirability, praiseworthiness and appealingness. Desirability depends on the goals of the actor.

The sentiment nodes of the MM use a mixed approach, allowing for several sentiments, in other words, different emotions, to be attached towards another entity, thus creating a compound set of sentiment. A sentiment set does not distinguish between types of entity in the world. The same type of sentiment can be directed towards objects as it can be towards characters or towards abstract principles.

As mentioned, sentiments in WoM are created in two ways. First, some emerge from interactions with other entities in the world, thus creating emotional memories of the entity. Second, there are *authored sets of sentiments*, that are similar to the emotions in the OCC model because they contain constraints on the type of object they can be set toward, and have specific combinations as described in Section 5.3.6.

The MM provides players with information about PCs’ feelings towards other entities in the world. Proximity to objects or characters affect the emotions, and thus the mood of a PC, functioning as information the player can use when deciding what to

do in the game world.

5.4 Summary

This chapter described the Mind Module (MM), a semiautonomous agent architecture built to be used in a VGW as a part of playable characters (PCs). The MM gives PCs personalities based on the Five Factor Model, and a set of emotions that are tied to objects in the environment by attaching emotional values to these objects, called sentiments. The strength and nature of a PC's current emotion(s) depends on the personality of the PC and is summarised by a mood. The MM consists of a spreading activation network of affect nodes that are interconnected by weighted relationships. There are four types of affect nodes: personality trait nodes, emotion nodes, mood nodes, and sentiment nodes. The values of the nodes defining the personality traits of characters governs an individual PC's state of mind through these weighted relationships, ideally resulting in values characterising for a PC's personality. Figure 5.10 displays summarising information about the node types of the MM.

Describing the MM an account was given for which sources of inspiration have been used in the construction: spreading activation theory, trait theory, affect theory and Moffat's model of how emotion can relate to personality. The approach used in the design of the MM was compared to the approach of Dynemotion People Engine and to that of the OCC model.

This chapter also provided brief history of the development of the MM as well as an overview of related work in the areas of believable agents and expressive AI, emotion modelling, applications for story construction and related work which use trait theory when constructing autonomous agents.

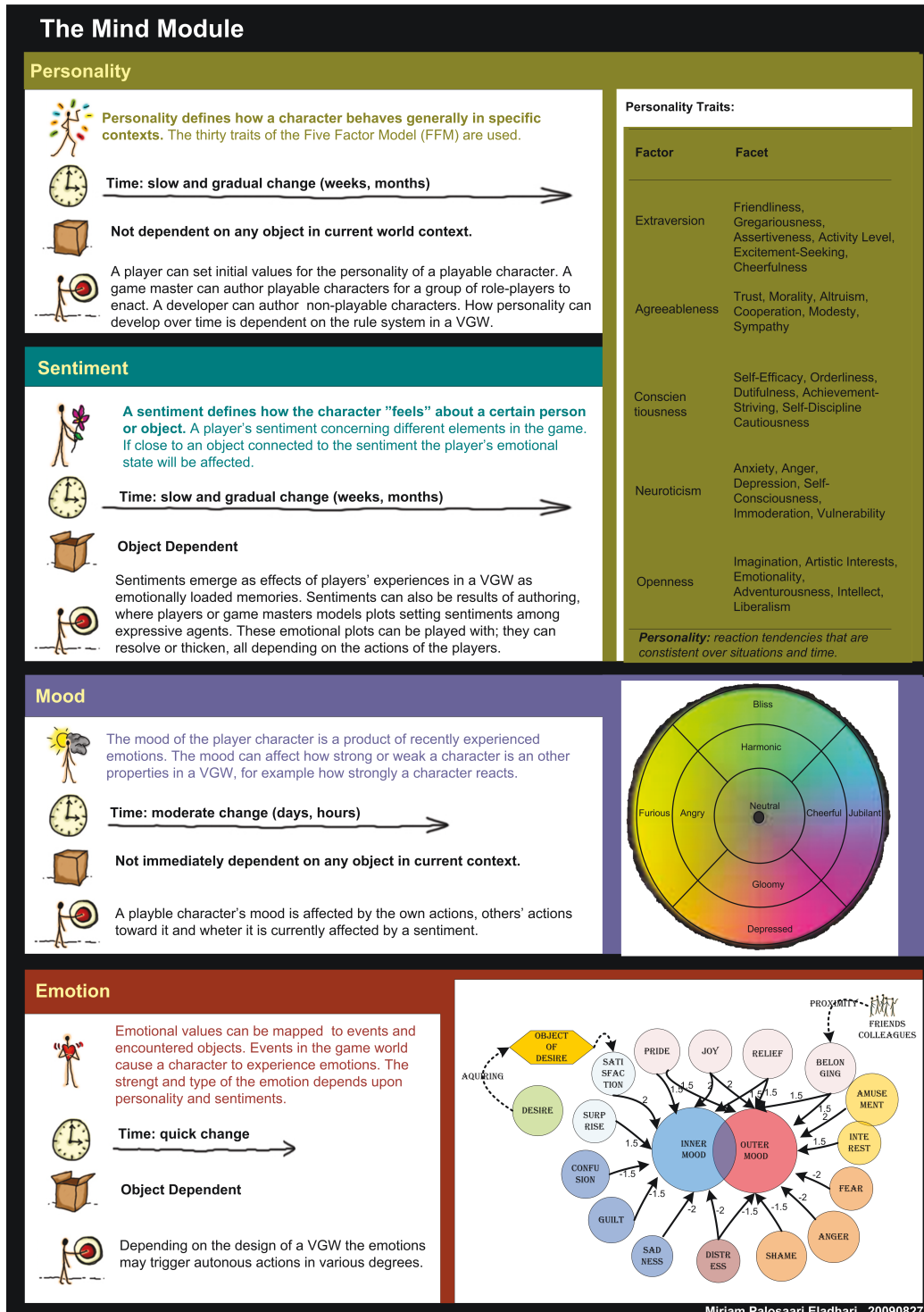


Figure 5.10: Mind Module Summary.

Chapter 6

Early Experimental Prototypes

Contents

6.1	Ouroboros	111
6.1.1	Early Sources of Inspiration for the MM	113
6.1.2	The Playable Character Greyhowl	116
6.2	Garden of Earthly Delights	119
6.2.1	Game Design	121
6.2.2	Play testing	127
6.2.3	Guided Paper Prototype Play-Test	128
6.3	Mind Music - The Soundtrack of your Mind	134
6.3.1	Background and Related Research	135
6.3.2	Design Considerations	137
6.3.3	Requirements	139
6.3.4	Implementation	140
6.3.5	Adaptation of the Mind Module for the Mind Music Application	141
6.3.6	Mind Music Composition	142
6.3.7	The Composition for the Mood Scales	142
6.3.8	The Composition for the Emotions	143
6.3.9	System Integration	144
6.3.10	Conclusions on Mind Music	145

6.4	Later Experimental Prototypes	147
6.4.1	World of Minds 1	147
6.4.2	World of Minds 2	148
6.4.3	Pataphysic Institute	149
6.5	Summary	149

This chapter describes the early prototypes where the mind module was used: Ouroboros, Garden of Earthly Delights and Mind Music.

6.1 Ouroboros

The first implementation the MM was part of was Ouroboros, an experimental prototype produced at the Zero Game Studio of the Interactive Institute in 2002 and 2003 (Zero Game Studio, Interactive Institute, 2003). In this project the foremost use of the MM was at a conceptual level. It was used for the design of a gesture system to ensure that the range of gestures available to characters reflected their emotional state. One of the prototype's main purposes was to help players to perform emotional expressions that were consistent with a particular character's personality and interpretation of the current context.

In conjunction with Ouroboros, a set of components constituting the open-source Purgatory Engine was developed. Purgatory Engine used the NEL Engine, developed by the French company NevraX. In 2001, when the Ouroboros project started, NEL was the only engine providing full-fledged 3-D as well as a network layer accommodating thousands of players where all libraries used were either open source or under the GNU license.

As the following list of planned components illustrates the Purgatory Engine was an ambitious project:

- Contextual Gesture System: Based upon the state of the mind of a particular character, other characters in the context, and various aspects of the state of the world, a particular subset of dramatic and emotive character gestures were made available to the player.
- Story Daemon System: This was a planned method for orchestrating narrative experiences.
- MM: A model of a PC's (or NPC's) mind would influence what a character could or could not do, affect other characters within intersecting zones of presence and reception, and provide goals to the player within the VGW.
- Metaphysics System: This was the world-level equivalent of the MM for a character, representing thematic states of the total game world.
- Language Characterisation System: The free inter-player chat was going to be enhanced by an adaptive discourse system.
- Social Grouping and Influence System: Rule-sets were going to encourage group actions such as 'group magical rituals'.

Due to limited resources the Zero Game Studio could not develop all components mentioned above. The Contextual Gesture System was given the highest priority in the development process. Figure 6.1 shows a screen image from the Ouroboros prototype. Gestures were recorded using motion capture equipment and modified for

use in the system. Though all components were not developed, the discussions in the Zero-Game development team provided valuable directions of further research.

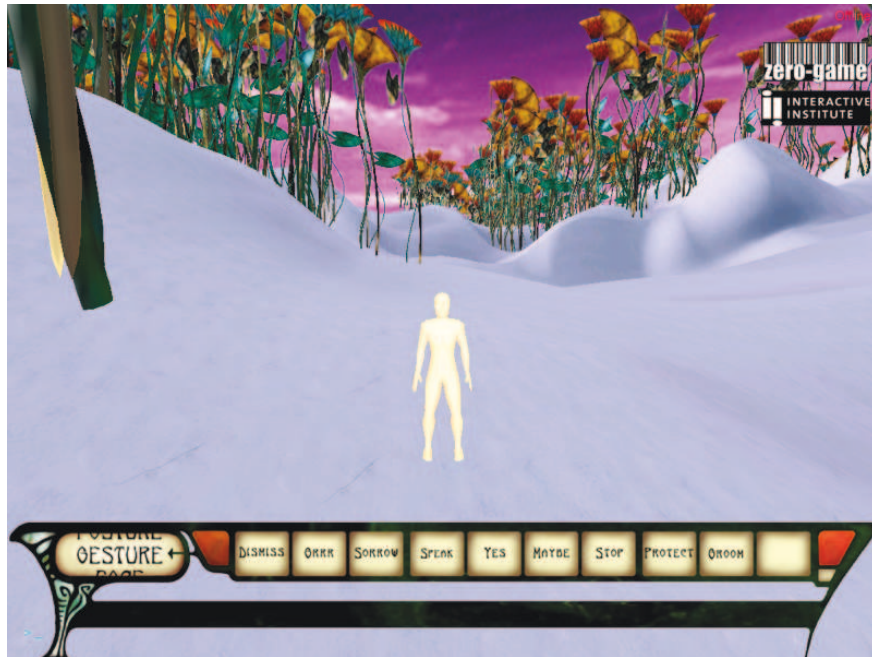


Figure 6.1: Screen image from the Ouroboros prototype.

6.1.1 Early Sources of Inspiration for the MM

While co-designing Ouroboros, at an early stage of the development of the MM, I wanted to try different architectures for the MM in order to experiment with different views of cognition and personality models. I contemplated a series of implementations that would address the ultimate question ‘What is it to be human?’. For such a project an already existing world was required — a VGW whose nature would accommodate, through game-play and mechanics, the types of contextual qualities interpreted and understood by the agents. Only then would it be possible to try out different architectures for semiautonomous PCs and compare them.

The early conceptual version of the MM, described in (Eladhari & Lindley, 2003), was inspired by several theories not mentioned in Chapter 5, which describe the most recent iterations of the MM: Freud's distinctions of the id, ego and super-ego (1923), Maslow's being-values (1968) as well as Grof's notion of COEX structures (1986). These theories were not used in the iterations of the MM that I built later, but it might still be interesting to consider these theories in further work. In this section, three of these approaches and their possible implications for the MM are briefly summarised.

Psychodynamic models of the mind are based upon the following three components following Freud:

- the id, which is a basic and biologically based level of drives and needs;
- the ego, which modifies desires arising from the id and directives from the superego in the light of the current situation for the sake of self-preservation;
- the super-ego, which is a set of internalised goals, directives, values and behavioural rules that have been learned from authority figures such as parents.

The psychodynamic model functioned as an inspiration for the MM; the id, the ego and the superego were not explicitly modelled as components in themselves. As Bellman writes, there is a danger of postulating a homunculus inside each brain as if there is a 'little seat of self' sitting there and controlling all the rest (Bellman, 2002).

The instantiated mind, as well as our biological minds, operates with so many parallel processes that a centralised view of the ego is not applicable. It can be added

that a homunculus provides no explanatory utility for the mind, since it recursively suggests a homuncular account of the mind of the homunculus itself (to infinity).

Nevertheless, the Freudian model can be conceptually interesting for distinguishing PCs' goals, drives and social norms guiding behaviour into layers, and also for showing what is left out. Figure 6.2 is a conceptual sketch from 2003 showing how the Freudian concepts of id, ego and super-ego can be mapped to PCs in VGWs.

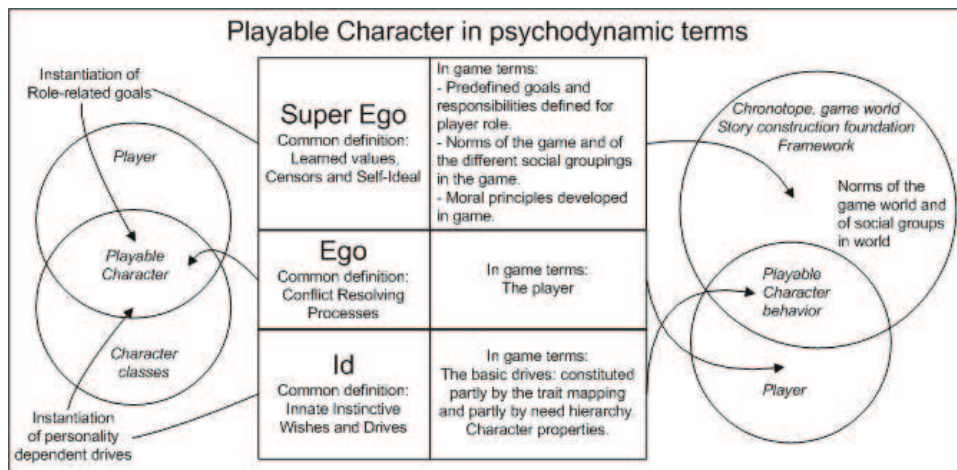


Figure 6.2: Freudian concepts of id, ego and super-ego conceptually mapped to a PC in a VGW.

Another potentially interesting psychodynamic model is what Grof refers to as COEX structures, or constellations of condensed experience (Grof, 1986). COEX structures are patterns of emotive and affective response to people, objects, events and situations, developed as an individual's ego defence mechanisms for resolving and managing conflicts within and between the id and the super-ego.

Maslow is well known in the phenomenological psychological tradition mostly because of his work on the hierarchy of needs (Maslow, 1943). In his later work he built upon

this, developing the concept of being-values which focus on a sense of purpose rather than on needs (Maslow, 1968). The being-values Maslow writes about include wholeness, perfection, completion, justice, aliveness, richness, simplicity, beauty, goodness, uniqueness, effortlessnes, playfulness, truth and self-sufficiency. These values could be used contextually for character-goals, tied to types of action or objects in a VGW in order to simulate types of actions that could give characters a sense of these being-values. These could be mapped to personality definitions or perhaps actively chosen by players in order to give differentiation in possible play-styles.

6.1.2 The Playable Character Greyhowl

One of the PCs created for Ouroboros by the team in the Zero Game Studio was Greyhowl, who appears in Figure 6.3 as modelled by Marcus Gezelius using concept art by Sri Elkins. In Ouroboros the players were intended to inhabit characters that had distinct personalities, relationships and goals that a particular player could enact by role-playing.

The concrete characters authored for Ouroboros, mainly by Martin Ericsson, provided me with a design context from which I could draft the first architecture for the MM. In the Ouroboros game design document Greyhowl is described as

[...]a hedonist of epic proportions and his ballroom parties are legendary. Greyhowl is found at the centre of debauchery, always with a pained look on his bored face. He plays his games of sedition and seduction listlessly, ever hoping for something that will touch his cold soul.

Greyhowl is of the undead Bysing breed. Bysing are beings present in the Gotlandic mythos of the Ouroboros project. These are shadowy figures crying in fear and hate



Figure 6.3: Greyhowl, a PC in Ouroboros

in the midwinter night. In the old days they haunted and hurt humans, feeding on their fear of the unknown.

Greyhowl had the following values set in his trait nodes (span 50 to 50): friendliness= -30.0, gregariousness= -20.0, assertiveness=10.0, activity level=10.0, excitement seeking= -25.0, cheerfulness= -45.0, trust= -30.0, morality= -40.0, altruism= -30.0, cooperation= -10.0, modesty= -10.0, sympathy= -30.0, self efficacy=10.0, orderliness=-10.0, dutifulness=0.0, achievement striving= -20.0, self discipline=0.0, cautiousness=10.0, anxiety=35.0, anger=10.0, depression= 35.0, self consciousness=30.0, immoderation=30.0, vulnerability = 40.0, imagination= 10.0, artistic interests= 15.0, emotionality= -25.0, adventurousness= -20.0, intellect= 25.0, and liberalism= 20.0.

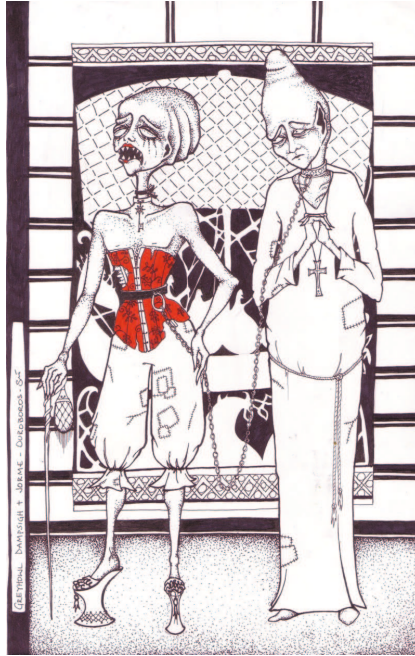


Figure 6.4: Concept art for Greyhowl and Jorme in Ouroboros

Greyhowl was designed to strive for a single being-value: Aliveness. This could be justified by his undead nature. A designed long-term story-deamon would hold a story premise and plot point knowledge for the scenario in which Greyhowl's love for Jorme, his servant, could make it possible for Greyhowl to stop being undead. Figure 6.4 is the one of the concept-art pictures drawn by Sri Elkins which illustrate Jorme, Greyhowl, and their relationship. Initially one sentiment was to be instantiated for Greyhowl: the PC Jorme was associated with the emotion Satisfaction. If the PC Jorme was near Greyhowl, the emotion node Satisfaction would increase its value. Greyhowl's mood would change as a result of the increased satisfaction. This would change the body posture of Greyhowl and free up the possibility of performing certain gestures.

6.2 Garden of Earthly Delights

The second implementation in which the MM was used was the Garden of Earthly Delights (GED). GED was the demonstrator of the work package Massively Multiplayer Reaching Out (MMRO), which was part of the Integrated Project for Pervasive Gaming (IPeRG). The GED prototype was designed, tested and implemented in 2004 and 2005.



Figure 6.5: Conceptual picture used for presentation of the MMRO work package

In MMRO, the focus was on ways to integrate the massively multiplayer gaming, which is mostly done at home by a personal computer, with modes to play outdoors, via a cell phone, as Figure 6.5 by Christian Wenninger aims to illustrate. The development work in the MMRO work package of IPeRG was done by researchers and

developers from five organisations; Nokia Research and Tampere University in Finland, Sony Network Services in Germany, Gotland University and Daydream (the company who made the location-based game BotFighters) in Sweden. The game design document for GED (Eladhari *et al.* , 2005) was produced by a team of 13 researchers and game designers.

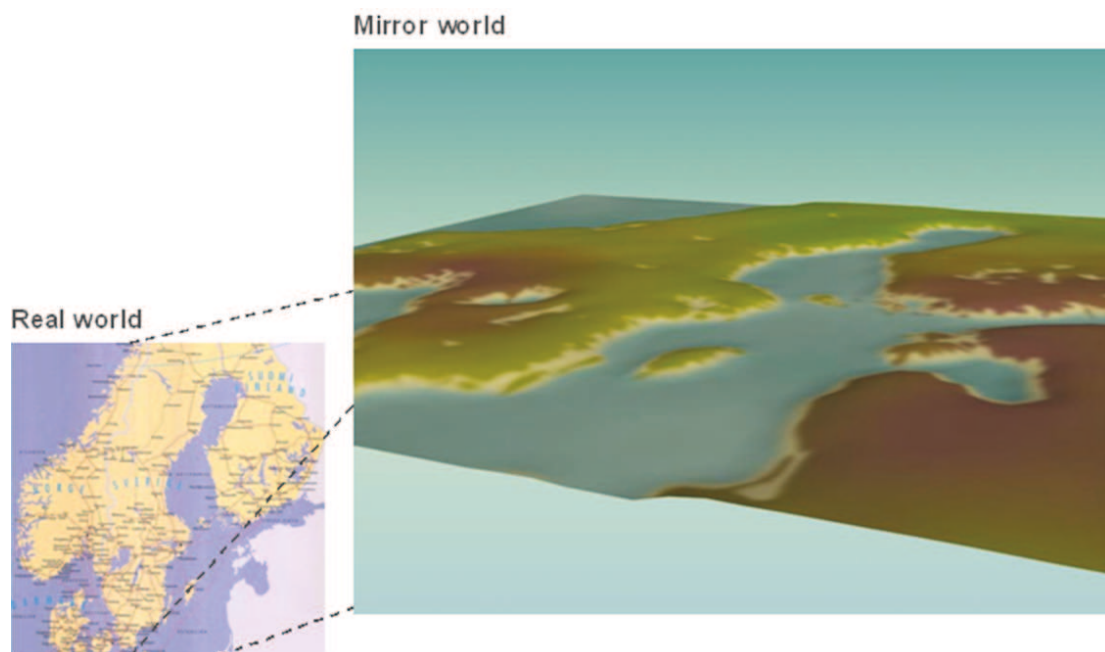


Figure 6.6: Conceptual picture aiming to illustrate that both the virtual world and the real world were used as play environments in GED.

Garden of Earthly Delights (GED) was a pervasive VGW prototype, that could be played both in a VGW and in the physical world, a concept illustrated in Figure 6.6.

The game design document (Eladhari *et al.* , 2005) states:

In a parallel, mirror world fuelled by the dreams and nightmares of people in the physical world, the order has been thrown off balance. Now, a battle for dominance takes place in both worlds.

In the physical world, players build social relations, affect each other's mood, find out secrets about players close by and fight phobias. In the mirror world, phobias are manifested as surreal creatures, and battling them becomes hands-on. Players in the physical world can project their fantasies into the mirror world, creating minions to help them.

GED was staged in a surreal fantasy world, where fantasy is understood in the sense of having a primary physical world and a secondary magical world (Nikolajeva, 1988). The primary target group for GED was dedicated players of commercial VGWs. Secondary target groups were players of location-based multiplayer mobile games such as BotFighters from Daydream, and players of downloadable mobile Java games in general.

6.2.1 Game Design

In the design of GED PCs and NPCs were equipped with MMs. Characters' personalities, moods, emotions and sentiments were to be simulated, and played an important part in the game. The semiautonomous agent architecture of the MM was used for the design of the core game-play mechanics, where important properties such as mind energy that was used for casting spells was directly derived from the MM.

The GED design included game-play uniquely facilitated by the co-presences of a physical and a virtual game world (i.e., parallel reality), including five possible play modes for players based upon their relationship with the virtual game space:













1. *Virtual*: playing the game with a PC in a conventional VGW.
2. *Mobile*: location-based game-play in the real world. The VGW has 1-1 mapping




with the real-world game area.

3. *Astral*: the players playing the game in the Mobile mode go to the Astral mode, and instead of moving physically to a place, move their presence virtually. This too can be used for going to places that could not be physically reached.
4. *Dormant*: players who are not playing can choose to be in the Dormant mode. In this mode they are represented by their aura balls and receive notifications from the game to their mobile phone when someone interacts with their aura ball.
5. *Offline*: the players can log off completely from the game. Other players cannot interact with a player who is in the Offline mode.

Players in different modes could see each other in the game world, with some exceptions, as illustrated in Table 6.7. The players who were offline could not see anyone else and could not be seen by the other players. The players who were in dormant mode could not see other players but could still receive notifications about game events. Players in the *Dormant mode* were visible to the other players as aura balls. Players in the *Astral mode* saw the PCs in the other modes similarly as the players in the *Mobile* mode. The colour of the aura ball represented the mood of a PC.

Table 6.7: The visual presentation of the players who are in different play modes. *Note.* The rows state the mode in which the player is and the columns state the mode in which the other players are.

	<i>Virtual</i>	<i>Mobile</i>	<i>Astral</i>	<i>Dormant</i>	<i>Offline</i>
<i>Virtual</i>					None
<i>Mobile</i>					None
<i>Astral</i>					None
<i>Dormant</i>	None	None	None	None	None
<i>Offline</i>	None	None	None	None	None

 3D avatar	 2D avatar	 Aura ball
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The ultimate long-term goal of the game was for the players to win a territorial battle fought between two factions. The players chose their side from either of the factions. The power relationships between these factions depended on the presence of players and NPCs who belonged to the factions. This was intended to encourage players to leave their aura ball in the game world, even if they were not actively playing the game (i.e., choosing the dormant mode instead of the offline mode).

The game design encouraged collaboration between players in the virtual and mobile modes. The players in different modes could see different pieces of information. For example, the players who were in the virtual mode could see what weaknesses other PCs had. The players in the mobile mode needed this information when they chose which spells to cast on other PCs. The players in the mobile mode could see which faction the other PCs belonged to. The players in the virtual mode did not see this information even if it was needed by all the players. The reason for this is that play tests (see Section 6.2.2) showed that it was necessary to add more incentives for

players to use the mobile mode in order to balance the game.

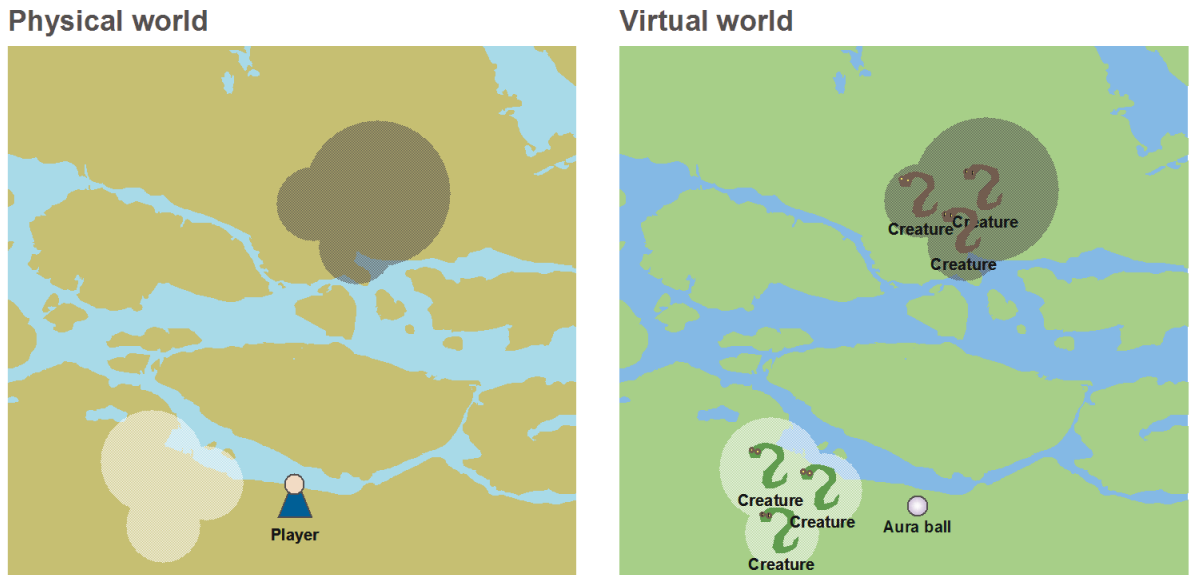


Figure 6.8: Different information is provided about the GED game world depending on whether the player uses the virtual world client or the cell phone to play in the physical world.

In the geography Comfort zones and Danger zones were used, see Figure 6.8, where players could see dark areas (danger zones) populated by hostile entities, and light areas (comfort zones) populated by friendly entities, where characters could recuperate. The geography in the mirror world was isomorphically mapped to the physical world (i.e., adjacency relationships in the real world are preserved between corresponding positions in the virtual world), but in the mirror world the distances are smaller and the nature of specific location representations were non-realistic. Figure 6.9 shows three different play modes as they looked during the development of the digital prototype.



Figure 6.9: Screens of play modes in the digital prototype of GED. *Note.* From the left: dreaming (3-D client on computer), mirror (cell phone client) and astral projection (cell phone client).

Design Notes

The main design challenge in GED was to design and implement game-play activities that would be enjoyable on both types of platform and complement each other. Much focus was put into designing for co-operative game-play. On special occasions team work would be required where some players performed tasks in the virtual world, and where some in the group performed tasks outdoors. Given the technical set-up where the players would learn new ways of using technology to participate in the game, we settled for a traditional fantasy setting, in order to use a familiar fictional code and style that would let players use their existing mind models, or preconceptions, and thus hopefully making it easier for players to understand the game-play.

For the digital prototype of GED I built a simplified version of the MM. The purpose of the simplified version was, through user test, to start with testing a smaller set of values, and perhaps in later iteration increase the complexity, depending on the results

of the tests. This simplified version of the MM contained only five personality nodes, which were the facets of the MM, thus called facet nodes. These were connected to two emotion nodes, joy and fear, through weighted relationships. The relations between the emotion nodes and the mood nodes, and potential sentiment nodes were the same as in the full version. This version of the MM is illustrated by the physical prototype test sheet in the lower part of Figure 6.10.



Figure 6.10: Physical prototype used for play testing a simplified version of the MM.

6.2.2 Play testing

Focus Test

During the development of GED three tests were conducted. The first was a focus test in which groups of participants of the intended target groups were asked about their attitude towards game features that would reach out from the magic circle of the virtual world into their every day lives via their cell phones. The focus test was conducted by Elina Koivisto and Christian Wenninger and is described in (Koivisto & Wenninger, 2005).

Function Test of Physical Prototype

The second test was a functional paper prototype test where the main development team made sure that the most obvious design flaws would be resolved before the first digital prototype was produced. This test, illustrated in Figure 6.11, was conducted by Gustav Stenmark, Peter Kullgard, Tom Söderlund and me. For the purpose of trying out features where several players co-operate using the two different game modes, the virtual and the physical, we designed a board game mock-up with turn-based game mechanics where two boards with grids on maps of Stockholm represented the virtual and the physical world of GED. The test provided us with details useful for the implementation of the digital prototype. The main finding from these sessions was concerned with game balance: players needed more incentives to play in the physical mode using cellphones. The results from these tests were used to enhance the game design before software implementation began. In the digital prototype, strategical information about opponents could only be retrieved while using the physical mode, as described in section 6.2.1

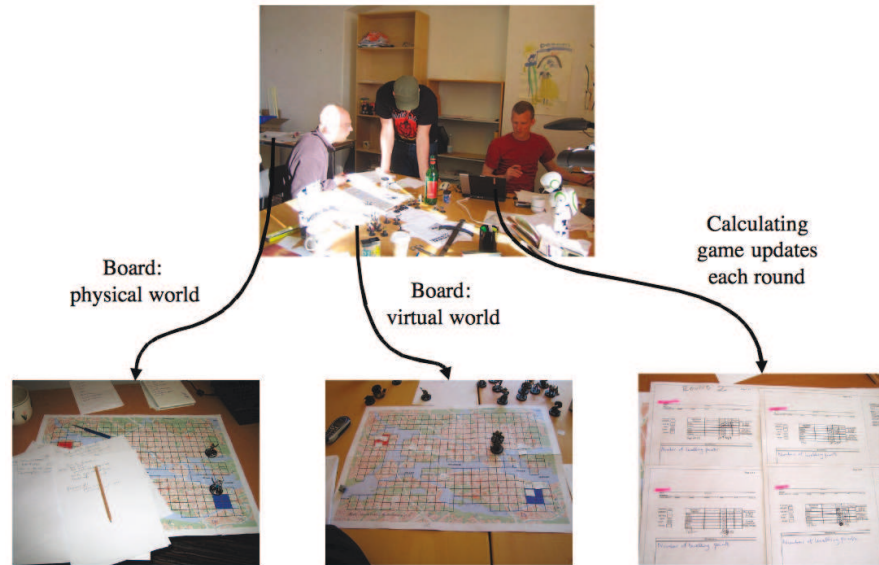


Figure 6.11: Functional test of GED using a physical prototype.

6.2.3 Guided Paper Prototype Play-Test

The third test was a guided paper prototype play-test organised with eight players in September 2005 where each session was video-taped. The test was conducted by Elina Koivisto, Christian Wenninger and me, and is described in detail in (Koivisto & Eladhari, 2006b). The test explored subject matters of usability, game-play (the core mechanics of the game) and pervasive features.

This section is concerned with the results related to the MM, that is, core game-play and characterisation. The testing took two days, and three researchers were needed for moderating and facilitating the test sessions. Each testing session lasted 1.5 hours on average. The test method was a modified version of a typical paper prototype testing method for testing utility applications (Nielsen, 1994). One of the researchers was an interactive storyteller who guided the player through the game

objectives and reacted to the players' actions (similar to a game master in tabletop role-playing games), one simulated the computer and kept the game interface of our paper prototype updated, and the other was the observer who also acted as a game manual when needed, as illustrated in Figure 6.12. In addition to explaining what happened in the game, the storyteller posed various questions about supposed situations to players, for instance, about what they would think about getting a message from the game when partying with friends.



Figure 6.12: From left: a player, storyteller, and 'computer'. The 'manual' is taking the picture.

Scenarios

Five scenarios were part of the play-test, of which two are relevant to game mechanics and characterisation. In the first scenario, a player had just bought the game and started playing it in virtual game mode. The player's first quest to kill spiders introduced the concept of mind energy (that is used for casting spells) and the battle system as illustrated in Figure 6.13. The aim of the scenario was to find out how well the core game mechanics worked.



Figure 6.13: The paper prototype of the virtual play mode.

In the fifth scenario the feature of affective actions was tested. The player was presented with a situation where a friend was sad because of an insult from another PC. The player could pick up one of the actions as shown in Figure 6.10, and point it towards a character in the scenario. The result of the action in terms of mind energy and mood was simulated in the character sheet shown in the lower part of the same figure. The aim of the scenario was to find out how well the feature of affective actions might work. Affective actions are described in detail in Section 7.7.

Demographics in the third test

The game was tested individually with eight players. All of the players were VGW players (who had played VGWs for 2 years on average). Many of the players had played World of Warcraft, but there were also players of other VGWs. Five of the players had only some or no experience of live-action role-playing (LARP) games,

three had played LARP games for several years and also organised LARP games. All of the players in the LARP group also had a strong table-top role-playing game background, and about half of the players in the non-LARP group stated that they had only sometimes played table-top role-playing games. All of the players in the non-LARP group were university students while the LARP group had mixed backgrounds. There was one female in both groups, and the percentage of females in the testing was 25 percent. The test players were all Swedish and they were 24-35 years old, with the average age being 26.

Observations and lessons

The positive observations regarding the game-play were related with learnability and characterisation. For the majority of the players, the game was not difficult to understand, even if it included different playing modes. The players with role-playing experience especially liked the detailed way the characters personality was defined at the beginning of the game. Most of the players enjoyed playing the game (see Figure 6.14) and all of them were interested to play a software version of the same game in the future.

Each character had a MM which reflected the character's mind and had an effect on its behaviour in certain situations. For instance, if the character had phobia for spiders and saw one, the MM could take over and the character might run away in fear. About half of the players considered losing control of one's character to be an interesting feature. However, there were also strong comments against this feature, with one player noting : 'Lack of control is no good if you realise it'. This is quite



Figure 6.14: Participants in the play-test.

understandable because having control is usually a guideline for a good game design (Höysniemi *et al.*, 2004). Most of the players liked the idea that the player would not actually lose control but the MM would affect how the character looked (for instance, happy when among friends). The results indicate that to, for short periods, override players' control of the PC can be an interesting feature, but the degree of player-control versus control from the semiautonomous agents needs to be carefully tuned to a VGWs game mechanics to suit the specific game-play. Features that temporarily take the control away from the player have been successfully used in for example World of Warcraft (WoW) where a character affected by the spell of fear runs in the environment outside the control of the player. Perhaps experience of this type of game-play among the participants influenced their opinions of the issue — the fear spell of WoW was discussed by a few of the participants.

The play-testing also revealed that the design of only one pool for health and magical energy can be difficult to balance. In the design of the WoM and PI prototypes

PCs have two properties important for conflict situations, mental energy and mental resistance, as expanded upon in Chapter 7. Play tests (described in Chapter 8) using both these properties as part of the game mechanics proved to be more successful in terms of understanding the core mechanics derived from the MM .

The test of the affective-action features was the last of the scenarios, which unfortunately had resulted in that, in a few cases, tests were incomplete due to lack of time. Thus the results of the scenario are not as comprehensive as the remainder of the play-test. However, the test results did indicate that players enjoyed the feature where affective actions had a direct effect on other PC's emotions. Normally in VGWs social actions such as emotes does not affect the game-play. The players' positive attitude to the affective-actions feature indicated that further development of the feature could be interesting.

The group that also had LARP experience were particularly enthusiastic about the personality-based game-play that was the result of integrating the MM into the overall design. It was, however, clear that the generic theme of fantasy in some ways hindered the perception of the MM derived game-play features, even if it was useful because players did not need to learn about a new mythical world but could use existing mind models regarding how entities are normally constituted in fantasy role-playing games. The simplified version of the MM proved to be easy to understand for the participants in the test, indicating that a more complex model would be feasible to use.

The MMRO work package of IPeRG came to an end before a second prototype could be produced. The lessons from the development were considered as discussed above in later prototypes: WoM and PI.

More detail about the game design of GED is available in Eladhari et al. (2005) and in Becam and Kullgard (2006). The technical documentation is available in Becam et al. (2005), and the internal evaluation of the phase of MMRO described in this section is available in Koivisto et al. (2006).

6.3 Mind Music - The Soundtrack of your Mind

The third implementation involving the MM was done in the winter 2005/2006 and was much smaller than the previous ones, Ouroboros and GED. It focussed on a single aspect: how music can be used to express the internal emotional state of a PC. In Ouroboros the expression of the PC's own emotional state was shown to others through postures and gestures. However, what is shown visually might not necessarily give the full picture of the fine-grained emotional state provided by the MM. Additionally, it could be a desired feature in a game that a player might choose to not be entirely transparent to other players about the emotional state of her PC. The traditional way of conveying the current state of a PC to a player is through numerical values that might or might not have a visual representation in the form of a set of bars or another type of diagram. The third implementation, Mind Music, instead used the energy level of the PC, derived from the mood nodes of the MM via the game mechanics of GED, as rhythm and groove. An emotion gave a melodic sound, and the encounter of a sentiment played a leitmotif. The mood gave the music varieties in harmony. These aspects resulted in different orchestral soundtracks for the players.

A simple demonstrator in the form of an arcade game was built by Mikael Friden-falk, where hitting different objects resulted in emotional events, which in turn triggered the interpretation of personality traits, moods, personal sentiments and formed the base for the music. Rik Nieuwdorp composed the music. The Mind Music was originally designed as a feature for GED.

6.3.1 Background and Related Research

Just as games often borrow narrative structures from films, musical structures are also borrowed. For music this creates the same problem as for the narrative: the games are interactive and usually not linear. The area of music needs similar research and design goals as narrative: adapting the composition to the media.

A shared property of music for film and of music for digital games is that it is functional. Cohen has described eight functions of music in multimedia (Cohen, 1999). The functions that are of particular interest to games include that music can be used to direct attention to important features of the screen, to induce mood (this is supported by several experiments; Pignatiello et al. (1986)), to communicate meaning to further the narrative, to enable the symbolisation of past and future events through the technique of leitmotiv, to heighten the sense of presence, and to add to the aesthetics.

Research into believable agents is often concerned with the expression of emotion. Because a fundamental aspect of music is its ability to express emotions research in believable agents can benefit from exploring how music can be used. When Bates (1994) coined the expression *believable agents*, the idea took a stance in arts, literature, theatre, film, radio, and drama, but especially in character animation for Disney

characters. Bates described a believable agent as ‘an interactive analog of believable characters discussed in the Arts’ (p. 5), and argued that artists hold similar goals to AI researchers, wanting to create seemingly living creatures where the illusion of life permits the audience’s suspension of disbelief. He proposed that emotion is one of the primary means to achieve believability. Study of believable agents has mostly been approached by making applications that to varying degrees create believability by using graphics showing facial expressions and gestures, and by using language, spoken dialogue and dialogue in text, most notably within the OZ Project (Bates *et al.* , 1989 - 2002) and the NICE project (NICE, 2002 - 2005). The Mind Music prototype aimed to widen the field of expression of believable agents to also encompass music. The approach might not be as relevant for environments where the approach is aimed solely at NPCs, but it could prove useful for semiautonomous PCs to express the states of the player’s own character.

Regarding how music can affect emotions of listeners there seems to be a consensus around the crucial need for further research in the area (Jusling & Sloboda, 2001). Nevertheless there is some empirical evidence as a basis for experiments in the field. Gabrielsson and Lindström (2001) reviews different factors in musical structure that affect perceived emotional expressions. Recent implementations in the area include Berg and Wingstedt’s studies with the REMUPP tool (2005), showing how musical parameters can contribute to expressing the emotions of ‘happiness’ and ‘sadness’ (Wingstedt & Berg, 2005). Taylor, Torres and Boulanger recently presented a real-time system that allows musicians to interact with synthetic virtual characters as they perform (Taylor *et al.* , 2005), and Livingstone and Brown proposed a dynamic music environment where music tracks adjust in real-time to ‘the emotion of the in-game

state' (2005).

In game development the term 'adaptive audio' is normally used to describe music and audio that reacts appropriately to game-play. Adaptive audio is more closely tied to the implementation of the game-play than the traditional pre-composed music and audio that often is tied to certain locations in the virtual geography of the game, or tied to certain events and/or actions. Just as Livingstone and Brown notes (2005), the event-based approach with looped audio tracks leads to music that is repetitive. This has the effect that players become adept at determining the game-state on basis of the track, and the music is reduced to serving as a mild distraction. Adaptive audio is currently under-utilised in games (Withmore, 2003), but there are several exceptions, such as *Castlevania: Dawn of Sorrow* (2005), *Fahrenheit* (2005), *GUN* (2005) and the VGW *Star Wars Galaxies* (2003).

6.3.2 Design Considerations

Because music, with some philosophical reservations, see, for example, Davies (2001), can be seen as 'the language of emotion' (Pratt, 1952) I believe that experiments with adaptive audio could benefit research into believable agents. Music can be used to give players an idea of what a character is like by *hearing* its affective processes, while the audio output depends on how a particular character with a particular personality and history interprets a particular context. To quote Cohen (2001, p. 267) :

Real life entails multiple emotions, simultaneously and in succession. Miraculously, yet systematically, these complex relations — this 'emotional polyphony' — can be represented by the musical medium.

Normally in digital role playing-games the characteristics of a PC is shown to the player via symbols on the screen. These can for example be numerical figures, text or icons. The more abilities and properties that a particular player needs to see during game-play, the more complex the user interface becomes. An illustrative example is the number of add-ons that players of the VGW World of Warcraft (2004) develop and share in order to enhance and personalise the user interface of the game to fit their needs.¹

There are several benefits to using music to represent affective processes of a character in a role-playing game. One benefit is that complex states, an ‘emotional polyphony’, actually *can* be represented by the musical medium. If music is used instead of visual symbols players do not need to keep track of a set of changing symbols on the screen in order to get information about affective states. A second benefit is the possibility to have different representations of the affective state and the affective reactions. The design of the GED and Ouroboros prototypes included features for expression of emotional state via posture and facial expression if the player used the 3-D client for the PC. For example, if a player character experienced fear, the posture and the facial expression would change when a certain threshold value was reached. This would be visible to not only to players themselves, but also to any players within the range of visibility. A small change, however, would only be communicated to the player experiencing the state — via music. A third benefit of using music to reflect the affective processes is a potential positive effect on the immersive qualities of a game. Tests show that music indeed can induce mood to a

¹The 12th of March 2006, 137 applications could be downloaded from the category Interface Add-ons at the URL <http://ui.worldofwar.net>. In July 2009, the number of applications for customised interfaces for WoW was several thousands, and categorised more narrowly; see for example the URL <http://wow.curse.com/downloads/wow-addons/>.

listener (Pignatiello *et al.* , 1986). In game genres such as role playing there is a heavy focus on drama and immersion (Ermi & Mäyrä, 2005), something that has been a challenge to digital role-playing games. Using music and adaptive audio to support immersion, presence and drama may be one way of enhancing the quality of digital role playing games. A fourth possible benefit could be that the believability of the character whose affective state is represented in fine granularity is increased.

While it might not be so difficult to envisage a system that plays a leitmotiv illustrating fear or sadness in situations that the system can identify as ‘scary’ or ‘sad’ the issue of more compound affective states is more demanding. The MM (described in Chapter 5) caters for compound states, where for example a character in a gloomy mood could experience mixed feelings such as combinations of joy, guilt and confusion.

6.3.3 Requirements

The Mind Music application is an attempt to create a musical soundtrack expressing the individual moods and feelings of each PC. Such a soundtrack would express and represent the affective processes of a PC to players, where each player would hear a different soundtrack.

In order to achieve this in a virtual world the following is required:

- an implementation of a model of mind that can give a PC a personality, moods, likes and dislikes, and feelings that are connected to the context of the PC;
- a mapping between the individual PC and the ontology, or domain, of the game world;

- an adaptive music implementation that can express the different affective states of the PC.

6.3.4 Implementation

State of mind can for example be expressed through emotionally loaded ambient musical compositions, situation specific melody themes and variations in the rhythm. In the design for the GED prototype a particular player would be exposed to three main musical elements:

- ambient music composition for description of mood states of a PC based on input from the MM;
- situation-specific melody themes, such as leitmotifs for objects that have the same meaning for all players, or players parts of larger groups. An example of a leitmotiv is when the shark comes close in the movie *Jaws*. In this system a scary leitmotiv would be played when something that the PC fears comes close;
- variations in the rhythm expressing the level of energy/excitement.

As sketched above, the musical experience of players would be individual, but given the personal creative style of the composer writing music for the elements it would be possible to have united ‘sound’ for the game that expresses the aesthetics of the particular game. In the test application, we only experimented with musical features in relation to the MM. We implemented a simple game application in arcade style. The test application used modules originally designed to be used in the full blown virtual world of GED, the MM, and compositions for adaptive audio, see Section 6.3.6. The test application was only intended as an experiment for the adaptive

music, and therefore only the parts of the system relevant to this were used. The PC was represented by a simple dot that the player could move in order to touch icons of 13 types, each representing an emotion. A short sound or melody was played when the player-dot was touched by an icon. The mood of a PC changed depending on what ‘emotion icons’ it was touched by and the music changed according to this.

6.3.5 Adaptation of the Mind Module for the Mind Music Application

The application Mind Music used thirteen emotion nodes and on two mood nodes. The application used the emotions listed in the Table 5.6 in Section 5.3.4. A generic personality with norm values was used for the test applications, and only 13 sentiments were instantiated. These sentiments were tied to classes, not specific objects, where in the game each sentiment were tied to a type of icon that the player can ‘touch’. This simplistic setting gave a very constrained mapping between the separate entities in the world, in this case the dot representing the player and game objects of thirteen different kinds.

The personality of a character with a MM defines how it is likely to react in different situations. In a role-playing setting the MM’s system of traits defines how likely a PC is to react in particular ways in particular situations. For example, a character who has a high value of the trait anger will more easily react with anger than a character who has a low value. In our test application, however, where only one player was active as a ‘dot’, the personality settings have a different meaning. Depending on the traits of the ‘character’ that starts the game, the music which is played tend to play

along different parts of the mood co-ordinate system (see Section 6.3.6).

The personality can be changed by the player via a XML file which is provided with the application. If it is not changed norm values are used. In the test application, the relations between the emotion and mood nodes, expressed in terms of weight, were used as explained in Table 5.7.

6.3.6 Mind Music Composition

Empirical research concerning the influence of different factors in musical structure on perceived emotional expression (reviewed by Gabrielsson and Lindström (2001)) gives a solid base of information which was possible to use as an inspiration for the composition of the Mind Music application. The most studied factors are harmony, rhythm, tempo, loudness, pitch and mode. Because the Mind Music application played several tracks simultaneously that in many cases were independent of each other, the number of factors were narrowed down, in order to decrease the level of complexity, to two factors: harmony and time signature. The results of a study by Berg and Wingstedt (2005), was inspiring. In Berg's and Wingstedt's study mode and tempo (among several other factors), were studied in respect to how musical parameters can express happiness and sadness to listeners. In their study, listeners could adjust musical parameters to best express a given emotion.

6.3.7 The Composition for the Mood Scales

In the Mind Music application, the inner mood was represented by harmony, while the outer mood was represented by time signature. The design intention was to let the inner mood represent the private, inner mood of the character, while the outer were

representing the more extroverted side of the mood, how the character emotionally was relating to the game world and to other characters. A challenge for the composer was to compose segments that would sound ‘good’ in all possible combinations in the mood co-ordinate system (illustrated in Figure 5.9). The sounds were manifestations of the different modulations that could occur within the mood co-ordinate system. For the inner and outer mood, there were 25 different modulations as the mood scales have 5 hard segments each (that is, musical tracks). These were created as MIDI files using DirectMusic Producer (Microsoft, 2001).

The outer mood was represented by the time signature of the music, because this characteristic did not interfere with the harmonic qualities of the inner mood music. Time signatures also were consistent with the extrovert nature of outer mood scale. Time signature controlled, to use a popular expression, the ‘groove’ of the music — it is often visible in how a listener ‘bobs’ his or her head. A change in time signatures is possibly more profound than a harmonic change, since the listener need to adapt to the new ‘groove’. The notes used for each segment of the mood, scales of inner and outer mood, are available in (Eladhari *et al.* , 2006).

6.3.8 The Composition for the Emotions

Musically, the co-ordinate system of the two mood scales was the very foundation. Inner and outer mood controlled the fundamental elements within the soundtrack, the way it felt and developed through time. When short melodies for the emotions are composed, they must not interfere with the structure of harmony and time signature; therefore they have to be represented in another element of the musical composition. Even though harmony and time signature were set by the mood scales, this did not

limit how the composition was ‘filled in’, that is, the amount of notes, instruments, sound effects or sound altering effects (like reverb or delay for example) were still open to the will of the composer. Direct translations like linking the inner mood scale to the harmony of the soundtrack can just as easily be used in the integration of the emotions into the composition; chaos can be represented by fast, random notes within the spectrum of the harmony, alienation can be expressed by the amount of reverb on the percussive instruments. In this case, the emotions were simply represented by short leitmotifs that could announce a fast change in the PC’s emotional state. DirectMusic Producer (Microsoft, 2001) was an appropriate tool for working with these extra melodies, as they needed to function with the musical result of all possible modulations of the mood co-ordinate system. Via DirectMusic Producer certain melody parts could be programmed to follow the rules of any set harmony, which resolved the potential problem of matrical adaptive composing, that is, having to make every emotion multiple melodic modulations for any possible harmony that could occur.

6.3.9 System Integration

The software systems platform consisted of an experimental 2-D game engine that was developed for the purpose of integrating the MM with the music system. It further incorporated a simple game client for analysis of the performance and the correct functionality of the system. The platform consisted of GLUT, OpenGL on Windows, and was developed in C++.

The game items consisted of a PC (the ‘dot’) and a number of sentiment objects, representing 13 different emotions. The positive sentiment objects moved in a scripted

way and the negative ones moved in formations and tended to chase the player. The role of the player was to hit the positive sentiment objects and to avoid getting hit by the negative ones if the player wanted to hear music that is ‘happy’ on the inner mood scale and ‘exultant’ on the outer mood scale. If the player instead wanted to hear ‘depressed’ and/or ‘angry’ music the game-play strategy would be reversed. As a result, the inner and outer moods were changed depending on which objects the player hit and the frequency of hits. The music system was implemented by mapping 25 possible emotional states (a grid consisting of five outer and five inner modes) to an equal number of pre-composed audio loops, waiting for each loop to terminate before the next started.

The MM is written in C++ and for use with this systems platform it was made available as a DLL with the necessary functions exported. Input data, specific to this implementation, was read from XML files. These input data gave the MM the necessary information required for activation of the affect nodes. These files also provided a convenient way of experimenting with setting different weights on the sentiment nodes in order to try out different paces of change in the music on the two mood scales, and for changing the personality trait settings.

6.3.10 Conclusions on Mind Music

The work with the Mind Music was challenging in many ways, and in retrospect I could see a number of issues that need to be addressed. For example, the larger the combination space is that the different elements of the audio operates in, the more difficult it is to ensure that the music sounds ‘good’ or ‘appropriate’ to game-play in all possible combinations. On the other hand, a smaller combination space may lead

to predictability. If players are fully adept at determining the game state information based on the music, the music ceases in its functional role and thus becomes less interesting (Meyer, 1956).

Another issue is that the music and sounds played for illustration may not have the meanings that the composer has intended for the individual player. If there is a large mismatch between intended meaning in the representation and what is perceived by the player the intention of the application is lost.² Even though there is much empirical research showing how to use musical structures and factors to have the intended meaning, the quality and nature of a composition, for each application, rely on aesthetic decisions made by a composer. A possible, but not necessarily feasible, approach for achieving musical expression that matches subjective interpretations of emotional meaning for listeners could be to ask players in the beginning of the game what emotions they perceive that certain musical elements convey. These musical elements could be stored as activation data used by the application to combine the musical elements for the individual player. This would give a character a personal music setting, a ‘music personality’.

In Section 6.3.2 I outlined the following four main possible benefits of using music

²Mind Music was not used and tested as part of GED, due to the premature ending of the project, but the mood co-ordinate system has been used by Stockholm in the application Eavesdropping where this is addressed (Stockholm, 2008; Stockholm & Pasquier, 2008). Eavesdropping is an Internet-based audio composition system, designed for public spaces where several computer users are gathered. In Eavesdropping, compositions are created from abstract mood objects rather than musical structures. Stockholm writes (2008, p. 56): ‘This research attempts to resolve issues raised in prior multi-user, collaborative mood-ecologies (Eladhari *et al.*, 2006) by applying a situation-aware, server-based Conductor to adjust the audio based on the number of participants. The composer uploads a variety of audio to represent the moods in the composition and the Conductor chooses which files to play to address issues of sound density, stream segregation and acoustic ecology.’ In Eavesdropping, composing users can project music projecting moods, and listeners can evaluate whether the audio matches the mood. Eavesdropping is accessible online at <http://www.oddible.com/cafe>.

to represent affective processes of a character in a role playing game:

1. the ability to express complex relations of the affective processes — an ‘emotional polyphony’ — through music instead of through visual symbols;
2. the ability to induce mood to players as a means to increase the level of immersion or presence in a game;
3. the possibility to differentiate between the expression of affect that a PC expresses through facial expressions, postures and gestures to other players from the affective states and processes that are represented by the music. The music represents affective states and processes of the character rather than reactions, and these are private to a player;
4. possibly increase the believability of the character by a finely granulated representation of its affective processes.

The first and the second benefit in the list above are supported by research in that is referenced in this chapter, especially (Gabrielsson & Lindström, 2001; Wingstedt & Berg, 2005). Even so, further research where the applications are geared towards CAP in games is necessary.

6.4 Later Experimental Prototypes

6.4.1 World of Minds 1

The fourth implementation is a virtual world prototype where the game design entirely builds upon the features of the MM and utilise the aspects relevant to characterisation

and story construction. The first implementation had the working name ‘World of Minds’ (WoM) and was done in 2006 as a text-based world, using the code base BetterMUD (Penton, 2004). The MM was integrated as a SWIG module. It was useful for trying out some of the game-play features in an environment that did not require any media assets such as graphics and audio, but left a lot to be desired in terms of usability. It did not render good enough responses from early functional tests to motivate further development on that particular platform, but did give enough material for the second game design iteration done in 2007.

6.4.2 World of Minds 2

The second digital prototype of WoM was done in 2008 using the Torque Game Engine (TGE) by GarageGames together with Prairie Games open source TMMOKit which provide an MMO game frame work and network layers, written in Python. The MM was rewritten in python and added to TMMOKit as a python module. In parallel, scenarios suitable for guided paper prototype play tests were designed. The purpose of these was to test game-play features before they were implemented in the prototype, and to get indications of the potential success or failure of the design in regard to game-play features using mood, personality traits and sentiments as means for characterisation and story construction. The guided play tests were video taped and transcribed. Additional material in relation to the tests were gathered through video taped interviews and a series of surveys. These tests yielded relevant results and are described in Chapter 8.

6.4.3 Pataphysic Institute

Despite the feasibility of TGE and TMMOKit as development platforms the task of finishing the WoM prototype turned out to be too large for a single developer. Therefore a partnership was sought, and found in the game company Pixeltamer, who during 2009 assisted in developing the prototype using an engine developed in-house. At this point the prototype was ready for leaving the working name WoM and receive its real name: Pataphysic Institute (PI). The design of PI and WoM is described in Chapter 7.

6.5 Summary

This chapter has described the early prototypes where the MM was used as part of the implementations.

In Ouroboros an important focus was to explore the use of expressive gestures of 3-D characters. Different gestures were available for use depending on the state of mind of the PCs and were consistent with their personalities. In relation to this, early sources of inspiration for the implementation of the MM were described. Ouroboros was developed at the Zero Game Studio, part of the Interactive Institute in Sweden.

Garden of Earthly Delights (GED) was the demonstrator of the work package Massively Multiplayer Reaching Out (MMRO) of the Integrated Project for Pervasive Gaming (IPeRG). The focus of MMRO was to explore ways to integrate massively multiplayer gaming with the play via cell phones with geographical location data. Five organisations in Europe co-operated in MMRO. A guided paper prototype play-test was conducted where issues of player control of the semiautonomous PC was

discussed and which showed that players with live action role playing experience were particularly positive towards the MM derived game-play in the test.

The Mind Music application, also a part of MMRO, focussed on how music can be used to express complex states of mind to players, communicating mood and emotions of the own PC via leitmotifs and groove. By using a model of mind such as the MM that provide a character with personality, emotions, mood and sentiments, the development team attempted to generate music that reflects the affective processes of a character. An aim with the test application, a simple game in arcade style, was to illustrate how affective processes could be represented in real-time to a player via music.

The development and design of the early prototypes were useful for the work with the later prototypes, where the entire design builds upon the MM, described in Chapter 7 and 8.

Chapter 7

Game Design

Contents

7.1	Background	153
7.2	Game Design Overview	155
7.3	Core Game Mechanics	157
7.3.1	Mind Energy and Mental Resistance	157
7.3.2	Summary of Mind Magic	158
7.3.3	Mind Magic Spells	159
7.3.4	Affective Actions	160
7.3.5	Mood Aura	161
7.3.6	Formalised Social Relationships	161
7.3.7	Character Creation	162
7.3.8	Character Development	164
7.3.9	Entity Types	165
7.3.10	Display of Mind Module Information	166
7.3.11	An Example Event and Possible Consequences	168
7.4	Back-story of the Pataphysic Institute	170
7.4.1	Introducing the Back-story to Players	173
7.4.2	Non-Playable Characters	173
7.4.3	Dialogue	175

7.5	Formalised Social Relationships	176
7.5.1	Friends	177
7.5.2	Protectors, Protégés and Departments	181
7.5.3	Acquaintances	183
7.5.4	Authored relationships	183
7.5.5	Design Notes about Social Relationship Features	183
7.6	Mind Magic Spells	184
7.6.1	Spell Types	184
7.6.2	Emotion Spells	185
7.6.3	Mind Energy and Mind Resistance Spells	186
7.6.4	Mood Requirement for Casting Spells	186
7.6.5	Personality-based Area of Effect Spells that Affect Mental Energy and Resistance	190
7.7	Affective Actions	191
7.7.1	Prerequisites and Success Criteria	191
7.7.2	Design and Test Process of the Affective Actions Feature	194
7.7.3	Specific Affective Actions	195
7.7.4	Design Consideration of Affective Actions Economy	197
7.7.5	Learning Affective Actions and Spells	198
7.8	Single-Sentiment Manifestations	199
7.8.1	SSM Properties	199
7.8.2	Exclamations	201
7.8.3	Specific SSMs	202
7.9	Compound Manifestations	203
7.9.1	Properties	204
7.9.2	Example of an Authored Compound Manifestation	205
7.9.3	Free Form Manifestation of CM	207
7.9.4	Manifestations of Curses and Blessings	208
7.10	Characterising Action Potential	212
7.10.1	Summary of Interrelated Elements Governing the Charac- terising Action Potential	213
7.11	Summary	215

This chapter describes the game design for the prototypes Pataphysic Institute and World of Minds. The chapter is organised in the following way: First, a brief background to the development is given, followed by a summary of the design work. Then a brief description of the core game mechanics is given. Next the back-story of the world and sections which describe relevant features of the game mechanics are presented in detail.¹ Finally, the characterising action potential of PCs given the presented design is summarised.

7.1 Background

The work on the early prototypes presented in Chapter 6 gave me the opportunity to start to map out game design that could use the functionality of the MM and provide a game system where issues of characterisation and semiautonomy could be explored.

This chapter describes the game design that is the base for the World of Minds (WoM) and the Pataphysic Institute (PI). In the text, PI is the game named, since this is the latest iteration. The game design is presented before the pen-and-paper play-test of WoM in Chapter 8 in order to give necessary background to the research question explored in the WoM play-test, even though some design choices presented in this chapter build on results from that very test.

WoM was developed both as a MUD, a text-based VW during the autumn 2006, as a 3-D graphic VGW using the Torque Engine and Prairie Games' open source

¹Not all design- and implementation-related issues are considered relevant to this thesis, such as design and development methodology, the specifics of the dialogue system or spacial design considerations. The list of discarded issues is long. The design features presented in this chapter are those that may have a bearing on the questions listed in Chapter 4.

MMOKit during 2007 and 2008. For both these iterations the Mind Module, which is written in C++, was wrapped with SWIG so that it is accessible via Python, the scripting language of the MMOKit and of the engine for the text-based world. Neither of these digital prototypes were developed to a stage where they were mature enough to test. The reason for this was that the platforms were not stable enough for a single developer (me) to be able to make a testable prototype in given the time frame of the project. Also, my skills in 3-D graphics programming, databases and network programming were insufficient. In 2008 in parallel with development using the MMOKit I conducted guided prototype play tests which are described in Chapter 8. In the winter 2008/2009 it became obvious that I would not manage to finish the prototype during the spring on my own in parallel with teaching and writing this thesis. The Department for Game Design at Gotland University, my home-department, came to my rescue at this point and helped me to establish a co-operation with the German game company Pixeltamer. PI is built in Pixeltamer's framework for web-based multiplayer games and is played in a web browser through a Java applet. The game design described in this chapter was written during the spring 2009 and is the product of design experience of previous prototypes and tests of these.

The PI prototype was built during the spring of 2009. Christoph Pech, managing director at Pixeltamer in Germany, did the development at the engine and framework level (as defined in Section 2.3.1), according to the design document provided to him. My part time assistant at Gotland University (HGO), Musse Dolk, did the development required at the scripting level. Ola Persson, a masters student in graphics for games at HGO whom I supervised, worked with Musse on the level design, and made

the 3-D graphics required for the prototype advised to use paintings by Hieronymus Bosch as his main source of inspiration. During the spring we had weekly meetings.

7.2 Game Design Overview

Pataphysic Institute (PI) is a prototype game world where the personalities of the inhabitants are the base for the game mechanics. When interacting with other characters the potential emotional reactions depend upon PCs' current mood and personality.

Players are introduced to the back story of PI before they log on, by reading the diary of Katherine, an investigator who was sent in to PI to investigate the consequences of a mysterious event called the Outbreak. In PI, reality has been replaced by the inhabitants interpretation of reality, and their mental states are manifested physically in the environment. The head of human resources at PI has taken upon himself the task of understanding the new and unknown world by applying personality theories. He forces everyone in PI to take personality tests, and studies what types of abilities these persons get, abilities he calls Mind Magic Spells. Another inhabitant in PI, Teresa, focuses on the finding that social interactions between people suddenly result in acutely concrete emotional reactions. She calls these Affective Actions (AAs), and tries to understand her changed environment by studying the patterns of these.

The basic game-play is simple: players need to defeat physical manifestations of negative mental states. In order to do so, they can cast spells on them, but the spells available are constrained by the avatar's personality, her current mood, and how far the avatar has progressed in learning new abilities. Each avatar has mind

energy (mana) and mind resistance (health points). Each spell costs mind energy to use, and attacks reduce mind resistance. The experience of the character defines how large the possible pool of energy and resistance is at a given moment. The regeneration rate of resistance depends on the inner mood, while the regeneration rate of the energy depends on the outer mood.

Players can affect each other's moods by using AAs, thus controlling the selection of spells available. AAs are actively chosen by the players, they are not effects of other social actions. If a player targets another avatar they can choose from a selection of AAs. For example, the AA Comfort can be used successfully on targets that have an active emotion node of Sadness, but only if the player's own avatar is not in the area of Furious on the mood co-ordinate system. If the AA Comfort is used successfully the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character.

The core game-play draws upon the Mind Module as described in Chapter 5, a semi-autonomous agent architecture built to be used in a multiplayer environment as a part of the player's avatar. All characters in Pataphysic Institute are equipped with Mind Modules, both playable characters (PCs) and non-playable characters (NPCs).

7.3 Core Game Mechanics

7.3.1 Mind Energy and Mental Resistance

A character has a pool of Mind Energy (ME) and Mind Resistance (MR). The maximum amount of possible MR and ME increases with the level of the character. Levels are gained for a PC as it gains experience points (XP). Mind Energy is used when the character performs action, as a cost. Mind Resistance is lost if the character is attacked by another entity. Figure 7.1 illustrates the fluctuations of MR and ME.

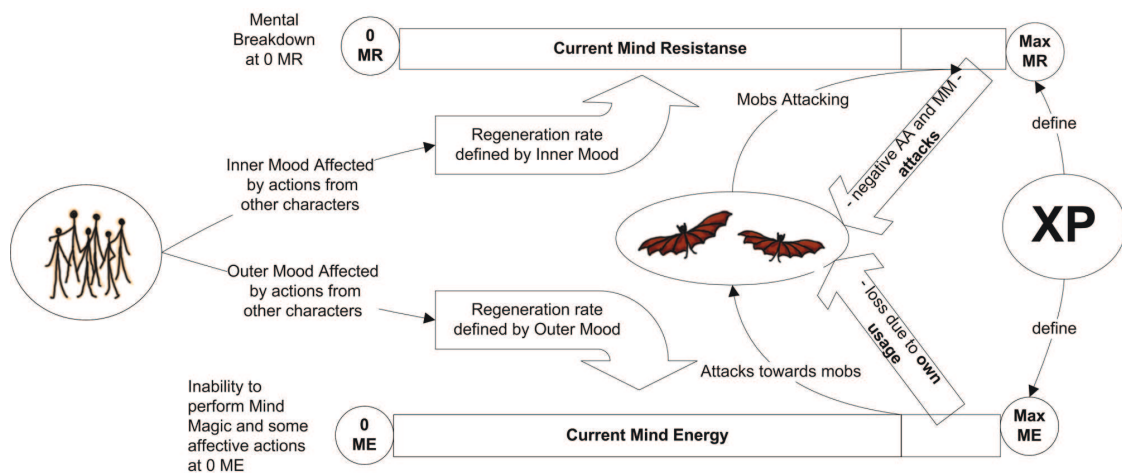


Figure 7.1: Fluctuations of Mind Energy and Mind Resistance

MR and ME is regenerated over time. The rate of the regeneration depends on the mood of the character. Inner Mood is tied to the generation of mind resistance while Outer Mood is tied to the regeneration of Mind Energy as illustrated in Figure 7.2.

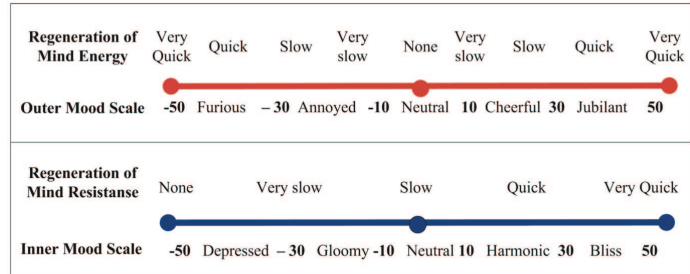


Figure 7.2: Regeneration of Mind Energy and Mind Resistance

The regeneration of mind resistance corresponds to the negative and positive values of the inner mood, meaning that the higher the value is of the inner mood, the quicker the resistance of the character is regenerated over time. In the case of the mind energy the regeneration is the slowest when the character is in the middle of the scale. The quickest regeneration of energy is achieved at the extremes of the outer mood scale, in the jubilant and furious moods.

7.3.2 Summary of Mind Magic

Mind Magic can be performed in two ways: through social interaction with the use of AAs, and through spells. The AAs mimic the way humans affect each other emotionally through interactions such as encouragements or insults. The mind magic spells are more traditional from a game history perspective where the target of a spell not necessarily needs to have chosen this interaction. From a social interaction perspective a simile could be to use a love potion bought from a witch-doctor, in the belief that emotions can be forced. In PI they can be.

7.3.3 Mind Magic Spells

Mind Magic spells (MMSs) can help or damage (in terms of MR and ME) characters that the spells are used on. There is a standard set of spells. Benevolent spells can be used on Self, on other characters, and on Manifestations. Harming spells can be used on Manifestations. The spells characters can learn depend on their personality traits.

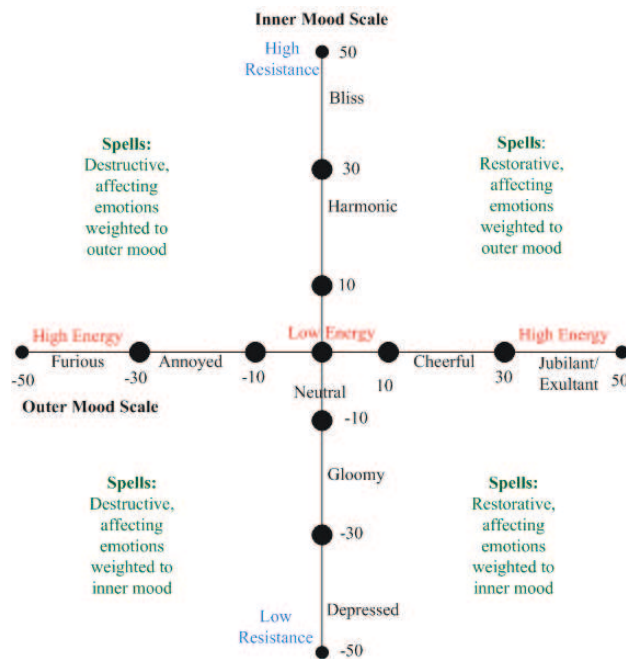


Figure 7.3: Mood co-ordinate system, MR and ME regeneration rates, and usable spells

The types of spells that affect the pools of MR and ME which can be used differ with the mood of the spell-caster. The action potential regarding these spells reflect the mood of the casting character, as illustrated in Figure 7.3. For example, a character in a furious mood can cast aggressive spells, while a character in a harmonic mood can cast benevolent spells helping her friends. Mind Magic Spells are described further

in Section 7.6.1.

7.3.4 Affective Actions

Players can perform a social/affective action towards other characters in order to change their mental state in both positive and negative ways. By affecting others mood's the selection of their available spells is changed. AAs are actively chosen by the players, they are not effects of other social actions. If a player targets another avatar she can choose from a selection of AAs. For example the AA 'Comfort' can be used successfully on targets that have an active emotion node of Sadness, but only if the player's own avatar is not in the area of Furious on the mood co-ordinate system. If the AA Comfort is used successfully the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character.

In order to use an AA in PI players choose it from a menu in the interface while targeting the character that is to receive the AA.

An example of an AA is Flaunt Big Secret. This AA increases the Interest of the target (i.e., the value of the emotion node Interest which increases according to individual weighting toward personality trait nodes). AAs are described further in Section 7.7.

Both AAs and spells affect the emotion nodes of the targets, while spells also can diminish or increase to pool of MR and ME. Spells are typically used in situations of combat with NPCs and other autonomous expressive agents.

7.3.5 Mood Aura

In PI, PCs can see what mood other PCs are in by the colour of the mood aura, which is a transparent half-bubble displayed on the head of PCs as shown in the middle picture of Figure 7.4. The colour and shade of the colour reflects the current position in the mood co-ordinate system. In the picture to the left the white dot in the middle in the mood co-ordinate system is the position of the PC Emil's mood, which was neutral at the time when the screen dump was taken. In the figure to the right the white dot shows the PC Neurotica's mood, which was in the blissful space of the mood co-ordinate system.

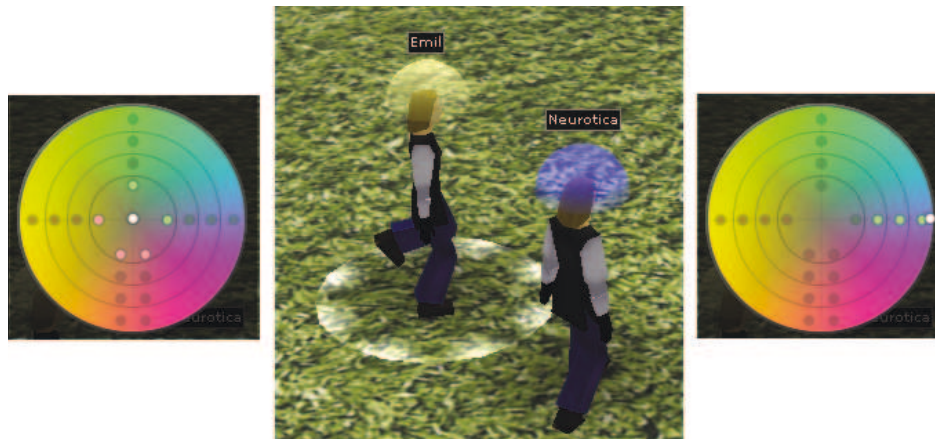


Figure 7.4: Mood Aura in PI.

7.3.6 Formalised Social Relationships

Characters in PI have several available types of formalised social relationships. Formalised in this context means that the relationships are part of the game mechanics, as opposed to non-formalised relationships where the players can have relationships independent of the game system.

PCs and NPCs can have friends, where the number of possible friends vary depending on values in the character's personality trait nodes. Friendship relations increase the MR and ME, and if friends are in proximity of each other in the VGW they get an increase in the emotion node Belonging. PCs can also have one friend relationship defined as a special friendship which give the same effect as other friendships, but with higher increases of the affected properties.

PCs may define relationships of protection, where one character can be protected by two characters, becoming their Protégé, and protect two others, becoming their Protector. These relationships also define the permanent grouping system in PI, further described in Section 7.5.2. The role of the Protector, who typically is a more experienced player is to help the Protégé. As a reward, the Protector receives a percentage of the experience points of the Protégé, and increases in the emotion node Pride when the Protégé 'levels up'. PCs in the same permanent group belong in PI to the same Department, and if they are in proximity of each other in the VGW the value in their emotion node Belonging increases. The formalised social relationships in PI are described in more detail in Section 7.5.

7.3.7 Character Creation

When a player logs on to PI the first time she can take an IPIP NEO test consisting of 120 rating scale items in order to create a personality for her PC (Johnson, 2001). Figure 7.5 shows a screen of the IPIP NEO in PI. In order to rate all items players need to scroll down in the dialogue window in the PI client.



Figure 7.5: IPIP NEO in the Pataphysic Institute.



Figure 7.6: Screen in PI for choosing to either take a personality test or to pick a personality template.

Players can also choose a quicker route and chose either a randomised personality or select one of five ready-made personality templates. Figure 7.6 shows a screen from PI where the player can choose a personality template or to take a test. The personality templates each have one of the FFM facets dominating, and have specific personality traits set so that they give different abilities in terms of available personality based

mind magic spells. The personality templates are provided in Appendix B.2 along with specifications of the spells available for each template.

The scoring system and report routines of the IPIP NEO test was kindly provided by John A. Johnson, Professor of Psychology at Penn State University. The perl CGI scripts provided by Prof. Johnson was rewritten in C++ by Mr Pech at Pixeltamer for use in the PI VGW.

7.3.8 Character Development

Character development in PI uses the well-proven system of levels and experience points (XP) used in most role playing games (RPGs), both table-top RPGs and computer-based RPGs. Generally in RPGs, XP are given to PCs as rewards for performed actions in the game world. When a certain amount of XP are gathered the character gains a level, that is ‘levels up’. When a character gains a level she can learn new abilities and often specialise the character’s properties according to the game mechanics of the specific game. The specialisation and learned skills define the types of actions the character can perform. The level of the character signals how experienced and powerful (in terms of the properties of the game world) she is. Normally PCs start at level 1 or 0. In many games there is a limit on how many levels a character can gain. This limit is often called ‘level-cap’.

In the current design of PI there are 30 levels, which I consider enough for the play-testing of the prototype. Gaining levels in PI give PCs:

1. an increase of maximum amount of mental energy (at each level);
2. an increase of maximum amount of mental resistance (at each level);
3. the possibility of learning new spells (at specified levels);

4. the possibility of learning new AAs (at specified levels).

The levels where players are introduced to new AAs and spells are summarised in Section 7.7.5 and specified in detail in Appendix B.1.

7.3.9 Entity Types

In PI there are entities of four types; Playable Characters (PCs), Non-Playable Characters (NPCs), Single Sentiment Manifestations (SSMs), and Compound Manifestations (CMs). The role of the NPCs is to provide information and challenges to the players. This is done via dialogue. SSMs and CMs are entities which can cast benevolent or harmful spells on PCs. CMs can also perform AAs. The entities in PI are or instantiated in the VGW in different ways. PCs are created by players, and instantiated whenever a player logs on to the VGW with her PC. NPCs are created by the world developers, and are in the VGW permanently. SSMs are also created by the game developers, but most of them are born as results of emotion nodes of other entities (PCs, NPCs and CMs) reaching their maximum value. As such, they are manifestations of the state of mind of the inhabitants of the world. For example, if a PC ‘feels’ a Joy intensely the SSM Joy Jumbo is instantiated in proximity to the PC. An example involving an ‘amusing’ action that potentially can give birth to an SSM is illustrated in Figure 7.9 in the following Section.

CMs can be created by the developers of the VGW, but also by players. The players can author a CM if their PC is affected by a sentiment curse or blessing, giving it a strong sentiment. Players can externalise the sentiment of their PCs by creating CMs representing it, as such manifesting emotions of the PC, authored by players. CMs become part of the VGW as threats or helpers to its inhabitants, in

ways that can call for collective action taken by the PCs.

Entities in PI have different abilities as specified in Table 7.7. All types of entities can cast Mind Magic Spells, but only PCs, NPCs and CMs can perform AAs. NPCs may communicate with PCs via pre-written dialogue, while CMs and SSMs exclaim lines of dialogue which are shown as speech bubbles in the PI client.

Table 7.7: Entity types and abilities in PI.

Expressive Agent Ability	PC Playable Character	NPC Non-Playable Character	CM Compound Manifestation	SSM Single-Sentiment Manifestation
MMS Mind Magic Spell	✓	✓	✓	✓
AA Affective Action	✓	✓	✓	
Dialogue		✓		
Exclamations			✓	✓

7.3.10 Display of Mind Module Information

In PI players can open a window displaying mind module (MM) information of their PCs by clicking the button which has a blue symbol of a human head shown Figure 7.8 in the top left part of the picture. The window displaying MM information is transparent, overlaid on the landscape shown in the PI client. In the screen from PI shown in Figure 7.8 the MM information of the PC Emil is displayed.

In the top left column the values of Emil's personality trait nodes are displayed. In order to see the whole list it is necessary to scroll down in the list using the grey

marker to the right of the column.

In the bottom left column a list of sentiments are shown, where first the entity that the sentiment is directed toward is named, and then the emotion of the sentiment. The numerical value to the right of the text shows the strength of the emotion. Emil has a sentiment of Belonging toward Neurotica, and in proximity of her the value of his emotion node Belonging increases.²



Figure 7.8: Display of Mind Module information in the PI client

In the middle column the values of Emil’s emotion nodes are displayed. The pink high-lighted dot next to the emotion Distress/Anguish signals that it is clickable. If Emil’s player hovers the mouse over the dot the text ‘Dull Pain’ is displayed. This is

²In PI the effect scales by proximity — the nearer the object, the stronger the effect. The effect increases with 0.1 multiplied with the relative distance to the sentiment object per second.

Emil's first personality based emotion spell. If the player clicks the dot the spell is cast on a targeted entity, reducing Distress in that target.

The column to the top right shows Emil's mood, displaying the value of the inner and outer mood nodes as well as the mood co-ordinate system. The white dot in the mood co-ordinate system shows which mood space Emil currently is in; Jubilant. The green dots in the right of the mood co-ordinate system are clickable spells of the type Resistance Aid, available when Emil is in the jubilant mood space (this is described further in Section 7.6.4).

In the column to the lower right effects of recent actions are displayed. Emil has performed the AA Squeeze hand on the PC Neurotica, who has performed the same AA on him. The number to the right tells for how long the effect of the action persists. At the time when the screen was taken the effect of the Squeeze hand Emil performed on Neurotica will be active for a few more seconds. ³

7.3.11 An Example Event and Possible Consequences

Sentiments for characters in WoM are generally instantiated results of their actions, both of those performed by themselves and of actions performed by others with themselves as targets. In the current implementation sentiments are instantiated when an emotion node reaches a threshold value, in most cases set as 90 percent of its maximum. Figure 7.9 is an illustration of how either a spell or an AA causing amusement is interpreted by the MM. The values on the arrows between the nodes are weights.

³The value of the remaining AA is the remaining strength. An AA begins with the strength 1, and decrease once per second with the decrease value specified for the AA.

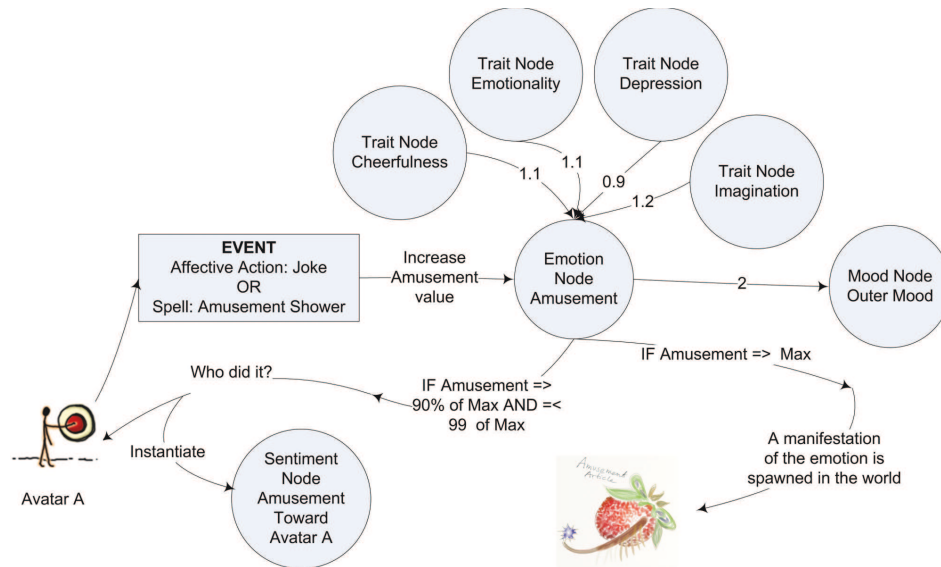


Figure 7.9: An example of how an amusing action is interpreted by the MM

Suppose that the PC A in Figure 7.9 performs the AA Joke on PC B, and that B selects to laugh as a reciprocal AA. (If a CM was supposed as the target of A she could have chosen to cast the spell Amusement Shower.) The increase of the emotion node amusement of B is calculated by the MM using the values of B's trait nodes Cheerfulness, Emotionality, Depression and Imagination. When the value of B's emotion node is calculated the value of B's outer mood node is updated.

If the value of B's emotion node exceeds 90 percent of its maximum value a sentiment of amusement toward A is created. This means that when A is in proximity of B the value of B's emotion node amusement will increase slightly. Metaphorically B senses an emotional memory of amusement.

If the value of B's emotion node exceeds the maximum value of the node an SSM is born, an Amusement Article. The Amusement Article casts the spell Amusement Shower on any PC who happens to pass by. Metaphorically, B is so amused that he

cannot keep the emotion to himself anymore, it ‘goes out of bounds’ and manifests in the VGW. When the SSM is born, B’s emotion node Amusement is set to its mid value.

7.4 Back-story of the Pataphysic Institute

At the Pataphysic Institute no conflicts surfaced. Bullies were left to bully. No one dared confront them out of fear of becoming a target. Victims learned to keep quiet. Because of the lack of vents for expressing emotions the behaviour of the staff got stuck in vicious circles of passive aggression. Boundaries were twisted, roles deformed, and responsibilities abandoned. Conflicting rule sets were propagated. Victims became perpetrators.

In the minds of the staff, paranoia became the normal state. Each person developed a different interpretation of the situation ‘real’ in order to function. A lot of energy was spent on maintaining mental pictures and projections supporting individual world views. These also served to justify actions that in other contexts would be defined as crimes.

This situation was maintained for many years.

The first death at PI that was impossible to classify as an accident at PI caused the central committee to instigate an inquiry. The Lead Investigator sent three psychologists under oath of professional secrecy to interview the staff. The report was presented in the main conference room. As point by point was projected in the PowerPoint presentation the mental pictures of each person were challenged. In order to protect the pictures, their personal versions of reality, the audience individually strengthened their mental pictures.

Point by point the results of the investigation were rejected. Not a single person on the staff let the facts of the situation alter their interpretation of the situation.

The Lead Investigator, not succeeding in reaching her audience, grew desperate. On an impulse, she suddenly pulled up a photograph of the deceased from the police investigation on the projection screen. In that moment, when the collected staff was confronted with the brutal evidence of the suicide, the membrane between reality as we know it and the projections of mind was ripped apart.

The Lead Investigator fled. In the confidential report she filed she speculated:

In that moment, it was as if they collectively chose to reject reality, and that reality in response shunned them. Or maybe the manifestations became too strong. This event is unprecedented. Irrespective of the reason for this sequence of events the consequence for the staff of the Pataphysic Institute is they can continue to avoid understanding the consequences of their actions and in actions. On a personal note, I think they made a devils bargain. They sentenced themselves to live with the manifestations and projections from their own minds. If just one of them had reached out for the other, dared to trust, maybe this would not have happened.

The emergency response group sent from the central committee sealed off the building and established channels to continuously provide the remaining staff at PI with food and other necessary supplies. The first field agents returning from a reconnaissance mission reported:

As we entered the facilities of PI we encountered several unexpected phenomena. The man known as Karl Sundgren had gone through a most peculiar transformation and acted as some kind of gate keeper. He only

let us in if he got to run his personality tests on us. He used to be head of the Human Resource Department and claimed ‘it was for our own good’. Karl was, despite the obvious trauma and his transformation, a valuable informant. As he expressed it, when inside PI it is as if all that was inside our minds are suddenly on the outside. There is a system for how to use the mind that needs to be investigated further [...] We recommend that colleagues venturing into the facilities take the utmost caution. Depending on what you bring in and how you act PI can be either your personal purgatory or your personal paradise. We also recommend colleagues to be prepared to help each other — the expression ‘No man is an island’ has never been more true.

The board of the central committee encouraged the former Lead Investigator to draft a confidential policy document regarding the situation at PI. She wrote, late in the night:

It falls under both the jurisdiction and responsibility of the Central Committee (CC) to investigate the situation at the Pataphysic Institute (PI). Opportunities include investigating the ‘Mind System’ and gaining an understanding of a possible solution to the situation. It is advisable to use investigators of various backgrounds in order to gain a multitude of nuanced perspectives. The first objective of the investigation is to determine whether the ‘Outbreak’ is only dangerous. It cannot be ruled out that we could learn about potentially beneficial [...]

Then she stopped writing, thinking: ‘I want to see those manifestations again’. She glanced at her archive, which contained the transcribed interviews of the staff of PI.

‘And those people need help. But I can’t do it alone.’

7.4.1 Introducing the Back-story to Players

Players are introduced to the back-story of PI at the log-in page of the game through excerpts of Katherine’s diary. Katherine recounts of her encounters with the staff at PI and speculates about the Outbreak. The story is presented to players in three parts so that players can choose to read only parts of it. Figure 7.10 shows the web page where players can log in to PI. The full text of the back-story is available in Appendix B.5.

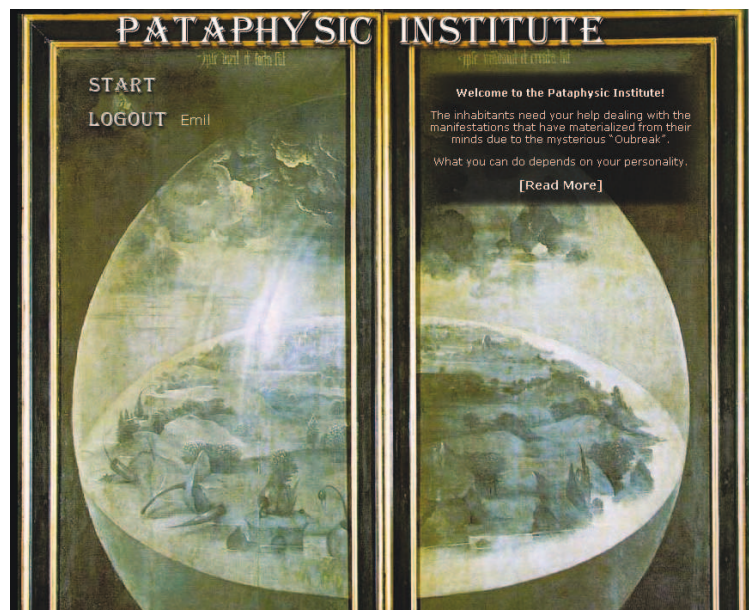


Figure 7.10: PI Login Page

7.4.2 Non-Playable Characters

Two NPCs are present in the PI prototype, Karl Sundgren, the former head of human resources (HR) at PI, and Teresa, a former PhD student at the institute. Their roles

are partly functional; Karl provides information about Mind Magic Spells and Teresa about AAs.

Karl Sundgren - the Gate Keeper

Karl Sundgren saw the situation that preceded the Outbreak in his role as head of the HR Department. He was afraid to handle the situation, but only after the outbreak has he confessed this to himself. Karl had fled into the secure world of spreadsheets, filling his time by cataloguing. The main part of his communication with others had the purpose of gathering data for more spread-sheets and reminding others to provide more material.

Karl blames himself for not handling the situation that led to the Outbreak. He tells himself that as head of HR the group dynamics was his responsibility. Karl sees the Outbreak as *his* punishment. He believes that if he can have all manifestations eliminated, the membrane between the physical and mental worlds will close again and things will go back to normal.

Karl becomes the Gate Keeper. His aim is to educate everyone who can help so that they most efficiently can rid the PI of the manifestations, good ones as well as bad ones.

Teresa

Before the Outbreak Teresa was working on her thesis titled 'The Pataphysic Frontier'. Teresa does not agree with the Gate Keeper's belief that 'all will be well' once the manifestations are eliminated. She has not formulated any counter theory, but she has been studying how social acts seem to be organised into patterns. She is sketching

a tentative framework for the rules, based on experience, of what she calls affective actions. Teresa hopes that a systematic use of affective actions can be key to coping with the Outbreak.

Teresa's and Karl's Mind Modules

Teresa and Karl have a reciprocal relation of friendship which renders them a permanent sentiment of belonging toward each other. Teresa is likely to have many short-term sentiments toward PCs because she is introducing them to performing AAs, offering herself as a guinea pig. Teresa's personality is quite neurotic and she is very open to experience. She is not very extrovert or agreeable. Karl on the other hand is very extrovert and quite conscientious, but not very open to experience. Just as Teresa, he is not very agreeable. Karl's and Teresa's personality trait node values can be found in Appendix B.3.

7.4.3 Dialogue

Much of the back story of PI and the characters of Karl and Teresa is revealed via dialogue. Dialogue is also the main tool used to present the players with the game mechanics. The dialogue system is described in Appendix B.8. In Appendix B.6 the dialogue for the PI prototype is available for reading. The codes for the dialogues below notifies by letter who utters the dialogue and the number in what order. The notifier GK 1-3 means that the dialogue line is given by the Gate Keeper (Karl) in the first conversation, and that it is the third line of dialogue of the conversation.

Figure 7.11 shows a screen from PI where the PC Emil engages in dialogue with Karl. In the left of the figure the latest dialogue line, GK 1-7 is displayed. The

preceding dialogue lines, GK 1-5 and GK 1-6 are displayed to the right in the screen.

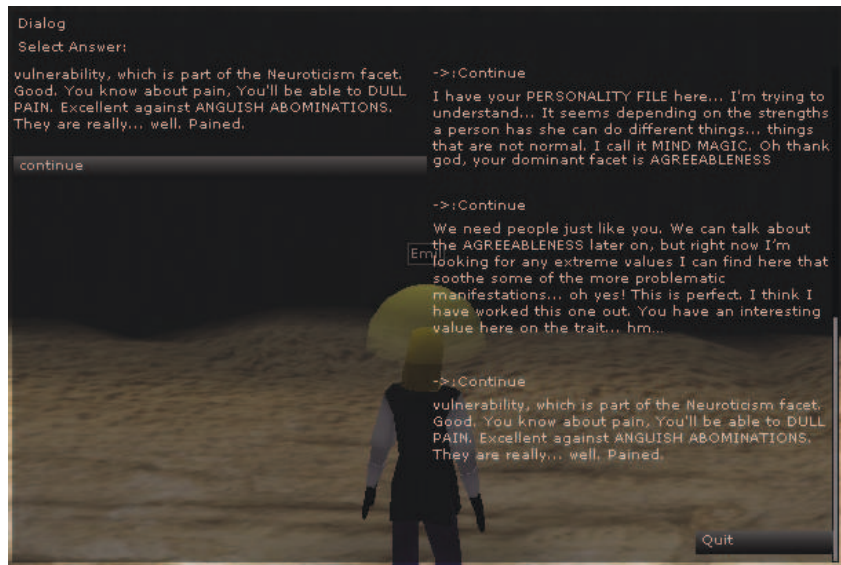


Figure 7.11: Screen of dialogue in PI when Karl tells the PC Emil that he can Dull Pain.

Notebooks

The information provided by Teresa and Karl, and more in-depth information about for example personality traits are provided to players through notebook objects adjacent to the NPCs in the geography. The purpose of these objects is to let the player browse information at any time. The text in Karl's notebook is available in Appendix B.7.

7.5 Formalised Social Relationships

In PI formalised social relationships between PCs are formed in the following ways:

- as a result of interaction and a mutual definition of the relationship between two PCs;

- as side-effects when ‘related’ PCs form relationships (i.e becoming part of the same Department);
- as a result of authoring in the world.

7.5.1 Friends

In PI friendships gives the characters the feeling of belonging, more energy, and increase their resistance to mental threats as well as their energy.

Maximum number of friends

The maximum amount of friends a character can have depend on her personality:

Maximum amount of friends = (friendliness/20) + (cheerfulness/20) + (cooperation/20) + (adventurousness/20) - (vulnerability/20).

Figure 7.12 shows two screens of friend lists in PI. The left the PC Emil’s friend list is displayed. His dominant personality facet is agreeableness, and he can have 8 friends at most. The friend list of the PC Neurotica is displayed to the right: her dominant facet is neuroticism, and she is not very extroverted, giving her the possibility of having 3 friends at the most.



Figure 7.12: To the left: The PC Emil's friend list. To the right: The PC Neurotica's friend list.

Forming a Friendship

A friendship can be formed between two PCs if they have performed positive AAs on each other and if they have positive sentiments toward each other.

The prerequisites for forming a friendship are as follows:

- number of positive AAs targeting each other $\Rightarrow 20$;
- number of positive sentiments toward each other > 1 .

If these conditions are fulfilled, PCs may ask each other to be friends. Any party can end the friendship at any point.

Permanent Friendship Effect

In PI each friendship gives PCs a *permanent friendship effect*. Each friendship increases the maximum amount MR and ME as follows:

$$\text{Permanent friendship effect} = 10/\text{maximum amount of friends.}$$

The highest total permanent friendship effect is 10 percent of the (un-friended) maximum MR and ME. The total permanent friendship effect amounts to the same amount for all characters irrespectively of how many friends they are allowed to have.

Proximity Friendship Effect

The *proximity friendship effect* is a sentiment which increase value of the emotion node Belonging. An increase of Belonging increase the values of the inner and outer mood nodes, and thus also increase the regeneration rate of MR and ME.

The proximity friendship effect scales by proximity — the nearer the object, the stronger the effect. The effect increases with 0.1 multiplied with the relative distance to the sentiment object per second.

Figure 7.13 shows the PC Emil's Mind window when he is in proximity of his friend Neurotica. In the bottom of the mind window she is listed as a sentiment object of the emotion Belonging. In Emil's emotion list Belonging has increased to 56 from 50 in her proximity.



Figure 7.13: The mind window of the PC Emil in PI when he is standing next to his friend Neurotica, which gives him a proximity effect of Belonging.

Long Friendship Effect

The *long friendship effect* increase the proximity friendship effect. For each month the friendship bond is intact the proximity friendship effect increases with 0.5 percent to a total maximum amount of 20 percent.

The Special Friend

If a PC has five or more friends she can form a special-friend bond with one of them, given that the other also has five or more friends already. If the maximum amount of friends a PC can have is less than five, the maximum amount of friends is sufficient to form a special-friend bond.

The *special friend effect* increases the maximum MR and ME by 5 percent. In proximity of the special friend the special friend effect increase the current value of the emotion node Belonging of a PC with 20 percent of its maximum value. This

value increases with 0.5 percent per month to a total maximum amount of 30 percent.

7.5.2 Protectors, Protégés and Departments

Protectors and Protégés

The role of the Protector is to help the Protégé. As a reward the Protector receives a percentage of the experience points the protégé earns.

The gain of the protector-protégé relationship is that experienced players get an incitement to help new players to get started in the world.

This relationship opens up the activation of the emotion node Pride (of another's achievement). No prerequisites are needed for forming the protector-protégé relationship. A character can have two protectors and two protégés.

Protégé Effect

The *protégé effect* gives the protector 10 percent of the Protégés XP and an increase of the value in the emotion node Pride. The protector receives the XP and the value of the pride node is set to its maximum amount when the Protégé gains a level. The XP is not taken from the protégé, the sum is calculated on the amount of XP the character has gained during the level. The emotion node Pride is have a positive weighting to both the inner and the outer mood nodes.

Permanent groupings - Departments

The networks of protectors and protégés are what constitute a permanent grouping or guild — in PI these are called Departments. Because characters can have two protectors they can belong to two departments.

If character A, who leads a department of seven characters, became the protector of B, who leads a department of nine characters, A would become the leader of a department of sixteen characters. This is illustrated in Figure 7.14 where the circles with letters in them represent PCs. The lines between the circles represent protector-protégé relationships, where the protectors are higher up in the figure than the protégés.

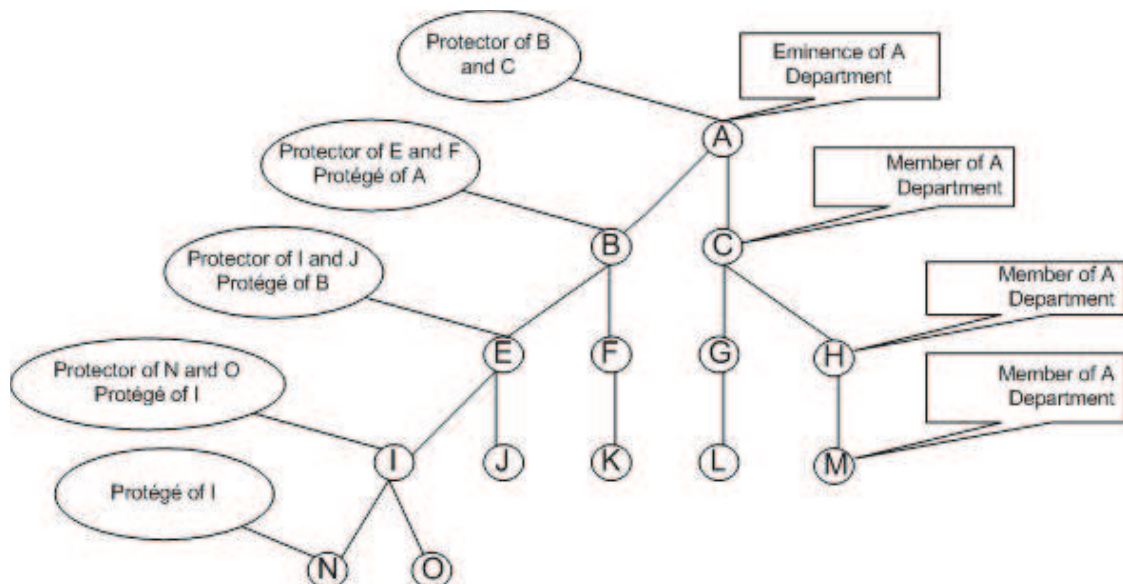


Figure 7.14: Protectors, Protégés and Departments.

Department Proximity Effect

If a PC who is member of a department is in proximity of another member of the same department she gains the *department proximity effect*. The value in the emotion node Belonging is increased with 1 percent of its maximum value. The effect applies to each department member in proximity, and would thus be strong at a big department meeting.

7.5.3 Acquaintances

Acquaintances are listed in a simple list where a player can add PCs and a short memory note. The acquaintance role has no bearing on the game mechanics — it is only intended as a practical feature for the player to list people she has met.

7.5.4 Authored relationships

Authored relationships are sets of sentiments set between PCs. Specific sets of sentiments can be defined, as well as possibilities of how and by whom they can be set. These relationships can be created by game masters by scripting in advance of, or during, guided play-test sessions.

7.5.5 Design Notes about Social Relationship Features

The system of protector and protégés (under other names) was successfully used in *Asheron's Call* (Turbine Entertainment Software, 1999) and *Asheron's Call 2* (Turbine Entertainment Software & Microsoft Game Studios, 2002), though each character could only belong to one permanent grouping. A similar system was implemented in *A Tale in the Desert* (eGenesis, 2003).

The feature of the two possible departments a character can belong to is modelled after real-world circumstances where people can find themselves in loyalty conflicts between different groupings they may belong to. A possible similar situation in real life is that of conflicts between families where an individual belonging to two families (mother's side and father's side) needs to make a difficult choice.

The feature of the Special Friend is modelled after real life strong relationships such as partnerships. It is not uncommon in VGWs that strong relationships evolve

as part of characters' lives. This feature is an attempt to accommodate this into the game mechanics. Formation, maintenance and ending of Special Friend relationships can potentially be dramatic in the sense that actions affecting the relationship may be sources of strong feelings for the player.

7.6 Mind Magic Spells

7.6.1 Spell Types

There are five main types of mind magic spells as listed below, differentiated by what properties are affected in the target of the spell.

- *Emotion spells* diminish or increase the value of an emotion node of the target. Emotion spell cost ME to cast. These can be of the type *Area of Effect* (AOE), which means that they affect all entities in proximity of the caster. If an AOE is used it is not necessary to target another entity.
- *Mind Resistance and Mind Energy Spells* (MR-ME spells) causes a direct decrease or increase of either ME or MR of the target. These can be of the type AOE.
- *Sentiment spells* instantiate a sentiment in the target.
- *Personality alteration spells* temporarily changes the value of a trait node of the target.
- *Sentiment set spells* instantiate several sentiments, a sentiment set, in the target.

Spells are learned successively during play. Emotion spells and MR-ME spells can be used by PCs, manifestations and NPCs, but using these PCs cannot cast destructive spells on other PCs. Sentiment set spells and personality alteration spells are not included as features in PI but can be used by game masters leading guided play tests by scripting in run time. Sentiment spells are further described in Section 7.9.4 since the spells ‘Sentiment Blessing’ and ‘Sentiment Curse’ are tied to the creation of compound manifestations.

7.6.2 Emotion Spells

Emotion spells increase or decrease the value of an emotion node of the targeted entity.

Table 7.15: Spells affecting the values of emotion nodes in targets.

Emotion	Spell increasing emotion	Spell decreasing Emotion
Amusement	Burst of Wittiness	Blotch of Boredom
Interest	Toss Secretive Glossy Parcels	Drabby Humdrum
Joy	Cheer Contagion	Woe
Relief	Threads of Salvation	Problematization
Satisfaction	Cloud of Complacency	Greed Golps
Surprise	Sudden Blipp! Astonishers	Blotch of Same-Bores
Confusion	Trumpet Irrelevant Questions	Laser Pen of Clarity
Anguish	Song of Pain	Dull Pain
Fear	Cold Ripple of Fear	Hold Hand
Anger	Primal fury	Cooling Cloth
Shame	Veil of Humiliation	Spine of Confidence
Sadness	Wet net of Tears	Accommodate Sorrow
Guilt	True-sounding accusation	Forgive

The emotion spells available in PI are listed in Table 7.15 where the column to the

left specifies the emotion that the spells in the middle and right columns affect.

7.6.3 Mind Energy and Mind Resistance Spells

PCs can use MR-ME spells to give MR and ME to other entities, and reduce MR and ME of their opponents. What MR-ME spells they can use depend on their mood. These availability of these spells is granted to all characters when they start playing. The spells are listed in Table 7.16.

Table 7.16: spells affecting mind energy or mind resistance of target.

Spell effect strength	Give MR to other	Reduce MR of other	Give ME to other	Drain MR from other*	Drain ME from other**
Low	Minor unfocussed resistance aid	Minor unfocussed aggression	Minor unfocussed energy rush	Minor unfocussed resistance drain	Minor unfocussed energy drain
Medium	Unfocused resistance aid	Unfocused aggression	Unfocused energy rush	Unfocused resistance drain	Unfocused energy drain
High	Focused resistance aid	Focused aggression	Focused energy rush	Focused resistance drain	Focused energy drain
Very High	Grand focused resistance aid	Grand focused aggression	Grand focused energy rush	Grand focused resistance drain	Grand focused energy drain

* Fifty percent of the efficiency compared to the other spells in this category. MR is taken from target and given to self.

** ME is taken from target and given to self.

7.6.4 Mood Requirement for Casting Spells

The MR-ME spells that a character varies with the mood of the caster. The aim with the design is to have the actions mirror the caster's mood.

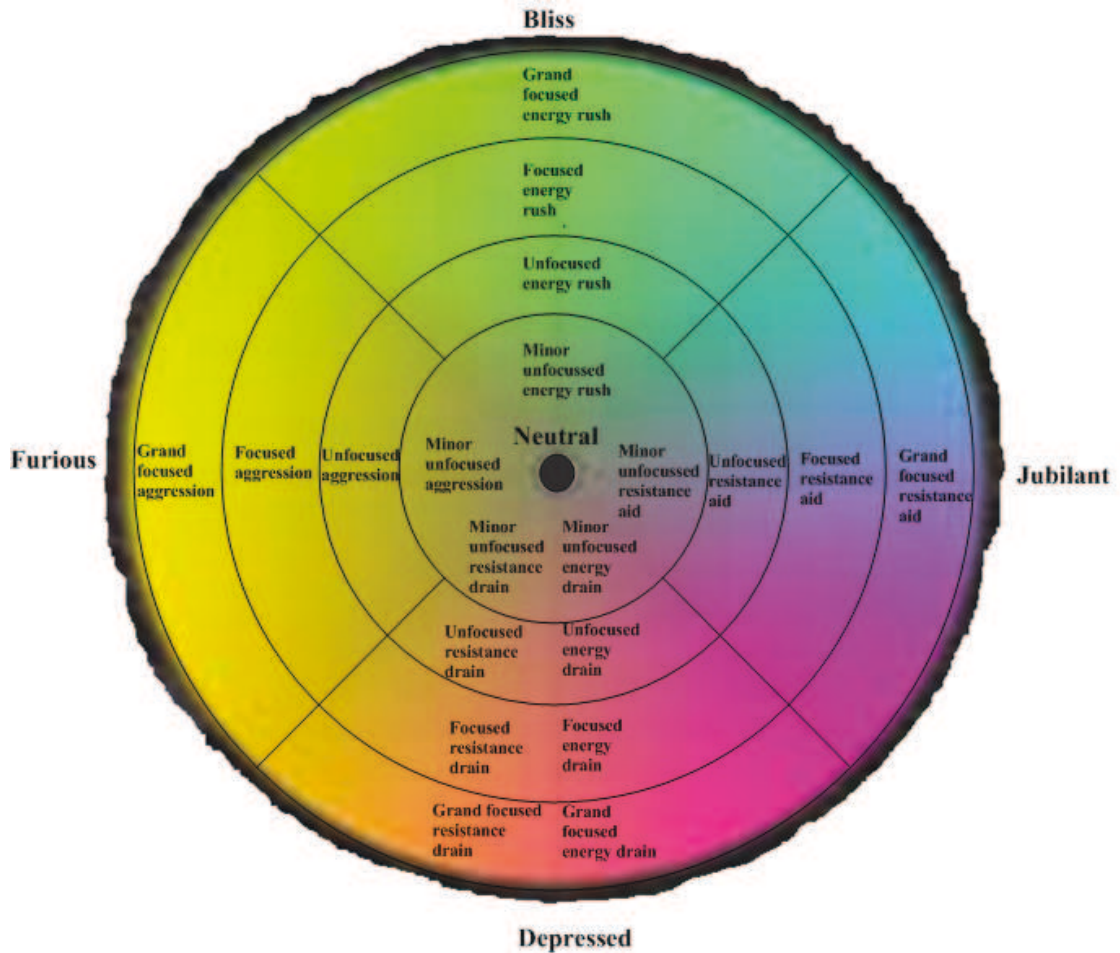


Figure 7.17: mood spaces in the mood co-ordinate system governing availability of MR-ME spells.

The mood co-ordinate system is divided into 13 spaces, as shown in Figure 7.17 where each mood space is associated to MR-ME spell(s). When characters are in neutral mood space they have access to all types of MR-ME spell, but only the weakest varieties. The more extreme the mood is, that is that either the inner or outer mood node dominates either towards a positive or a negative value, the more powerful MR-ME spells become available, but simultaneously the range of MR-ME spell types gets

more narrow. For example, a character in a furious mood can cast strong aggressive spells but no benevolent ones, while a character in a blissful mood can cast strong beneficial ones, but no harmful spells.

Figure 7.18 shows the MR-ME spells available when casters are in a neutral mood. In this mood the full functional range of both giving and taking MR and ME to and from others is available, but only in the weakest varieties of the spells.

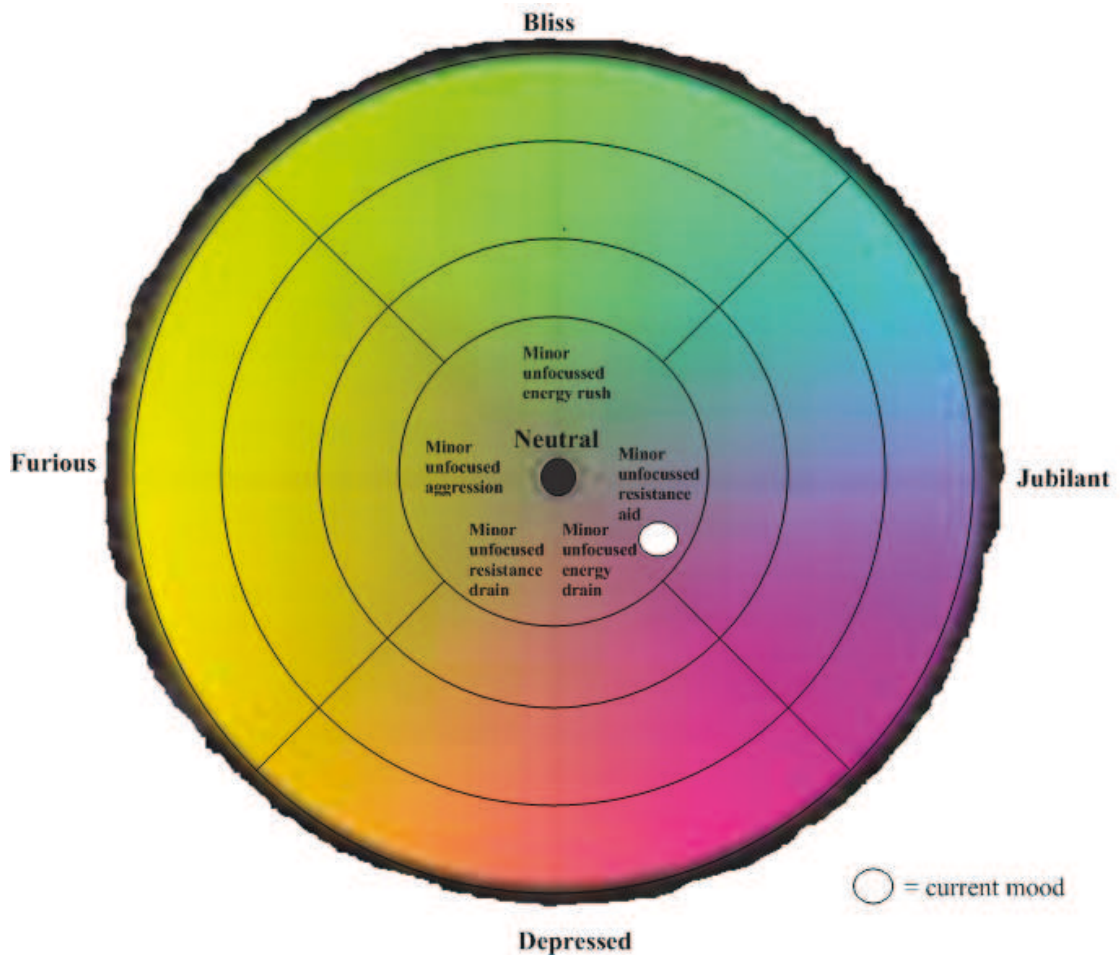


Figure 7.18: MR-ME spells that are available when the caster is in neutral mood. In the figure, text in the neutral mood-space signifies that the spell is available for use.

Figure 7.19 shows the available spells in three moods. In the circle to the left the mood is glad. In this mood the caster can cast the full range of the weakest spells, and all spells of the second weakest type except Unfocused Aggression. The middle circle of Figure 7.19 shows a Cheerful mood, that is, a mood that has a higher value in the outer mood node than the previous mood mentioned. In this mood the caster can, besides the spells available in the cheerful mood, also cast Focused Resistance Aid. In the right circle of Figure 7.19 a Jubilant mood is shown. In this extreme mood the caster can only cast spells of the type that gives resistance to the targets of the spell, but has access to the most powerful of the type, Grand Focused Resistance Aid.

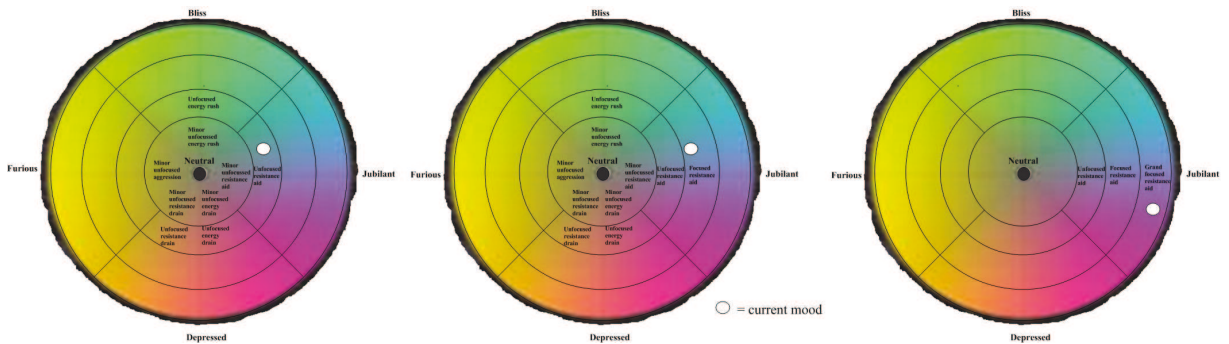


Figure 7.19: availability of MR-ME spells vary with mood. From the left: Glad mood, Cheerful mood and Jubilant mood. The text in mood-spaces is the same as in Figure 7.17.

The mood spaces along the lower part of the inner mood axis where a character is in a gloomy, sad or depressed mood are associated with two types of spell, Energy Drain and Resistance Drain while the other mood spaces only have one type of spell associated with them. The reason for this is that characters whose mood are the in gloomy, sad and depressed mood spaces regenerate MR and ME very slowly. The regeneration rates of MR and ME are, as illustrated in Figure 7.2 are tied to the values

of the mood nodes. Characters in Furious moods for example regenerate energy very quickly. Characters in a Depressed mood need to act as ‘energy vampires’, to use a popular expression, and can therefore be helpful in groups that set forth to vanquish powerful manifestations since they, though fragile, can harm both the foe’s pool of energy and resistance. Characters in a Harmonic mood regenerates mind resistance quickly, and can share this with their friends, while if they are in Jubilant mood and quickly regenerates energy, they can share this instead.

7.6.5 Personality-based Area of Effect Spells that Affect Mental Energy and Resistance

When PCs reach level eight they learn a special personality based MR-ME Spell with is of the type AOE. (This means that no targeting is necessary and that all entities in proximity are affected by the spell.) This spell can be used independent of mood.

Table 7.20: MR-ME area of effect spells.

MR-MS Area Of Effect Spell	Trait prerequisites based on values of the trait nodes activity and altruism	Effect on expressive agents in proximity and on self	Effect on Self
Alacrity Alarm	Lowest difference value is towards maximum activity level	Increase of ME	Small decrease of ME
Damp Dough of Catatonia	Lowest difference value is towards minimum activity level	Decrease of ME	Small decrease of ME
All Out Resistance	Lowest difference value is towards maximum altruism	Increase of MR	Small decrease of ME
All Out Aggression	Lowest difference value is towards minimum altruism	Decrease MR	Small decrease of ME

Which spell characters learn depend on their traits nodes Altruism and Activity Level. The number that defines what spell to get is calculated on which of the difference between the actual value of a trait and its difference to the traits maximum and minimum value. The lowest difference-value decides which spell is given. The number of possible spells is limited to four. These are listed in Table 7.20

7.7 Affective Actions

A player can perform an AA towards another character in order to change that character's mental state in both positive and negative ways. Players can affect each other's moods by using AAs, thus controlling the selection of spells available. AAs are actively chosen by the players, they are not effects of other social actions. If players target another avatar they can choose from a selection of AAs. For example, the AA Comfort can be used successfully on targets that have an active emotion node of Sadness, but only if the player's own avatar is not in the area of Furious on the mood co-ordinate system. If the AA Comfort is used successfully the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character. An example of an AA is *Flaunt Big Secret* which increases the value of the Interest emotion node in the targeted entity (where the value depend on the personality traits of the target).

7.7.1 Prerequisites and Success Criteria

Some affective actions can be performed at any time and at any target. Others can only be performed as response to other AAs, such as *Laugh at Joke*. However, there

may be prerequisites whether the action has an effect, depending on the mood of the target. These can also be called the success criteria for the AAs. For example, a character in a depressed mood cannot respond with the AA Laugh at Joke. The success criteria can also depend on the relationship. *Praise* for example will give an increase the emotion Pride to a target that is a protégé, but not affect others. Figure 7.21 shows the interface in PI for using AAs. The screen capture shows the PC Emil who has targeted the PC Neurotica and performed the AA Calm Down. The system says (in the bottom left of the picture) that this is unsuccessful, since Neurotica's Outer Mood is higher than -5, something which the colour of her aura signals.



Figure 7.21: The PC Emil unsuccessfully performs the AA Calm Down on the PC Neurotica.

Figure 7.8 in Section 7.3.10 shows a screen from PI with the PC Emil's mind window is displayed. The text in the lower right part of the window reports that Emil successfully has performed the AA Squeeze Hand on his friend Neurotica, who has performed

the same AA on him. This has increased the value of the emotion Belonging, visible in the list in the middle of the mind window.

Possible prerequisites and success criteria for AAs are the following:

- mood and emotions of target (success criteria);
- mood and emotions of performer (prerequisite for performance);
- relationship to target (success criterion);
- other AA (other action as prerequisite).

When a PC's mood is either the prerequisite for performance or the target's mood is the success criteria for the performed action, a selection of nine spaces in the mood co-ordinate system is used as illustrated in Figure 7.22.

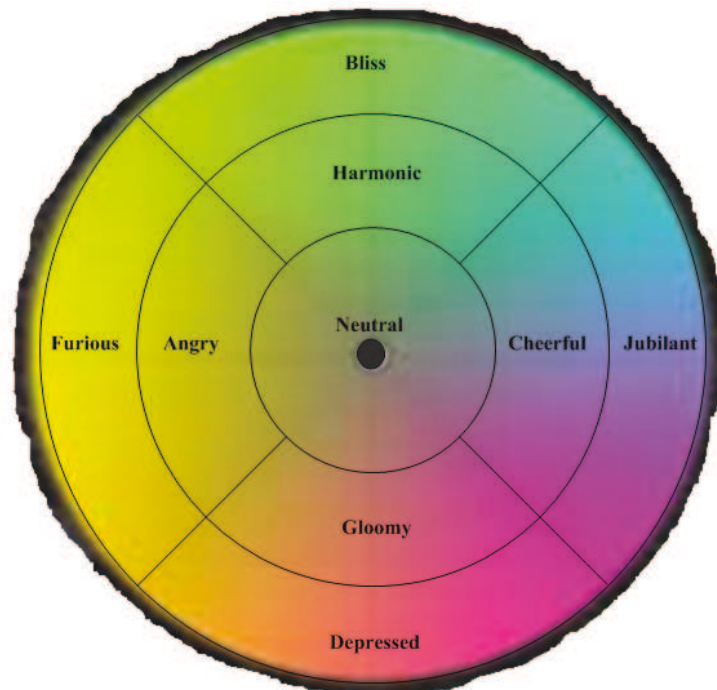


Figure 7.22: Spaces in the mood co-ordinate system used by the AA system.

7.7.2 Design and Test Process of the Affective Actions Feature

The AA feature is the feature that has undergone the largest numbers of iterations. The feature was worked out on a conceptual level in 2005 as part of the GED prototype described in Section 6.2. A small paper prototype play-test, described in Section 6.2.3, with participants of different backgrounds in terms role-playing game-playing experience was performed the same year. This test confirmed that the AA feature was worthwhile developing further. A second iteration of the design was pondered upon in relation to a potential project involving natural language processing, described in Brusk and Eladhari (2006). A second paper prototype play-test of the AA feature was conducted in 2008 for the WoM prototype which is further described in Chapter 8. In this second test the participants used AAs in combination with Mind Magic Spells, and were presented to sets of AAs in steps in order to make the feature more accessible and not overwhelm the participants with too many AAs. At each step the participants were asked whether they missed any AAs. The results of this test was the basis for the next iteration of the AA feature. A small functional test was conducted by three persons working with the development of the digital PI prototype. This functional test was partly done in order to find which AAs had effects that duplicated each other so that they could be considered for removal from the system. Another aim with the test was to refine the order in which players learn AAs and to make sure that at each step contained AAs affecting the mood co-ordinate system in all four directions of the mood node axes.

7.7.3 Specific Affective Actions

Table 7.23: Affective Actions

Affective Action	Effect on target	Effect on self	Success criterion	Prerequisite for performance	Decay rate
Agree enthusiastically	Joy 0.6 interest 0.2			Self not in furious or depressed mood Any AA (I.e, character has something to agree with)	Norm value
Misunderstand on purpose	Distress,0.2 confusion 0.1			Self not in blissful or jubilant mood	Norm value
Joke with someone	Effect depends on response		Target not in furious or depressed mood.	Self not in furious or depressed mood	Norm value
Refuse to laugh at joke	Distress 0.4 sadness 0.2			Joke with someone cast on self Self not in jubilant mood	Norm value
Laugh at joke	joy 0.4 satisfaction 0.2	amusement 0.7		AA.Joke with someone Self not in furious or depressed mood.	Norm value
Comfort	sadness -0.5			PreValT = sad>60 Self not in furious mood	Norm value
Cheer up	amusement 0.5		Target in gloomy or depressed mood	PreValT = i<-20 Self not in furious mood	Norm value
Affirm	joy 0.6 belonging 0.05			Self not in furious mood	Norm value
Threaten	fear 0.3			Self not in blissful or jubilant mood	Norm value
Blame	shame 0.3			Self not in blissful or jubilant mood	Norm value
Insult	anger 0.3 distress 0.2			Self not in blissful or jubilant mood	Norm value
Compliment	joy 0.3 pride 0.1		Target not depressed or furious	Self not in furious mood	Norm value
Interrupt	anger 0.3 distress 0.2			Self not in blissful or jubilant mood	Norm value
Ignore	anger 0.3 distress 0.2 0.1 confusion			Self not in blissful or jubilant mood	Norm value
Be attentive	satisfaction 0.4			Self not in furious mood	Norm value
Make feel guilty	guilt 0.3	satisfaction 0.6		Self not in blissful or jubilant mood	20
Be Martyr	guilt 0.1	satisfaction 0.2		Self not in blissful or jubilant mood	80
Forgive	guilt -0.4			guilt>60 Self not in furious mood	Norm value
Show aversion	distress 0.2 shame 0.2 sadness 0.2			Self not in blissful or jubilant mood	Norm value
Show affection	joy 0.2 satisfaction 0.2			Self not in furious mood	Norm value
Flaunt Big Secret	interest/excitement 0.3	amusement 0.2			Norm value
Reveal Big Secret	satisfaction 0.3 belonging 0.2			Flaunt Big Secret (20)	Norm value
Stunned Silence		-0.1 confusion			Norm value
Small Talk	0.05 interest				Norm value
Thank	0.2 satisfaction			Any positive AA	Norm value
Hug	Depends on reaction		Target not in angry or furious mood	Self not in angry or furious mood	Norm value

Table 7.24: Affective Actions continued

Affective Action	Effect on target	Effect on self	Success criterion	Prerequisite for performance	Decay rate
Be hugged	0.2 satisfaction 0.2 joy -0.2 sadness (if sadness > 0)	0.2 satisfaction 0.2 joy -0.2 sadness (if sadness > 0)	Target not in angry or furious mood	AA: Hug Self not in angry or furious mood	Norm value
Shrink away	0.3 shame 0.3 sadness	0.1 guilt		AA: Hug	Norm value
Look at target with dismay	0.1 sadness 0.1 shame			Self not in jubilant or blissful mood	Norm value
Talk	0.2 interest				Norm value
Agree	0.2 joy 0.1 interest			Self not in furious mood	Norm value
Tell a small secret	0.2 interest 0.1 belonging 0.1 surprise				Norm value
Share a memory	0.3 interest 0.2 belonging				Norm value
Mumble unintelligibly in sulky tone	0.3 confusion			Self not in jubilant or blissful mood	Norm value
Calm down	-0.5 anger		Target in angry or furious mood	Self not in furious mood	Norm value
Let off Steam	0.3 confusion	-0.1 all negative emotions			Norm value
Disagree	0.1 anger				Norm value
Angry discussion about mutual nuisance	-0.2 anger	-0.2 anger			Norm value
Deep Lament	0.3 distress 1.0 confusion (on entities in proximity)	0.3 relief		Must be in depressed mood	Norm value
Radiate Bliss	0.4 satisfaction on entities in proximity			Must be in bliss	Norm value
Exultant Jubilation dance	0.3 joy on entities in proximity			Must be in Jubilation	Norm value
Uncontrolled Wrath	0.1 confusion, 0.2 anger 0.2 Fear on entities in proximity	-0.4 anger		Must be in fury	Norm value
Respect	0.5 pride			Target must be protector of self	Norm value
Praise	0.5 pride			Target must be protégé of self	Norm value
Reproach	0.5 shame			Target must be protégé or protector of self	Norm value
Squeeze hand	0.3 belonging			Target must be a friend.	Norm value
Group Hug	0.8 belonging			3 participants who are friends	Norm value
Funny Walk	0.4 amusement			Target may not be in gloomy, annoyed, depressed or furious mood	Norm value

The design and test process summarised in the previous section resulted in 48 AAs which are learned by players in six steps. In Table 7.23 and 7.24 these AAs are listed along with information about the effect of the AAs on the performer and target as well as success criteria and prerequisites for the performance of the AAs. The colours of the cells in the tables signifies what kind of effect in terms of mood the AA has. Yellow signifies an increase on outer mood, and red a decrease of the same mood node. Light blue signifies that the AA has an effect that increase the value of the inner mood, and darker blue that the value is decreased. Salmon coloured cells signifies that the effect of an AA increases both the values of the inner and the outer mood node, while the colour bordeaux signifies that the values decrease. The categories signified by colour are based on how the emotion nodes affected by the AAs are weighted toward the mood nodes, as illustrated in Figure 5.8.

7.7.4 Design Consideration of Affective Actions Economy

In the WoM play-test (described in Chapter 8) players could use an unlimited amount of AAs. The reason for this was to observe potential patterns for the use of AAs. Many ways of restricting the use of AAs are possible to use, among them the following were considered:

- restrictions based on cost of mental energy;
- limiting the total number of AAs that can be cast by a performer on any target;
- limiting the number of AAs that can be cast on a single target, by a single performer, or by all potential performers;
- limiting the number of each type of AA that can be cast between performers and targets.

The play-test indicated that, in terms of game mechanics, it can be good to be able to use AAs even if the pool of ME is running out. In terms of believability, it might be good to restrict the number of identical AAs possible to use in sequence so that characters are restrained from using AAs of similar types too many times. These considerations resulted in the following restrictions, suggested by Christoph Pech, developer at Pixeltamer:

- each AA is active for a limited amount of time, depending on its specified decay rate;
- characters can receive a maximum amount of eight AAs that are active at the same time;
- characters can only have one of the same type of received AA active at the same time;
- characters can perform a maximum amount of four AAs that are active at the same in a single target.

7.7.5 Learning Affective Actions and Spells

The list below summarises the steps for PCs of learning new abilities as they gain levels. Specific AAs and spells referred to in the list are specified in Appendix B.1.

- Level 0 - The full range of mood based MR-ME Spells, 1 personality based emotion spell and 8 AAs.
- Level 3 - 8 new AAs.
- Level 5 - 1 personality based emotion spell.
- Level 7 - 4 new AAs.
- Level 8 - 2 new personality based emotion spells.
- Level 10 - 2 new personality based emotion spells.
- Level 12 - 6 new AAs

- Level 15 - 2 new emotion spells
- Level 17 - 8 new AAs
- Level 22 - 8 new AAs
- Level 30 - 2 sentiment spells

The PC's learning of new abilities is in two cases triggered by events instead of by gaining a certain level. When a PC for the first time either becomes the protector or the protégé of another PC three new AAs are introduced: Respect, Reproach and Praise. When a PC for the first time forms a reciprocal friendship the AAs Squeeze hand and Group hug become available for use.

7.8 Single-Sentiment Manifestations

Single Sentiment Manifestations (SSMs), are types of manifestation that have their origin in a single emotion. They have a limited amount of mental resistance and energy. If the value of the emotion they represent equals zero they dissolve. The spells an SSM can cast increase the value of 'their' emotion in targeted entity. SSMs are mainly instantiated by scripting at designated points in the geography of the game world (spawn points) or due to emotional threshold values reached in PCs' states of mind. In PI all emotions of the Mind Module except pride, belonging and desire have representations in the form of SSMs.

7.8.1 SSM Properties

SSMs have full mind modules. An SSM is instantiated with its emotion at 99 percent of maximum, and with full MR and ME. Maximum MR and ME are modified for

their level.

The norm value for the emotion is set to 90 percent of its maximum value. This means that a manifestation that is wounded in its emotion will recuperate over time in this respect.

In PI SSMs have their personality trait values set at mid-values. It is possible instead to use customised personality templates. These would need to be set so that manifestations can cast their emotion spell according to the same principle as PCs are assigned spells. It is also possible to assign sentiments to a manifestation that upholds an extreme emotional value instead of setting a norm value of 90 percent of maximum. This is done in the authored CMs, as described in Section 7.9. For example, the SSMs of the type Sail of Sorrow are instantiated with Sadness at 99 percent of maximum, and with full MR and ME. Maximum MR and ME are modified to their level.

SSMs can be instantiated in three ways:

- by scripting of the game world;
- instantiated if a maximum-level of the emotion it represents is reached in a PC, NPC or CM (Its level becomes half of the entity's level who is cause of the instantiation.);
- by a game master using the administration interface of PI in run-time.

SSMs target PCs if they are in proximity. Spells are cast on the targets. Spell to cast are chosen randomly from its limited set of known spells. A Sail of Sorrow for example alters between casting Drain Energy, Aggression and its 'own' emotion spell, Wet Net of Tears, which increase the value of the emotion node sadness in the target.

An SSM dissolves if the emotion it represents or if the MR reaches the value zero. A Sail of Sorrow dissolves if the value of its emotion node sadness is zero, or if the MR is zero. Thus SSMs are especially vulnerable to spells that decreases the value of the emotions they represents. Sails of Sorrows are especially vulnerable to the spell Accommodate Sorrow.

7.8.2 Exclamations

The SSMs of PI exclaim lines of dialogue when their MR, ME and the emotion they represent reach threshold values. The text is shown in the client as speech bubbles. Table 7.25 shows the threshold values of SSMs' emotion nodes that are used for triggering exclamations. The exclamations are specific for each emotion.

Table 7.25: threshold values in SSM emotion nodes that trigger exclamations.

Mental Resistance	Mental Energy	Emotion
0.0% of maximum (when they dissolve)	0.0% of maximum (when they can not cast any spells)	0.0% of maximum (when they dissolve)
10% of maximum	10% of maximum	10% of maximum
30% of maximum	30% of maximum	30% of maximum
60% of maximum	60% of maximum	60% of maximum

All SSMs make the same exclamations when their MR and ME decrease. The threshold values for these exclamations and the dialogue lines displayed in the PI client are specified in Table 7.26.

Table 7.26: threshold values of MR and ME of SSMs and the exclamations triggered.

MR	Dialogue Line	ME	Dialogue Line
0.0% of maximum	I can't resist anymore.	0.0% of maximum	I'm exhausted. I'll just sit here.
10% of maximum	Please! You hurt me!	10% of maximum	I'm so tired! Why are you doing this to me?
30% of maximum	I feel so vulnerable.	30% of maximum	Oh no, you must be one of those energy vampires!
60% of maximum	Think you can wear me down?	60% of maximum	You may be an energy eater, but I can still do things!

7.8.3 Specific SSMs

Thirteen SSMs appear in the PI game world: Amusement Articles, Interest Integrals, Joy Jumbos, Relief Raptors, Satisfaction Shells, Surprise Singletons, Colossuses of Confusion, Anguish Abominations, Terror Trolls, Rage Roughnecks, Shame Shells, Sails of Sorrow and Guilt Ghosts. All these are described in Appendix B.4, but the Sail of Sorrow is described below as an example.

Example: Sail of Sorrow

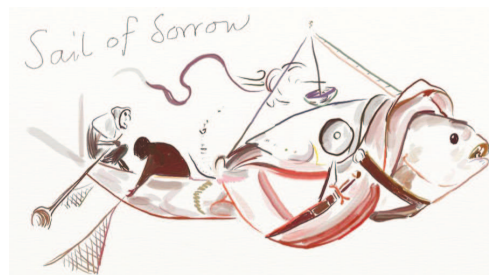


Figure 7.27: Concept art for the SSM



Figure 7.28: The SSM Sail of Sorrow in the PI client.

Table 7.29: Spells that the SSM Sail of Sorrow casts, and a spell it is vulnerable to.

Casts Spell	Effect on target	Effect on self
Wet Net of Tears	Increase of Sadness	Decrease of ME
Aggression	Decrease of MR	Decrease of ME
Drain	Decrease of ME	Decrease of ME

Vulnerable to Spell	Effect on target (i.e., self)
Accommodate Sorrow	Decrease of Sadness

Table 7.30: Exclamations that the SSM Sail of Sorrow makes at certain threshold values of its emotion node Sorrow.

Emotion: Sadness	Exclamation (dialogue line)
0.0% of maximum	Goodbye friend. You taught me to use my sails.
10% of maximum	I can see the color of the world now. The lump in my throat is melting.
30% of maximum	I don't know who I am when the sorrow diminishes. I have been crying for so long.
60% of maximum	You may try, but my sorrow goes too deep. It is impossible to accommodate a world devoid of color.

7.9 Compound Manifestations

Compound Manifestations (CMs) are unique, that is, there is only one of each. CMs are stronger than SSMs in terms of larger maximum amounts of MR and ME and are more versatile in their behaviour, they can cast both spells and AAs. In order to vanquish a CM generally several players need to co-operate. CMs do not engage in dialogue, as NPCs, but they can have custom-written exclamations that are triggered under specified conditions. For example, exclamation-triggering conditions can be threshold values of the MM or PCs entering the perception range of a CM.

7.9.1 Properties

CMs have full mind modules. They generally have strong permanent non-decreasing sentiments. CMs target PCs, SSMs and other CMs if they are in proximity. Spells to cast and AAs to perform are chosen randomly from their known spells. If several targets are in proximity the CM chooses the one that has cast a spell on it. If no one has cast anything targeting the CM, it cycles between the targets, choosing randomly for each spell which target to cast it on. CMs can move over a fairly large area, large in comparison to the movement of the SSMs. CMs spawn SSMs in the same way as NPCs and PCs do (as described in Section 7.3.11). Because of this CMs might end up killing or boosting their own spawns.

CMs are instantiated in ways which differ depending on the role of the person creating them. Firstly, CMs can be created for instantiation by developers who script them as part of the game world. In the scripting the location of the CM is defined, as well as several other properties. Section 7.9.2 provides an example of a scripted, that is, a pre-authored, CM where these properties are described by example.

Secondly, CMs can be instantiated by a game master using the administration interface of the PI client, which include real time world editing tools. This is useful in guided play tests.

Thirdly, CMs can be instantiated by players through an in-game interface. These CMs can be of different types; Manifestation of Curse, Manifestation of Blessing and Free Form Manifestation, which are described in Section 7.9.3 and 7.9.4.

Each CM has a unique name and description, written by the creator of the CM.

Spells that CMs cast can be given unique names, though picked from the standard set of spells when a CM is created. The creators of the CMs can custom-write the exclamations of the CMs.

Player-created CMs and CMs created by game masters dissolve if their MR reaches 0. Scripted, or authored, CMs (such as the Confused Guest Lecturer, described below in Section 7.9.2) do not dissolve, but recuperate.

7.9.2 Example of an Authored Compound Manifestation

An example of an authored CM is The Confused Guest Lecturer (TCGL). TCGL was trapped in a lecture hall at the Outbreak, and being slightly traumatised already he cannot get out. He is in a constant state of confusion, fuelling this feeling by repeating the reasons for his confusion over and over again. His confusion node goes out of bound repeatedly, spawning SSMs of the type Colossus of Confusion.

The strongest personality facet of TCGL is neuroticism, and his second strongest is conscientiousness. His least pronounced facet is openness. He rigidly stays in his confused state, refusing to let go. Even immobilised he keeps mumbling.

When TCGL is approached by PCs it gets even worse, since he feels an obligation to lecture them. Doing this he cannot refrain from blaming them, though he knows this is irrational. He also tries to get them to understand his situation by ‘sharing’ his confusion.

Toward PCs TCGL has sentiments of confusion and shame. These are triggered as the PCs approach, that is, enters TCGLs range of perception. The number of players in proximity multiplies the number of active sentiments. This has the effect that level of difficulty for calming TCGL is adjusted to the number of PCs co-operating.

TCGL is confused because he is not sure whether they are students or not, and ashamed because he knows his lecture probably not is what is expected of him. He falsely claimed to be versed in pataphysics in order to get the lecturing assignment.

If a PC targets the TCGL the following description is shown: ‘This confused guest lecturer is trapped in a jungle of slippery theory.’ TCGL casts spells on PCs in proximity as listed below. The effects on the targets of the spells are noted in parenthesis.

- Problematisation (- relief)
- Drabby Humdrum (- interest)
- Trumpet Irrelevant Question (+ confusion)
- True-sounding accusation (+ guilt)
- Energy Drain, if his mood permits it (- ME)
- Resistance Drain, if his mood permits it (- MR)
- Aggression, if his mood permits it (- MR)

After two spells, TCGL performs an AA. These are listed below. In parenthesis the emotion affected in the target of the AA is specified.

- Misunderstand on purpose (+ distress, + confusion)
- Blame (+ shame)
- Be martyr (+ guilt)
- Look at target with dismay (+ sadness, + humiliation)
- Mumble unintelligibly in sulky way (+ confusion)

When TCGL is in full force, that is when his values of MR, ME and Confusion are greater than 80 percent of maximum, he may utter any of the following exclamations:

‘Yes! I DO propose pataphysical counterpoint to the rational axiology of mathematics!’

‘You there! Elaborate on the mathematics of the Umbrella! Arnaud explained it already in 1955! That was mandatory reading!’

‘You asked me... oh yes. We can indeed use the Pataphysics of Sophrotatos in order to calculate that God is equal to the tangent between nihility and infinity.’

If TCGL is somewhat weakened in his confusion, that is, if the value of his emotion node confusion is lesser than 60 percent and greater than 30 percent of its maximum value, he may exclaim:

‘I must confess! I’m a mathematician! But I DON’T understand the aerodynamics of equations!’

‘Listen closely. You need to trace the spirals of your own cognitive gidouille deriving the reductio ad absurdum of an impossible hypothesis!’

If the MR of TCGL reaches zero he exclaims:

‘I do not want to interact. I must understand the ‘Pataphysic Frontier’.’

If the MR of TCGL reaches zero he does not dissolve. Instead he recuperates. On PCs in his proximity he performs the AA Mumble unintelligibly in sulky way.

7.9.3 Free Form Manifestation of CM

Game masters and players with high-level PCs can instantiate *free form* CMs using an in-game interface. First, they need to name the CM and give it a short description.

Second, they are presented with a drop-down list of spells. These are the existing MR-ME spells and the emotion spells. When the creator has picked a spell they can give it a custom name, though the effect is that of the chosen spell. Next, the creator is presented with a drop-down list of AAs. Also these can be renamed by the creator. After this the creator can choose between three graphical representations for the CM. Finally the creator may write exclamations for the CM and define under what conditions these are uttered. This last step requires knowledge of the scripting syntax used in PI.

Suppose that a player with a PC named Adam create a free form CM in the location Entrance. The player names the CM as ‘The bus driver’ and describe it as ‘The evil bus driver hates all passengers. When they are in his bus they talk, and he can’t hear his music.’ The player chooses the emotion spell Wet net of tears and names it ‘Drives by’. Among AAs the player chooses Ignore, but keeps the name Ignore for the AA. Finally, the player chooses to not write any exclamations.

When the player has confirmed all choices the free form CM is instantiated. The bus driver emerges at a point close to the PC Adam, but far away enough for Adam to not be within perception range of the CM. A system message is sent to all players online: ‘The bus driver is in the Entrance, casting Drive by and Ignore!’

7.9.4 Manifestations of Curses and Blessings

PCs can be affected by the spells Sentiment Curse and Sentiment Blessing. The spell Sentiment Curse gives a player a strong negative sentiment that has a zero decay rate. For example, it can be a curse of Guilt. The way to get rid of this sentiment is to create a manifestation of the sentiment, a CM. If the CM is vanquished, the

sentiment disappears.

Sentiment Blessings are different from curses in the way that the emotion attached to the sentiment is positive, it could for example be Joy. The player might want to keep the blessing or curse instead of ‘externalising’ it as a CM if it affects the mood of the PC in a way that the player finds desirable. However, if a CM is instantiated it can cast beneficial spells on other players, or can help vanquish other CMs.

Which spells CMs of the curse/blessing type cast on entities in proximity depends on which emotion they represent. CMs cast the emotion spell that increase the emotion they represent, as listed in Table 7.15. The MR-ME spells they cast depend on how the emotion they represent is weighted to the mood nodes. Blessing CMs of Amusement and Interest cast Energy Rush, and those representing Satisfaction or Surprise cast Resistance Aid. Blessing CMs representing Joy or Relief cast both Energy Rush and Resistance Aid. Curse CMs representing Anger, Fear or Shame cast Aggression while those representing Confusion, Guilt or Sadness cast Energy Drain and Resistance Drain. Curse CMs representing Distress/Anguish cast both Aggression, Resistance Drain and Energy Drain.

The interface for creating Curse- and Blessing-CMs is similar to the one for creating Free Form CMs, but is simpler since all choices are limited by spells and AAs affecting the emotion that the CM represents. Players can name and describe the CM, and are then presented with the emotion spell which increases the emotion the CM is to represent. Players can rename this spell. Then a drop down list of AAs increasing the emotion is presented from which the player can choose one and rename it. Finally the player can choose to write three or less short texts that the CM can exclaim.

In the PI client the graphic representations for CMs are the same as for SS manifestations but three times larger. Names of the CMs are visible, while their descriptions are displayed if a CM is targeted by a PC. The place in the world where the CM emerges, called the spawn point, is close to the player who created the CM, but not within the perception range of the CM where it targets players and start casting spells. The reason is that the player might need to retreat, perhaps for fetching friends for reinforcement if the CM is a hostile one. Exclamations of Curse- and Blessing-CMs are exclaimed issued per minute, and the dialogue line is randomly picked.

The personality trait values of these CMs are mid-level, that is, the values in the trait nodes are in the middle between their possible minimal and maximal values. Each CM of curse/blessing type has a strong sentiment object of the emotion it is to represent. The sentiment is directed toward objects of type the PC. This means that a CM associated to the emotion Joy ‘feels’ strong joy if a PC approaches. A CM associated to Guilt would ‘feel’ guilt under the same circumstances. The effect multiplies if several PCs approach.

Suppose that a PC named Adam is afflicted by a sentiment curse of guilt. The player does not find the state of mind this results in desirable for Adam and decides to instantiate a Curse CM. While being in the location Entrance he names it ‘Grandmother’ and describes it as ‘Forgives you when you don’t deserve it’. The spell ‘True Sounding Accusation’ is renamed to ‘being so unselfish that you can never repay it’. He picks the AA ‘Be martyr’ and lets it keep the original name. He writes three custom exclamations: ‘And I, who loved you so much’, ‘I never expected anyone to

thank me' and 'I don't want to be a burden'.

When Grandmother is instantiated the following message is sent to all players online: 'Grandmother roams in the Entrance, being so unselfish that you can never repay it and being a martyr! Adam needs help to get rid of the trauma!'

If the CM instantiated would have been a Blessing CM the wording of the system message instead would have been: '[Name of PC who made it] has blessed us! [CM Name] casts [custom spell name] and [affective action] in [Location]!'

In order to vanquish Grandmother PCs would either need to get her MR or the value of her emotion node guilt to zero. If Adam chose the strategy to reduce Grandmother's guilt value he would need to cast the emotion spell 'Forgive' on her, which reduces guilt. If he is unable to cast Forgive he would need to find a PC who can. Suppose that the PC Christine has a personality allowing her to cast Forgive, and that she comes to help. Christine, being the caster, would be targeted by Grandmother. Grandmother would cast the spells and AAs specified by Adam on Christine, as well as energy drain and resistance drain spells. Adam and other PCs coming to assist would want to make sure to give Christine both MR and ME to ensure her ability to cast and for her to not suffer a mental break-down. In order to give Christine ME and ME the other PCs would need to be in positive mood spaces on the mood co-ordinate system allowing them to cast spells of energy rush and resistance aid. In order to balance their minds to be in the positive mood spaces allowing them to do this they could perform positive AAs toward each other. If PCs helping out have relations of friendship among them this would increase their mood through an increase of Belonging in each others' proximity, and would be able to use the especially effective

AA ‘group hug’.

If Adam instead chose to vanquish Grandmother by reducing her MR to zero he would need to make sure to either himself be or, have a group of assisting PCs who could be, in a depressed or furious space of the mood co-ordinate system. A PC in a furious state can cast Grand Focussed Aggression while regenerating ME quickly. A PC in the furious mood space might need assistance from entities that can aid in giving MR in the case the conflict takes long time. A PC in the depressed mood space can cast Grand Focussed Resistance Drain as well as Grand Focussed Energy Drain. Since a PC in the depressed mood state do not generate MR and ME over time the PC would need to steal the MR and ME from the opponent. In assembling a group of PCs for reducing Grandmother’s MR Adam might want to make sure to include members who because of their personalities deviate toward depressed states of mind, that is, PCs who have dominant neurotic facets.

7.10 Characterising Action Potential

In PI the mood and the personality are the guiding principles which define the characterising action potential (CAP) as described in Chapter 3. The personality which in turn governs the trend of mood change and direction of the mood co-ordinate system is authored and thus controlled by the player who in the beginning of the game define the traits by taking the IPIP NEO test. The mood is controlled by the player through actions performed in the VGW. However, players do not act in isolation. The relation to others, and how others relate to a PC through actions define the mood of a PC. Indirectly in PI, PCs become partly defined in their CAP by those PCs close to them.

7.10.1 Summary of Interrelated Elements Governing the Characterising Action Potential

The list below summarises the CAP given to PCs in PI by the Mind Module and elements in the design affecting it:

1. Personality trait nodes define:
 - (a) trends in mood fluctuations;
 - (b) specific mind magic spells available;
 - (c) the number of possible friends.
2. The current position in the mood co-ordinate system depends on:
 - (a) trends in mood fluctuations given by personality traits;
 - (b) affective actions performed;
 - (c) affective actions received;
 - (d) spells cast on self;
 - (e) if a protégé gains a level (increase of Pride);
 - (f) proximity to other entities which the own PC have a sentiment toward:
 - i. friends and special friend (where the amount of Belonging increase the longer a friendship lasts);
 - ii. protectors, protégés and members of the same department (increase of Belonging);
 - iii. an entity which the PC has a sentiment toward which is an effect of previous interactions (PCs and NPCs);

- (g) whether the PC in the process of dealing with a sentiment blessing or a sentiment curse, either by ‘keeping’ the sentiment or by externalising it by authoring a CM;
 - (h) whether the player has had an emotion go out of bounds and the emotion reset is to its norm value by the event of spawning of a manifestation of the emotion.
3. The position in mood co-ordinate system define in a given moment:
- (a) possible AAs to perform;
 - (b) possible AAs receive from others;
 - (c) possible MR-ME spells to cast, whether the player may cast restorative or harmful spells, and whether those affect the MR or ME of the player, and what kind of space the cast spells affect in the mood co-ordinate system of the receiver;
 - (d) regeneration rate of MR and ME.
4. The overall action potential depend on:
- (a) current position in the mood co-ordinate system;
 - (b) amount of AAs performed already on a targeted entity;
 - (c) progression, that is, level define how many AAs and spells a character has learned;
 - (d) amount of available MR and ME, where the maximum values depend on:
 - i. level (a PC with protégés who play actively will reach high levels faster because they receive a percentage of their protégés’ XP);

- ii. number of friends and whether there is a Special Friend.

7.11 Summary

In this chapter the game design of PI and WoM has been described. A background to the practical work of developing the prototype and an overview of the game design was given. Next, the core game mechanics were described briefly. Then the main features of the design was described in detail. What PCs can do in a given moment is largely governed by their mood. Depending on which mood space PCs are in they can cast different spells, which affect values of mental energy, resistance and emotion in their targets. The position in the mood co-ordinate system also governs which affective actions they can perform toward other PCs and what affective actions they are receptive to. By performing affective actions on each other PCs can affect each others emotions, which, if they are strong, may result in sentiments toward each other. PCs' personalities governs the trend in the individual fluctuations of mood and emotions, and define which types of spells PCs can cast. Formalised social relationships such as friendships and protector-protégé-relationships also affect the CAP, giving players more energy and resistance, as well as by activating the emotion nodes Belonging and Pride. PCs states of mind are reflected in the world in the form of physical manifestations that emerge if an emotion 'goes out of bound'. These manifestations are entities which cast different spells on approaching PCs depending on what emotion the manifestations represent. PCs can also partake in authoring manifestations which become part of the world and the game-play in it.

The Ouroboros prototype (Section 6.1 in Chapter 6) focussed on expression of

character performed to other players through gestures, while the Mind Music prototype (Section 6.3 in Chapter 6) explored expression of the own PC to the player herself. The focus of PI is on expression of character — to both self and others — through fluctuations of CAP and of manifestations of the PC’s mental state that become part of the game world.

Chapter 8

Play-Test of World of Minds

Contents

8.1	Rationale	218
8.2	Research Questions and Aims	219
8.3	Method	221
8.3.1	Research Ethics	222
8.3.2	Play-Test and Survey Design	223
8.3.3	Participants	226
8.3.4	Materials	227
8.3.5	Procedure	233
8.3.6	Data Analysis	234
8.4	Discussion: Player’s mental models of the system	236
8.4.1	Effects of Personality Factors	238
8.4.2	Extraversion and the design risks of Five Factor Model . . .	240
8.4.3	Emergent Game-Play	241
8.5	Discussion: Individual Differences	243
8.6	Discussion: Implementation Focused Design Evaluation	244
8.6.1	Sentiments in the Play-Test Scenarios	244
8.6.2	Survey and Interview Results Regarding the Sentiments . .	247
8.6.3	Deep Structure and Sentiments	250

8.6.4	Affective Actions	252
8.6.5	Spell Abilities	256
8.7	Conclusions: Design Implications Relevant to the Pataphysic Institute	259
8.7.1	Sentiments and Attributing Meaning to them	260
8.7.2	Agency and Co-creation	262
8.7.3	Core Game Mechanics	263
8.8	General Conclusions	264
8.9	Summary	267

This chapter presents a case-study of AI-based game design, where the design is based on the Mind Module (MM), and lessons learned for both the MM and the game design from a play-test of a paper prototype of World of Minds (WoM).¹ WoM was the virtual game world (VGW) prototype preceding the Pataphysic Institute (PI) prototype.

8.1 Rationale

Experimental research and evaluations of rules and game mechanics in VGWs are rare in the academic sphere due to the enormous work effort required for the development of VGWs. Researchers are generally constrained to studying existing VGWs or using (e.g., Castranova (2008), Tychsen (2007)) existing systems, such as the Aurora scripting system of Neverwinter Nights (Bioware, 2002), that through their architecture enforces very traditional computer role playing game mechanics. When building new game mechanics from scratch where the system need to support a large number of simultaneous players it is necessary, unless the research funds are unlimited, to

¹Some of the findings described in this chapter have been presented in (Eladhari, 2009; Eladhari & Sellers, 2008; Eladhari & Mateas, 2008).

find alternative evaluation methods, such as paper prototyping. The guided paper prototype play-test described in this section was conducted in order to get feedback early in the development process with the aim to render results that could guide the development of the digital prototype towards game-play elements most useful for the design of characterising action potential (CAP).

8.2 Research Questions and Aims

The purpose of the play testing was to acquire information that could help address questions in three main areas: players' mental models of the game-play in the WoM prototype, how and if individual differences of participants affected they way they related to the presented game-play, and how the game-play of WoM could be improved.

The following list, divided in the three categories mentioned above, present the research questions that the play-test was designed to elicit feedback on.

1. Can participants build mental models of the MM in order to use it for game-play in the WoM prototype? Mental models are here understood as the result of the construction of meshed sets of patterns of actions as described by (Schubert *et al.* , 2001), expanded upon in Section 3.6.
 - (a) During game-play, are players able to 'reverse engineer' the MM to build a mental model of how to manipulate emotional state to achieve game-play goals? For any successful game design, players must be able to build a model of the mechanics that allow them to successfully interact with the game.

- (b) How can players' hypotheses of how traits relate to MM state and game-play be used in order to gather new design ideas for how traits might influence emotional state and game-play?
 - (c) How do players perceive the relationship between the emotional state maintained by the MM and the game mechanics and interaction options that depend on that state?
2. What impact does individual differences of participants have on the way they relate to the play-test?
- (a) What differences are displayed depending on whether participants role-play, self-play or use a mixed approach?
 - (b) Does participants' general attitude towards personality tests affect their attitude to the personality trait based game-play?
 - (c) What are participants attitudes to how sensitive personality trait data are in a VGW game-play situation?
 - (d) Does previous experience of game-playing and preferences regarding game genres matter for players' understanding of the game-play in the prototype?
3. In what ways can the game design be improved?
- (a) In what ways can sentiment objects be created and used in a game to be meaningful for the play experience in a VGW? Three different ways of instantiating sentiment objects were evaluated using the paper prototype in order to see which ways would be relevant to implement for further testing

in the digital prototype. Issues of agency and player's attached meanings to sentiment objects were explored. Also different ways of interacting with the sentiment objects were studied.

- (b) How can the feature of affective actions (AA's) be improved? How do players use AAs combined with the other features of the prototype? In what pace can players be introduced to new AAs? Are participants missing any possible AAs in the limited scenarios given, and if so, which ones?
- (c) How can new spell abilities be introduced to players? Two ways of introducing players to new spells were tested and evaluated. Focus was put on getting feedback regarding abilities that would characterise PCs according to their personalities.
- (d) Do players understand the core mechanics? Do players understand the concepts of mental energy and mental resistance and how the regeneration rates of these are related to the mood of their PC? Do participants understand how to vanquish hostile single-sentiment manifestations using these concepts?

8.3 Method

A paper prototype of WoM was constructed, in which players were guided through five scenarios that presented the main categories of action in WoM. Players were asked to think aloud while playing the game; additionally, the test leader stopped the game at two points and conducted interviews. Additionally, data were collected through web-based surveys.

During the five scenarios, each player was guided while using the main categories of actions in the game, including affective actions, navigation in a landscape of sentiment, and mind magic spells. Using the game interface presented in Figure 8.1, the test leader updated the state of mind of the PC and NPCs, showing the player the effect of her actions in the game in terms of fluctuations in emotions, mood, mind energy and mind resistance.

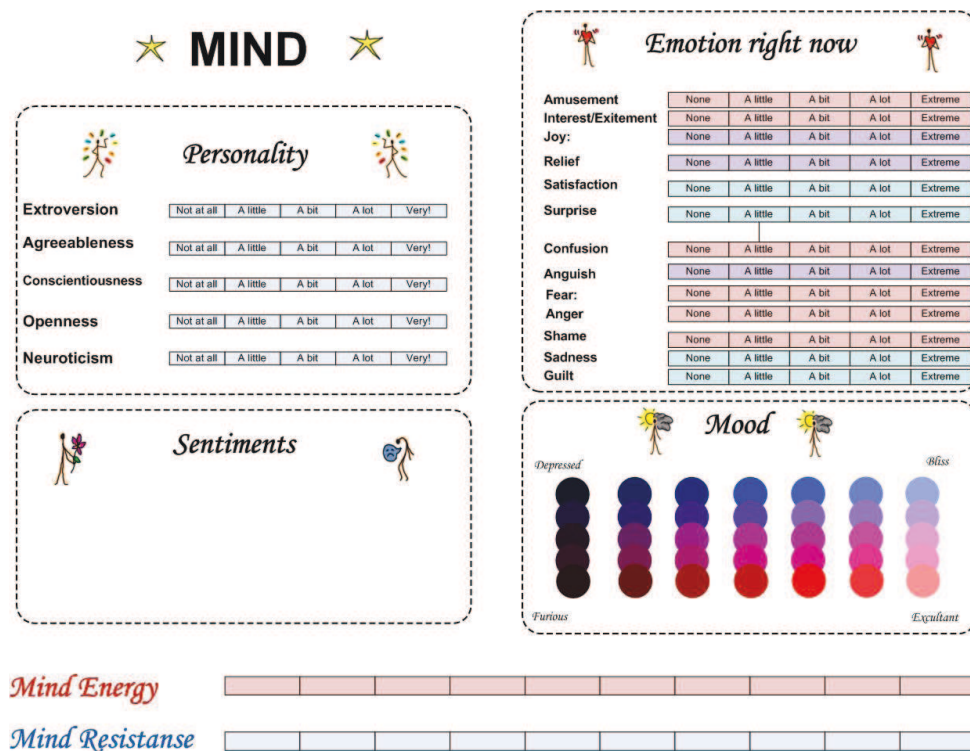


Figure 8.1: Mind Sheet used in play-test of WoM.

8.3.1 Research Ethics

The play-test was conducted in May 2009 in Expressive Intelligence Studio (EIS) at University of California Santa Cruz (UCSC) where I was a visiting scholar at the time. In order to conduct tests with human participants it is necessary to request

and be granted an exemption from Institutional Review Board (IRB) Review. This is equivalent of ethics approval. The request for an exemption from IRB review for the WoM play-test can be found in Appendix C.3 and the approval of it can be found in Appendix C.4.

8.3.2 Play-Test and Survey Design

My approach for evaluating the game design via a paper prototype combines features from several approaches of User-Centred Design where users' experience is the main driver for the design, as well as from rapid prototyping and play testing approaches that are becoming more common in game design (Fullerton *et al.*, 2004; Salen & Zimmerman, 2001). In the test of the WoM prototype I used scenarios, using the Wizard of Oz method to simulate user-interaction. When conducting my tests I had real players playing the game individually. Just as in the play-test of GED, described in Chapter 6, I used scenarios and a game master/test leader, who simulated the game events. Players were asked to think aloud while playing the game; additionally, the test leader (me) stopped the game at several points and conducted interviews. The approach that was taken is described in detail in Koivisto and Eladhari (2006b).

During the scenarios, the players were presented with the interaction objects and given minimal explanations about how and what to do, in order to capture confusions and, even more important, implicit assumptions about the game-play. At any point the users could tap the 'manual' button and ask any question, whereupon the dialogue with the test leader temporarily left the think aloud protocol. Figure 8.2 shows the state of mind of a PC in the paper prototype in the end of a session.

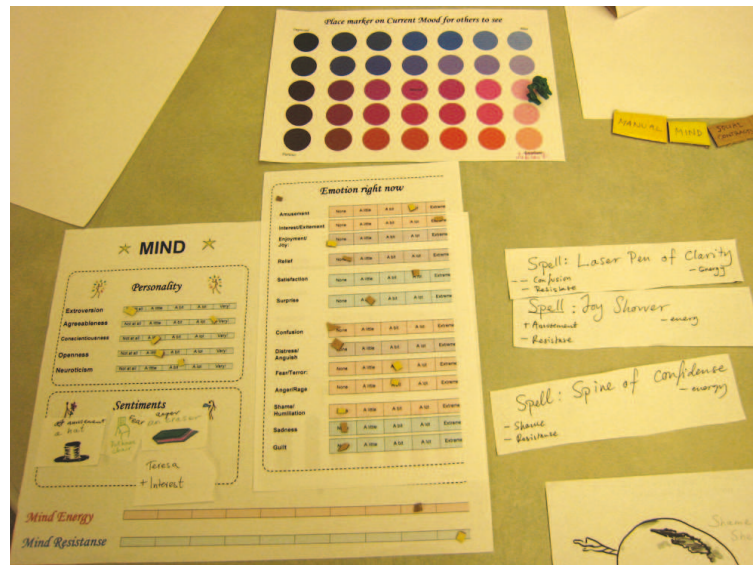


Figure 8.2: End state of the Mind Sheet of a PC in a WoM play-test session.

In order to capture answers to the questions described in Section 8.2 several ways of asking them were considered necessary. For questions in category one and three I believed it could be useful to observe the players as they were interacting with the prototype as well as listen to them using the think aloud protocol in order to understand the way they reasoned about their own actions and how they understood the system. I also believed it could be useful to interview participants in depth with open ended questions which potentially could capture issues that were not foreseen when designing the test scenarios. The survey questions sometimes duplicated the interview questions. One purpose of this was to capture potential negative feedback that the player might not be comfortable voicing in the interview situation. Another purpose was to capture further thoughts about the same subjects that may have evolved during and after the conversation in the interviews. To gather data concerning the second category of questions described in Section 8.2, relevant characteristics of

the participants, two online-surveys were conducted before the play-test sessions.

In both surveys conducted before the test the participants were exposed to the question whether they would prefer to role play a character or play as ‘themselves’ in order to play down the potential feeling of vulnerability if they had answered the personality test as ‘themselves’, and also to prepare for the test by bringing the issue of role-playing to consciousness. Since it is not always possible to know before a test is conducted exactly which questions or scenarios will yield relevant data a multitude of questions were asked, but in order to not make it too strenuous for the participants they were asked in steps.

In association to the play-test, each participant answered survey and interview questions in six steps. For the surveys, the online survey tool SurveyMonkey was used (SurveyMonkey Corporation, 1999-2009). On each page of the surveys, three questions were asked. Each survey was limited to nine questions.

The first survey was concerned with demographics and players’ previous experience of role-playing games. When the participants had completed the first survey they were asked to fill in the online IPIP NEO personality trait test, save the results and send them by email to the test leader.² After this they were instructed to fill in the second survey. The reason for ordering the questions in this sequence was to capture the participants’ attitude to the use of a detailed personality test before the play-test, when the experience was still fresh in the memory and not blended with the experience of the play-test. The second survey asked about participants’ intended play-style, whether they planned to self-play, role play or use a mixed approach, as

²Using SurveyMonkey for IPIP-NEO was not considered since the program code underlying the scoring routines and the narrative report was not feasible to duplicate using SurveyMonkey.

well as several questions about attitudes towards personality related issues in potential game-play situations. The participants were also asked about their attitude towards personality tests in general.

The first interview with the participants was conducted after the first two scenarios in the play-test. The interview-questions were concerned with the participants' impressions of what was presented to them in the scenarios; sentiments, mood and affective actions. The second interview was conducted at the end of the play-test. The questions were concerned with personality related game-play issues, spells, mood and participants' general impressions.

Immediately after the play-test the participants were instructed to fill in two short surveys. The majority of the participants filled them in within three hours after participating in the test. The questions in the last surveys duplicated many of the interview questions and asked participants about what sentiment objects they remembered. One question also asked the players to describe in their own words what 'mood' in WoM is. The questions asked in the interviews and in the surveys are presented in Appendix C.8.

8.3.3 Participants

The ten participants of the play-test were graduate students and staff at UCSC and their spouses.³ Participants had a mean age of 28 with a standard deviation of 5.6. Of the ten participants four were female and six male. Seven participants were graduate students in computing science, two were spouses of graduate students and

³An eleventh test with a female participant was conducted, but due to a prior engagement of the participant the test was ended after two scenarios and one interview. Therefore the data from the eleventh play-test are not included in the data analysis, nor in the discussion.

one participant was a member of staff. All participants were residents in California, USA.

8.3.4 Materials

For character creation the WoM paper prototype used a short version the International Personality Item Pool Representation of the NEO PI-R (IPIP-NEO) as constructed by Johnson, a method for evaluating personality traits using a survey with 120 items the user rates on binary scale (Johnson, 2001). The full IPIP contains 1,699 items assembled by Dr. Lewis R. Goldberg. For the purposes of the prototype the short version was considered sufficient.

As mentioned, before filling in the IPIP-NEO test players were advised to decide whether they wanted to play as being themselves or if they wanted to role play a character of their own design. If they chose to role-play a fictive character they were advised to fill in the IPIP-NEO rating the items as if they were rating the attitudes of their fictional character.

The IPIP-NEO was implemented in the digital PI prototype, but did not yet exist when this test was conducted. Participants were instead directed to a web-page where the IPIP-NEO is available, and were instructed to save their results which they could attach to an email and send to the test leader.⁴ The ‘system’ could then create a PC for the test session.

The remainder of this section describes the scenarios in the guided play-test. The PC Mastaya’s traversal through the scenarios is used for illustration. The script for the

⁴The IPIP-NEO Short Form is available at the following URL (verified 2009-09-10): <http://www.personal.psu.edu/j5j/IPIP/ipipneo120.htm>.

play-test, used by the test leader, is presented in Appendix C.7.

Scenario 1 - Sentiments

The PC meets the character ‘the gate keeper’ (Karl Sundgren). Via prewritten dialogue script the gate keeper gives information about the game world. The gate keeper has a bucket which he searches in order to give the player two random sentiment objects. In the scenario the test leader has the role of the gatekeeper, and takes two paper tokens representing the objects at random from a plastic container, as well as tokens representing different emotions. The player represented by the PC Mastaya was given a sentiment of Anger towards mittens and Amusement towards socks. The gate keeper also asks the player to picture an unnerving scenario where she can choose which of three different objects would be most scary. Mastaya picked garden gnomes and was given a Fear sentiment towards objects of the type garden gnome. Finally, the gate keeper asks Mastaya to fetch him a glass of water from the water cooler down the corridor.

Scenario 2 - Affective Actions

The PC meets the character Teresa who says she is too sad for explaining what affective actions (AAs) are, and asks the PC for a hug. A selection of AAs is presented to the player. Teresa and the PC exchange AAs until threshold values for emotions result in the generation of sentiment objects between the characters. Mastaya chose to comfort Teresa instead of hugging her. Teresa’s Distress and Sadness decreased, and her mood improved. After a few exchanges of AAs a threshold value for Mataya’s emotion Interest/Excitement was reached and the system generated a sentiment for

Mastaya of this emotion towards Teresa.

Scenario 3 - Facing the Sentiments

The player needs to guide the PC through an environment with sentiment objects in order to reach the water cooler. The state of mind of the PC changes according to which sentiments are encountered. Mastaya avoided her Fears (garden gnomes) on her way to the water cooler, and then moved close to the sock in order to gain Amusement before moving on.

Scenario 4 - Using Spells and Affective Actions

The player finds Teresa in a state of distress as she is attacked by a manifestation of Confusion. The player finds a spell, Laser Pen of Clarity, which reduces Confusion and mental resistance in the target. The player is introduced to the concepts of mental energy and resistance through seeing the mind values on Teresa, the Colossus of Confusion and her own PC. When the Colossus of Confusion is defeated a new foe enters the scene, the Sail of Sorrow. When this is defeated Teresa explains that when an emotion goes out of bounds a manifestation of that emotion is created.

Scenario 5 - Trait based spells

The gate keeper accepts the glass of water and gives the PC two spells that he claims are based on the personality of the PC. Mastaya learns an 'Interest/Excitement Shower', based on that her highest factor except Neuroticism is Openness. She also learns the 'Soothing Hand', which lowers Fear in the target, based on that the highest value of her traits in the Neuroticism factor is Anxiety. The gate keeper tells her that

she will be particularly good at defeating manifestations of Fear, the Terror Trolls.

Figure 8.3 shows the table in the end of the five sessions on which the tests were conducted, when all game elements have been presented to a player. The figure is annotated with numbers. In the list below the numbered items describe elements in the figure at positions with corresponding numbers.



Figure 8.3: When all five scenarios were traversed most game-play elements were visible on the table.

1. The blue horizontal lines are the meters of values of the five personality factors of the PC.⁵ The values of the thirty traits were available on lists for each PC. These lists are not visible in the figure.

⁵In the prototype meters were used to represent values of parameters relevant to the game-play mechanics. The spaces to the left in the meters represented low values and the spaces to the right represented high values. Markers were placed on the spaces of the meters that represented the current values of the corresponding properties.

2. The horizontal lines are the meters of values of PCs' emotions. Markers were placed on the meters at positions corresponding to current values.
3. The rectangle of coloured dots represents the mood co-ordinate system of the participants PC. The marker is placed on the position of the current mood.
4. Above number 4 is the space where representations of the PCs sentiment objects were placed. To the right of number 4 are the meters for values of mind energy and mind resistance where markers were placed on spaces representing current values.
5. The horizontal lines are the meters of the NPC Teresa's emotions. These were not visible to the player during the scenarios. The values were used by the test leader to calculate the current mood of Teresa. Above the sheet with Teresa's emotion values a pile of paper notes representing items. When the gate keeper 'searched his bucket' in order to create sentiment objects the test leader picked two items from the pile at random. One of the items was associated to anger, the other to amusement.
6. The rectangle of coloured dots represents the mood co-ordinate system of the NPC Teresa. The marker shows in which mood space Teresa is in at a given moment. This was visible to players during the scenarios.
7. The white rectangle represents the location of the gate keeper's office. This was the location for Scenario 1 and 5. The green marker right of the number 7 represents the current position of the PC in the geography of WoM. The paper figure above the number 7 represent the gate keeper. Below the white rectangle are six pieces of carton. These represented 'buttons' in a supposed digital

interface. The yellow ones are turned up, signalling that they are ‘clickable’. The brown ones are turned down, signalling that they are ‘greyed out’ and not ‘clickable’. From left the buttons are as follows: ‘mind’, ‘manual’, ‘dedications’, ‘spells’, ‘affective actions’ and ‘social contracts’. In the scenarios, the buttons were ‘turned up’ on their yellow ‘clickable’ side as the abilities became available. All buttons except ‘dedications’ and ‘social contracts’ were used by the participants during the scenarios.

8. The white rectangle represents the part of the corridor where Teresa is located. This was the location for Scenario 2 and 4. The paper figure to the top left of the number 8 represents the single sentiment manifestation Sail of Sorrow. The table representing the Sail of Sorrow’s mental energy, mental resistance and current value of the emotion sadness is not visible in the figure. The paper figure above and to the right of the number 8 represents the NPC Teresa.
9. The white rectangle represents the location of the corridor where the water cooler is located. This was the location for Scenario 3. In the figure, the items of this scenario (different for each PC) are not visible.
10. The notes represent affective actions. Participants could pick them up and point them towards an entity, an action symbolising the performance of the affective action named on the note towards the entity it was pointed at.
11. The notes contain lines of dialogue. When the NPCs Teresa and the gate keeper said something the test leader gave a note with dialogue written on it to a participant.

12. The notes represent spells. In order to use a particular spell, participants picked up the corresponding note.

8.3.5 Procedure

Before the play-tests the majority of participants were briefed at a meeting about the procedure and the privacy of the data they would provide during the test, as well as how the video material would be used (C.2). Before the test sessions the participants signed two forms, one about volunteering as test subjects (Appendix C.5) and another about granting, or not granting, use of the video material in publications (Appendix C.6). Ten guided paper prototype play tests were conducted. In the procedure a participant completed the following steps in order.

1. Filled in a short (fewer than ten questions) survey about demographics and previous play experience.
2. Took the IPIP NEO Personality test and emailed the results to the test leader.
3. Filled in a short survey about their opinions about using personality traits for PC creation.
4. Went through the guided play-test. Each test was videotaped and took between one and one and half hours. The player was guided through three scenarios. After that the participant was interviewed, 14 questions were asked. Then the player was guided through the remaining two scenarios. The test was concluded with an interview with nine questions.
5. Filled in two more short surveys, one on the subjects of sentiment objects, the other about general impressions of the experience.

8.3.6 Data Analysis

Ten participants can be considered a small number. However, Ollila (formerly Koivisto) has shown (2009, p. 64) that often already six players are enough in laboratory testing to provide good understanding of a player experience of a game, given that the results are interpreted carefully.

The video analysis tool Transana (Woods & Fassnacht, 2007) was used to transcribe and analyse the 15 hours of videorecordings of interviews and play sessions. Transana is an open-source transcription and annotation tool developed by University of Wisconsin that allows researchers to transcribe and analyse collections of video and audio data. With Transana, I viewed the video clip first. I then identified and organised analytically interesting portions of video, and attached keywords to those video clips. The tool embedded automatic time codes during the transcription process. A coding scheme for potentially relevant phenomena was developed guided by the research questions presented in Section 8.2. This provided the initial framework for searching for patterns and regularities, as advocated by (Miles & Huberman, 1994). An overview of the analysis process recommended by Miles and Huberman is presented in Appendix C.1. The interesting portions of the video-recordings were transcribed verbatim. Qualitative analysis in the form of thematic coding was carried out on the portions transcribed verbatim.

Figure 8.4 shows different windows in the transcription tool. The window in the top left shows a visualisation of the audio file (sound-wave form) of a video clip while the window to the top plays the video image. The window in the left bottom shows a verbatim transcript of a portion of a video recording. The window to the lower right shows which keywords have been assigned to the particular clip. In this case the video

clip is of a participant answering Question 2 in Interview 2, where she was asked how she thought the personality of her PC affected other elements of the mind of the PC. The keywords assigned to the clip visible in the figure annotates that this particular participant reasons about the personality's potential effects on the emotions Interest and Distress. The collection report of the second question in the second interview generated by the tool Transana containing the keywords used and their frequency is presented in Appendix C.9 as an example. Verbatim transcripts are available in rtf-format on a CD which is provided with this thesis.

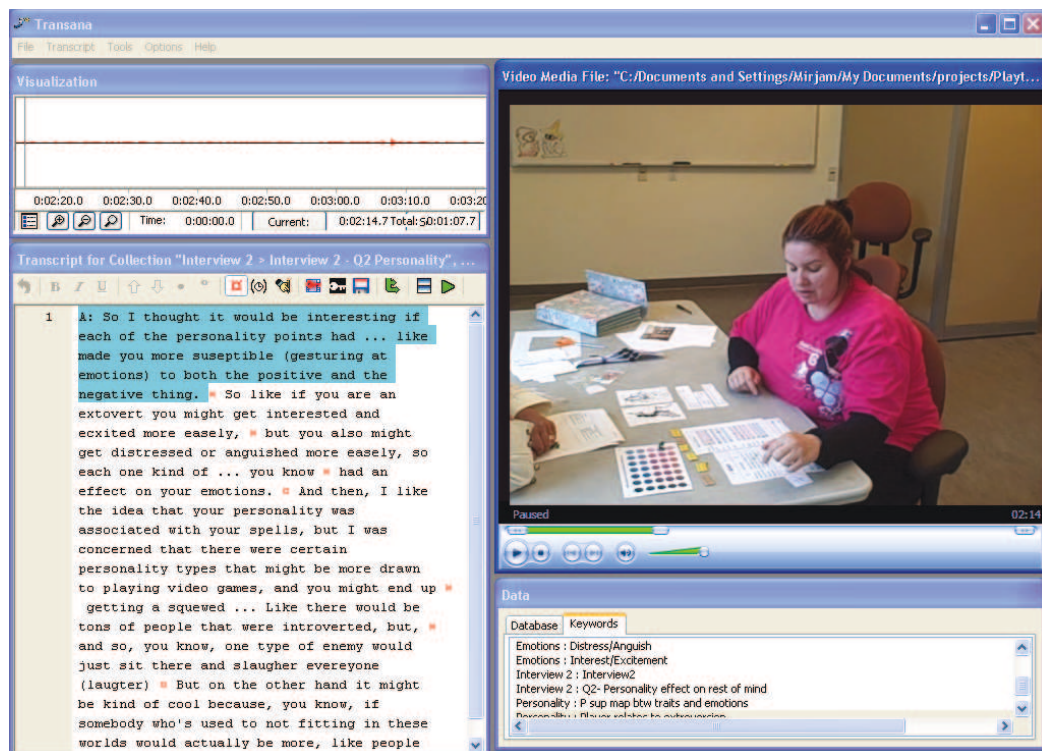


Figure 8.4: Windows in the video analysis tool Transana.

The results of the surveys were compared to the results of the interviews in order to verify the statements by participants in the interviews. Five-level Likert items were

used to acquire participants attitudes in terms of preference to certain game elements. Summaries of all responses gathered in the surveys are presented in Appendix C.10

Also, in one case, participants were given the teach-back task to describe what mood is in WoM to someone else. Teach-back tasks are often used in user-centred design in order to assess users' mental models of systems (Van der Veer *et al.* , 1990; Puerta-Melguizo *et al.* , 2002). The texts that participants produced describing mood were compared with their behaviour and statements in the videotaped materials. The survey results served as possible validations (or refutations) of the conclusions drawn from the analysis of the videotaped material that was conducted using the coding scheme. The coding scheme was developed in order to address the research questions.

8.4 Discussion: Player's mental models of the system

All players built mental models of at least one of the effects of personality on the MM and the game mechanics that were 'correct' in the sense that players understood existing relations between personality traits and other elements in WoM.⁶ That is, players were able to construct meshed sets of patterns of actions (as described by Schubert *et al.* (2001)) constituting a mental model of what action potential players had in the WoM paper prototype. Three of the players built correct models of multiple effects of personality. As summarised in Table 8.5 five of the ten players thought that personality affected the strength and/or the nature of emotional responses. Two players thought that personality affected the amount of mind energy

⁶This was observed in conversations following the second question in the second interview: 'How do you think the personality of your PC affects the other values in the mind?'

and mind resistance. Three players thought that the effect of AAs on themselves and others depended on personality. One player thought there were personality-specific effects on mood values, hypothesising a mapping between traits, emotions and mood. All of these effects are indeed part of the mechanics.⁷

Table 8.5: Participants assumptions about effects of personality on other elements.

Participant supposes personality affect:	Participants n=(10)
the strength and nature of emotional responses of the own PC	5
the amount of mind energy and mind resistance of the own PC	2
the effect affective actions have on their own PC and other players' PCs	3
mood values of the own PC	1

All players demonstrated enough understanding of the system to be able to act in the world in such a way as to reach an emotional state they found desirable. At the end of the test, the mood of all ten PCs was in the range between jubilant/exultant and bliss. There was one exception to the general pattern of striving towards positive mood spaces in that one player in his interaction with Teresa in the second scenario used AAs in order to let his PC enter an angry mood, but once he had tried that he made sure to, during the rest of the scenarios, choose actions which left his PC in the mood space of bliss when the play-test came to its end.

These end-states indicate that players' preconceptions regarding mood states in their ordinary lives, where being in happy or harmonic moods are generally more desirable than in being furious or depressed moods, transferred to their choice of

⁷The collection report of the second question in the second interview generated by the tool Transana containing the keywords used and their frequency is presented in Appendix C.9.

actions in the play-test. Being in a blissful or happy mood was by players perceived as a success criteria for their play. In the tightly scripted scenarios there was no indication given to players that this was *not* a desired state. However, in WoM and PI negative states of mind can be desirable in certain context, even though this aspect of the game design was not tested in the paper prototype play-test. The behaviour of the participants in the test indicates that if a game design is used where the game-play mechanics is at odds with the preconceptions players have regarding mood states in the ordinary life this needs to be communicated to players in a clear way.

8.4.1 Effects of Personality Factors

Regarding the detailed mapping between factors and their effects, players had an inclination towards building models about extraversion. Eight of the ten players hypothesised about the Extraversion factor, though they had different hypotheses of exactly how the level of Extraversion would affect their PC. Table 8.6 summarises which personality factors participants discussed in the second question of the second interview. In the table, ‘Relating’ signifies that the participant had a hypothesis about the effects of a particular factor. ‘Mentioning’ means that the participant mentioned a personality factor, but that the participant did not expand the discussion about a factor’s potential effects. ‘Unsure’ means that a participant attempted to build a hypothesis of how a personality factor might affect other elements of the MM, but that the participant did not come to a conclusion.

Table 8.6: Participants hypothesising about personality factors.

Participant reasoning about personality factors	Participants n=(10)		
	Relating	Mentioning	Unsure
Neuroticism	2	2	0
Extraversion	8	2	0
Openness	2	2	2
Agreeableness	3	6	1
Conscientiousness	1	2	1

Eric the Red's player hypothesised that *'Depending on how extroverted you are, sadness and guilt would probably move more or less as you are affected by them.'* Kita's player said *'So, like, if you are an extrovert you might get interested and excited more easily, but you also might get distressed or anguished more easily, so each one kind of ... you know ... had an effect on your emotions.'* Players chose to discuss certain emotions more than others in relation to extraversion: amusement, anger, excitement and sadness were discussed by three players each, while the other eight emotions were only discussed by two players or fewer. Perhaps players found the emotions they discussed to be particularly relevant to extraversion.

The factor Agreeableness was accessible or interesting enough for six of the players to mention it and for three players to discuss it in more depth. The factor Conscientiousness was the most difficult for players to relate to. The following statement about it comes from Dante's player: *'If you are not conscientious at all [...], other people pick up on that, how [...] are they going to ask you to do anything for them?'* These results indicate that players are able to successfully use their everyday theories of mind and personality to apply them to the personality-based game mechanics in WoM. However, future design work may be needed to make some of the factors, such

as conscientiousness, more understandable to players.

8.4.2 Extraversion and the design risks of Five Factor Model

It is no surprise that the factor of extraversion was perceived as the most accessible. Even in ancient Greek philosophy, extraversion is included as a central dimension of human personality. Recent research where the FFM is used in the context of synthetic humans and conversational agents also favours extraversion before the other factors (Mairesse & Walker, 2007; Isbister & Nass, 2000). From a design perspective, the results of the play-test indicate that it would be beneficial to introduce players to the mechanics of WoM or PI by focusing on the factor of extraversion in the early stage of the game.

However, as a character trait in an RPG, the dominance of extraversion carries a design risk. The participants expressed worries about how their PCs would perform in social situations if their level of extraversion is low, relating to real world social situations where introverted persons have difficulties. If a game world heavily relies on game mechanics derived from metaphors of social interactions, such as AAs, it would be easy to perceive an introverted PC as ‘gimped’, that is, the PC has properties that make it difficult or impossible for its player to progress in the game.

The design goal of WoM was for personality traits to be non-normative: a game design in which each possible combination of personality traits allows a player to successfully progress in the game. The design of the Mind Module *does* weight connections between trait and emotion nodes such that it may be more difficult for an introverted PC to perform certain social actions. In the play-test of WoM the use of spells was very limited and only constrained by the amount available mind energy.

The feedback from the participants, along with the non-normative design goal was used when refining the mind magic spell system as described in Section 7.6.4. The intention of the system design is manifold: on the one hand to by action potential reflect both the personality and the mood of the PCs, and on other hand make sure that PCs who tend to (as a result of perhaps high values in the trait nodes of the neuroticism factor) deviate towards the Depressed areas in the mood co-ordinate system (where MR and ME regenerate slowly) have spells powerful enough to make the game playable and enjoyable. Focus was also put on creating a system where different strategies regarding where to be in the mood co-ordinate system would be beneficial to use for players co-operating taking on different functional roles, while not restraining players to need to use the same strategy all the time.

8.4.3 Emergent Game-Play

The scenarios in the prototype were purposefully tightly scripted, since a primary purpose of the prototype was to explore players' understanding of the MM in the context of WoM. Nevertheless, players used the MM-based game mechanics to discover alternative strategies for completing the scenarios that had not been foreseen in the design.

A clear example of this appears in the fourth scenario, when the player helps Teresa battle the Colossus of Confusion. The only other object in the environment was the Laser Pen of Clarity, which the player can pick up to learn the spell of the same name. This spell reduces confusion and mental resistance; in the design it was assumed that players would use only this spell to help Teresa by casting the Laser Pen of Clarity on the Colossus of Confusion. However, 70 percent of the players

combined the use of AAs on Teresa with the use of their (only) spell on the Colossus of Confusion. Players hoped to improve Teresa's emotional state through the AAs, and thus increase her effectiveness at battling the Colossus of Confusion. Thirty percent of the players used their Laser Pen of Clarity on Teresa, which decreased her confusion and again made her more efficient against the Colossus of Confusion. Thirty percent of the players used AAs instead of the Laser Pen of Clarity on the Colossus of Confusion, damaging the Colossus of Confusion with a lesser decrease in their mind energy than using the Laser Pen of Clarity. Figure 8.7 illustrate the fourth scenario of the paper prototype.

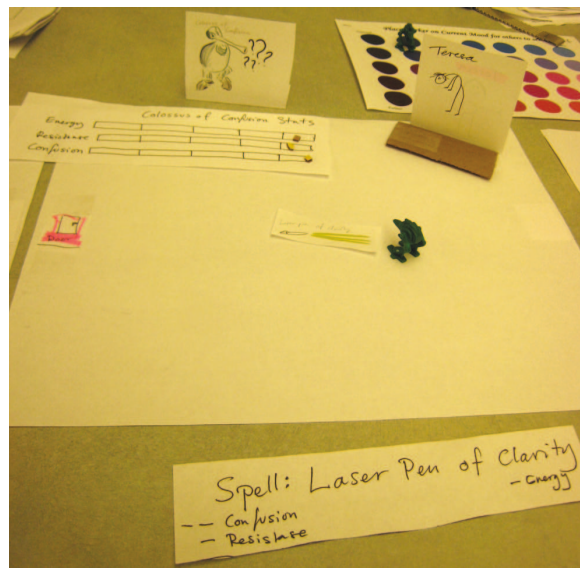


Figure 8.7: In the fourth scenario players pick up the spell Laser Pen of Clarity to help Teresa overcome the Colossus of Confusion.

The fact that players discovered interesting, alternative strategies even in very constrained and simple scenarios validates the potential for rich and emergent game-play in MM-based game mechanics. In the same way that physics systems have created opportunities for emergent game-play in games such as Deus Ex (Ion Storm Inc.,

2000), the ‘mental physics’ of the MM creates emergent game-play opportunities for VGWs.

8.5 Discussion: Individual Differences

All ten participants in the play-test chose to either self-play or use a mixed approach, that is, no participants chose to create a fictional character to role-play. Thus, the potential role-playing aspects were not explored in the test which instead could become focused on the mental model players created of the system while they related the personality trait properties to themselves. The majority of the participants were of the opinion that the IPIP NEO had reflected their personalities in a way that reflected them in a ‘accurate’ way as self-playing PCs (Survey 2, Question 7). Their attitudes towards personality tests in general were mixed (Survey 2, Question 9), but these attitudes did not moderate any of the effects of other individual differences studied, nor was any differences in approach to the WoM prototype noticeable that could be connected to these attitudes.

Several questions in the second survey explored players’ attitudes towards the privacy of the information of personality trait values. Given the situation presented, in which other players in the VGW would not be provided information about whether another PC was self-playing, and thus using their ‘own’ trait data, or role-playing using fictional authored trait values, the issue of privacy was not considered a problem by any of the participants. The design of PI does not allow PCs to see any properties of other PCs except the current mood which is signalled by the colour of the ‘aura’ (see Section 7.3.5). However, the attitude of the participants indicate that features regarding display of information on personality traits that may cater for strategic

game-play could be positively received. (The response text given by participants answering Question 6 in Survey 2 is presented in Appendix C.11.)

The previous play experience and preferred game genres seemed to correspond with attitudes towards the trait-based system of defining sets of abilities where the avid role-playing- and strategy game players were less positive than the others, as elaborated on in Section 8.6.5.⁸ Only one of the players had no RPG playing experience of any genre asked about in Survey 1. Perhaps surprisingly, she was the player who showed the most rapid understanding of the game mechanics which were directly derived from the MM. Given the small sample of players no definite conclusion can be drawn from this, but it indicates that the mental model of the typical RPG class-based system may conflict with the mental model of the MM, which is derived from psychological models of personality and emotion.

8.6 Discussion: Implementation Focused Design Evaluation

8.6.1 Sentiments in the Play-Test Scenarios

As described in Section 8.3.4, where the PC Mastaya's traversal of the scenarios in the play-test was used as an example, sentiments came into play in the following situations.

In the first scenario, the gate keeper gave Mastaya two random sentiments by

⁸In this case there was a discrepancy between the results from the surveys and from the interviews and think-aloud sessions. In the survey results the participants reasoning about the trait-system was more positive and less elaborated ('It is great!') than in the interviews. Therefore the conclusions guiding the further development of the prototypes in this respect rely more on the materials from the think-aloud sessions than from the survey results.

pulling out objects from his bucket. The natures of the objects are deliberately chosen to have little emotional charge. Pulling out a spider from the bucket would for example have the given preconception of fear towards it. The objects that are in the gate keeper's bucket are as follows: a ping pong ball, a hat, an eraser, a sock, a mitten, a pencil, a pair of scissors and a shoe. One of the items were associated to Anger, the other to Amusement. These combinations constitute sentiments, i.e., for Mastaya a sock is tied to Amusement.

After this the gate keeper tells Mastaya the following: *'At night you wake up by an unfamiliar touch. There is a damp smell.'* Mastaya is then asked which of three objects would be most disturbing to find in the bed: a garden gnome, an empty noodle container or a small chair. Mastaya chose the garden gnome, and received a sentiment of Fear towards garden gnomes. In the second scenario Mastaya interacted with the NPC Teresa who was puppeteered by the test leader. Mastaya chose AAs such as 'gossip', 'tell small secret' and 'flaunt big secret', and the test leader chose reciprocal AAs that resulted, for Mastaya's part, in a sentiment of Interest towards Teresa. Teresa gained a sentiment of Interest towards Mastaya.

In the second scenario, players displayed a higher variety of differentiation in their choice of action than anticipated by the test leader. Teresa's emotional memory after the ten sessions in terms of sentiments may give a pointer; she has a sentiment of Amusement towards one character, Interest towards three, Joy towards three, and Satisfaction towards three characters. In the limited set of AAs available to the players it is possible to see which main types of AAs were chosen in the interactions. For instance, the three characters receiving a sentiment of Satisfaction chose to 'hug' Teresa several times.

In these two scenarios, sentiments, or emotional attachments, were instantiated in three different ways. From the gate keeper's bucket a *random sentiment* was instantiated (the Amusing sock), through a question a *sentiment of limited choice* was created (the Fearsome garden gnome), and finally sentiments were born as *results of interactions* (the Interesting character Teresa).

In the third scenario the player is navigating her PC on a board as shown in Figure 8.8. Present on the board is the goal, in form of a water cooler, and a number of objects. For each player three items were placed on the board, one that had a sentiment of Fear attached to it, one item that had a positive feeling attached to it, and one object that the PC did not have any sentiments attached to. The player started to navigate from the top left corner on the board as shown as a picture using a marker to signify the position of the PC on the grid.

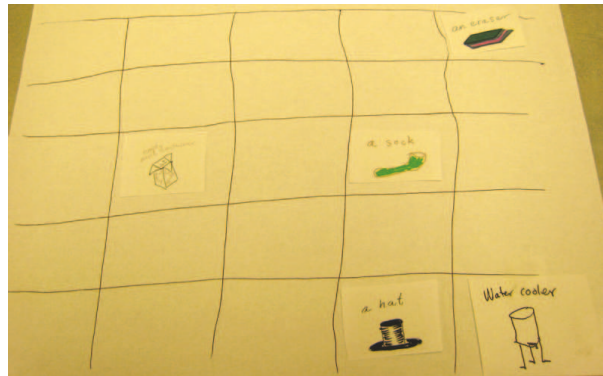


Figure 8.8: The board with a goal and sentiment objects that players navigated in the third scenario of the play-test.

This scenario mainly functioned to confirm that the concept of emotional attachments and their effect in a spatial environment was understandable to the participants in the play-test. All players successfully navigated the board towards the goal. An example

transcription of one of the players reads as follows:

'I was like whatever there is a gnome and then when I got close to it, I was like, well not that close. But then you said I was close and you started moving my things [note: the fear meter] and I was, oh my gosh, something is happening. Then I was like, oh whatever. What can a gnome do to me? So I tried to go right to it, then you like moved it up a lot and I was like, oh crap. So then I just tried to move away from it, and now I'm trying to walk around it cause I don't want to leave any spawns around that are bad [note: an emotion out of bounds spawns manifestations that stay in the environment, in this case Terror Trolls].

The majority explored what effect all the different objects would have on their PC's states of mind, and a few committed to reach certain moods in order to experiment on what effect that would have in the coming scenario.

In the fourth scenario Teresa asked for help in defending herself against the manifestations of Confusion. The PCs had reciprocal positive sentiments towards Teresa, resulting in giving both the PCs and Teresa a 'boost' in their state of mind, different according to the individual sentiments. This boost was helpful when they together defeated the Colossus of Confusion and the Sails of Sorrows and illustrated what effect a sentiment could have on the game mechanics.

8.6.2 Survey and Interview Results Regarding the Sentiments

As mentioned, a survey was conducted immediately after the play-test. One of questions was whether the participants remembered the sentiment objects, and if so which ones? One hundred percent of the participants remember the sentiment of fear they

got by limited choice (garden gnome, small chair or noodle container). For the random sentiments the memory of the group was less accurate, of the total 20 random sentiment objects (2 for each participant) 15 were accurately remembered, or 75 percent. The response text from the survey regarding remembered sentiments is presented in Appendix C.12

The players were asked to rate the three different types of sentiment objects according to their preference on a scale from Bad(1), Not so good (2), It was ok (3), Good (4), to Very good (5). There was a strong trend of preferring the instantiation of sentiment objects that resulted from interactions with Teresa, which received the overall score of 4.58, while the sentiments given by limited choice were rated to 4.0 and the random sentiment only 3.33. A representative comment by a player asked the survey question *‘What did you think about getting a sentiment towards the NPC Teresa when you interacted with her through using affective actions via your PC?’* was:

It was built through my actions and therefore made sense. I also felt a real emotional attachment to Teresa, whereas I could not care less about pencils or garden gnomes.

To the question of what sentiment object that had made most sense to the players and why, there was a strong trend to mentioning Teresa (70 percent), motivating it with that there was an effect of their actions that ‘made sense’. Three of the players instead mentioned the chosen sentiments: *‘because I picked it’*. When asked which sentiment object that had made least sense to them the majority of the players mentioned one of the randomly assigned sentiments: *‘Anger towards mittens. What did they ever do to me?’*

The interviews conducted in the play-test gave almost the same result as the surveys. Eighty percent of the players strongly expressed their approval of receive a sentiment towards Teresa through interaction. One player said:

[...]even though it is a made up NPC, it is like just the way you are interacting, the way you are affecting her mood, it makes sense to have a lasting effect. Like I'm going to remember Teresa. [...] in this sense it was like I was on par with her so it was cool that it had a lasting effect on both of us. And it makes it feel more real because they remember me too...so I like that part a lot.

In the interviews, 50 percent explicitly expressed approval of the chosen sentiments, and 30 percent of the random sentiments, a similar result as in the survey, though in some cases some silent on a certain subject in the interview instead expressed themselves in the survey, and the other way around.⁹

In both interviews and surveys, players expressed that the more agency they felt in relation to the creation of sentiments, the more they preferred it. One player said:

'This one made the most sense [pointing at the sentiment towards Teresa], the satisfaction. Because with Teresa I had a history with her, whereas I did not have much of a history with these other things. I have a history with the garden gnome, but it seems just as likely it could have been any of these other objects.

In the think-aloud parts of the tests, most of the players were reasoning about each

⁹As mentioned, the survey was conducted as a way to make sure that the results would not be skewed by the finding that participants in face to face situations in tests often tend to want to please the test leader and thus did not express views that may not be 'pleasant' but relevant to the outcome of test.

object's relevance to the rest of the context. The more impact they had had on the creation of the sentiment, the more meaning they could read into it. In the case of the sentiments towards Teresa they did not reason at all when they were 'thinking aloud'. Teresa and the sentiment towards her was not problematised or discussed, but accepted at face value. She was explored rather than questioned. The chosen and the randomly assigned sentiments were on the other hand discussed and interpreted. The players attempted to come up with explanations for the random emotions towards the objects. For example one player said *'I'm angry at socks, because you always lose that one in the dryer, then you end up with mismatched socks.'* Regarding the chosen sentiments half of the players tried to come up with an own back-story of why the particular object would hold a certain emotion for them, and 40 percent of the players came up with ad hoc explanations for the randomly assigned sentiments.

8.6.3 Deep Structure and Sentiments

The interview and survey results showed that sentiments instantiated as a result of interactions were what made most sense to the players. However, the notion of the sentiments given by choice seems promising. In my interpretation of the data, the players' main dismay came from the reasonable standpoint that the objects did not make sense in the environment. The fact that many of them created their own meaning, and seemingly enjoyed doing so, and that the actual choice gave them a limited feeling of agency is still unsatisfactory. Perhaps any such object needs to be rooted in deep structure of a story driven game world. In the case of persistent VGWs the drivers need to be the players if the chosen objects are to carry meaning. Possibly the notion of life-path systems, a feature used in some table top role playing games,

could be experimented with as a formalised way of creating individual back stories for the PCs, where the entities tied into the back-story have functional representations in the virtual world.¹⁰ A sentiment or a set of sentiments towards such an object would function as a memory as well as have an effect on a PC's state of mind and thus give a player material that a planned course of action can be based upon.

The interactions between Teresa and the PCs in the play-test were carried out in a context where several components were governing for the initial deep structure (discussed in Chapter 3). The script of the play-test gave the gate keeper, in Greimasian terms, the role as sender when he asked for a glass of water in the first scenario. Teresa received a role where she in the first meeting functioned as a giver of information, and in the second meeting had a role of someone seeking help. The PC had, in being the subject, in the first scenario a need for information, given that she was new in the environment, and in the second one she got the role of helper to Teresa. In the third scenario the sentiment objects with negative emotions tied to them would be the opponents and the ones with positive emotions would be the helpers in the PC's navigation towards the water cooler. In the fourth scenario the opponents would be the Colossus of Confusion and the Sail of Sorrow, while the PC temporarily stays acting as Teresa's helper on her way to the Gate Keeper (Karl). As a subject the PC could, in the last scenario, deliver the object (glass of water) to the sender (Gate Keeper). The constitution and rules of the game world governed the action potential of both characters, which was a limited dialogue, a set of AAs and a small sets of spells performing 'mind magic'. The exact actions of all the PCs varied, and took

¹⁰A life-path system is a formalised way to provide a character with a back-story at the character creation stage. In the table top RPG MechWarrior 3 the following information is asked for: 'early childhood, age 10', 'Late Childhood, age 16', and 6 additional paths (Path 3 to 8) concerning 'higher education and real life'. Another table top RPG using a life-path system is BattleTech Solaris.

place in the surface structure, but the result was that new components were added to the deep structure: the sentiments, different in nature to each PC, depending on the choices of the player.

8.6.4 Affective Actions

Players were introduced to Affective Actions (AAs) in the second scenario of the play-test where they met the NPC Teresa who was played by the test leader. Teresa had an identical character sheet as the player but with values showing that she was depressed. The players were able to see where Teresa's marker was on her mood co-ordinate system. Teresa introduced the player to the use of Affective Actions (AAs) by saying that she was very sad, and asking for a 'hug'.

Seven of the players chose to 'hug' Teresa, while three of them started the sequence of performing AAs in the scenario with using 'comfort'. The AA 'comfort' would diminish the emotions of sadness and anguish in the targeted character. No one chose the AA 'Look at target with dismay' which would have created an increase in the nodes confusion and sadness. Some AA's were to be used in a reciprocal fashion, such as 'joke' where the target could respond by either 'Laugh at joke', or 'Refuse to laugh at Joke'. Using such an AA included a risk, since if the target chose to, or had to refuse due to the mood, the effect on the joker would be an increase in distress and sadness. Laughing on the other hand would give both the joker and the target in increase of amusement, plus an increase in the satisfaction node of the successful joker. However, if the target of the AA 'Joke' had her mood marker in the leftmost row in the mood co-ordinate system in the character sheet used in the play-test (see

Figure 8.1) it was not possible to use the ‘Laugh at Joke’ reciprocal AA. Figure 8.9 shows a participant using an AA in the play-test.



Figure 8.9: Guided paper prototype play-test. A player is using an AA by pointing the note representing the AA at the paper figure representing Teresa.

The play-test situation in the second scenario changed in the majority of the ten tests from the think-aloud protocol to more resemble a situation of participatory design. Players suggested other types of AA that they would like to use instead of the ones provided. These suggestions were immediately added to the prototype and the participant could try them on Teresa. Figure 8.10 shows the second scenario where Teresa asks for a hug. The marker on Teresa’s mood co-ordinate system in the top left of the picture shows that she is in a depressed mood. The markers symbolising the affective actions are placed in the lower part of the picture. The pink and the lilac AA markers were the ones provided in the start of the scenario; Comfort, Look at Target with Dismay, Hug, and two AAs reciprocal to Hug; Be Hugged and Shrink Away. Some of the players thought these actions too extreme given that this was

the first time they met Teresa; for example, one of them requested to respond with Stunned Silence (see hand-written note in Figure 8.10), another to be able to Small Talk.

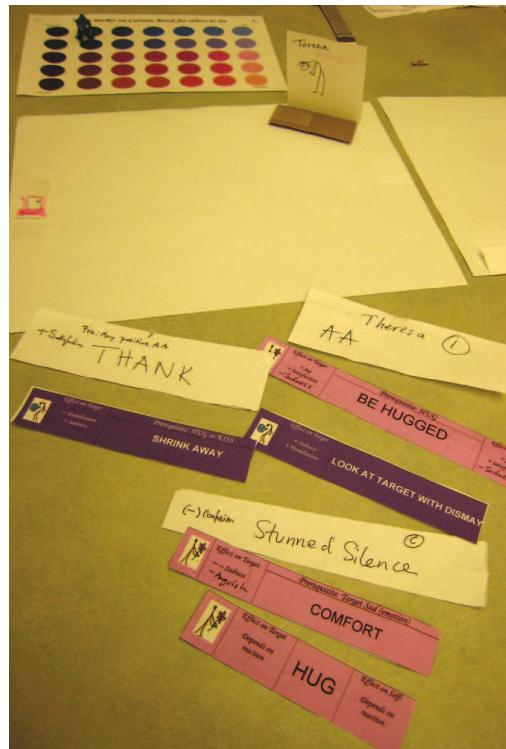


Figure 8.10: The first set of AAs introduced to participants of the WoM play-test.

In the second step of introducing AAs the following AAs were added: Cheer Up, Joke and the reciprocal Laugh at Joke and Refuse to Laugh at Joke. The conversational AAs Gossip, Tell a Small Secret and Share a Memory were added along with the reciprocal Agree, Be Very Attentive and Misunderstand on Purpose. Two more steps of introducing AAs were added in some sessions if the time limit allowed and the participant requested it.

The feedback from the participants was used when the AA feature was reiterated

for the digital PI prototype. In PI the initial meeting of the NPC Teresa was also different (see her dialogue in PI in Appendix B.6), she did not ask to get hugged. In PI the first set of AAs the player can learn is Small Talk, Calm Down, Look at Target with Dismay, Ignore, Joke, and the reciprocal Laugh at Joke and Refuse to Laugh at Joke. This set of initial AAs in PI affects the mood of the target in all four directions of the mood co-ordinate system, allowing players to try out the feature on each other's PCs. Specifications of which AAs a player has access to in the five subsequent steps of learning AAs in PI are presented in Appendix B.1. Based on the pace indicated as comfortable in the play-test for introduction of new AAs, sets of eight AAs are introduced at each step in PI except for one of the steps where only four are introduced. In this step players are introduced to AAs with more properties than the others; they affect all entities close to a PC and are only available if a PC is in an extreme mood.

The fourth scenario of the play-test was designed to focus on the introduction of mind energy and mind resistance and on using spells on single sentiment mobs, as well as on evaluating how the participants would take to the 'spawning' of new single-sentiment manifestations. While designing the scenario I was concerned about adding too much complexity due to a multitude of features and concepts in a single scenario. However, in the test situation all players used the game system to its fullest, even using AAs in combination with the spells. The behaviour of and the comments from the participants gave useful feedback about how to limit the use of AAs in the PI prototype as described in Chapter 7, Section 7. Several players noted that players might 'misuse' the system by repeatedly hugging each other, something that hardly

would be a believable behaviour.

Summarising, the players enjoyed monitoring the fluctuations of the mood in their own PCs and Teresa and experimenting with different AAs. The second scenario was popular among the participants. In the survey, which did not include any questions about the AAs, the majority of the players pointed it out as their favourite part of playing the prototype as a response to the question in the last survey about what they particularly enjoyed in the play-test. Several of the participants used the expression ‘make sense’ when discussing the mood feature in relation to the affective actions in the interviews conducted in relation to the tests.

8.6.5 Spell Abilities

During the play-test sessions players received spell-casting abilities at two occasions. The fourth scenario started with Teresa exclaiming via pre-written dialogue that she is attacked by a single-sentiment manifestation, a Colossus of Confusion. She calls for help and asks the player to ‘pick up the pen’. When players placed the marker for their PCs by the ‘pen’, as shown in Figure 8.7, the test leader gave them the spell Laser Pen of Clarity, represented by a white note in the lower part of the figure.

In the PI prototype the mechanics of ‘finding’ a spell as an item in the environment was discarded. The reason for this was not that the approach was dysfunctional. On the contrary, players found it comprehensible, and it is a common way in RPGs to give players access to spells (often contained in items called ‘scrolls’) where randomness create varieties in different PCs’ sets of abilities. The reason for discarding this way of giving abilities to PCs was a guiding design principle in PI not to use items

of any kind at all.¹¹

In the final scenario, each player was given two spells by the gate keeper, based on their personality traits. One spell was based on the highest trait value in the factor Neuroticism, while the other was based on the highest factor value (except if that factor was neuroticism, in which case it was ignored and the factor with the second-highest value was chosen).

Seven of the ten players had positive comments about receiving PC-capabilities based on traits. The other three raised the issue that the spells were not of their own choice.¹² The three players who had reservations are avid players of single-player RPGs, and thus have deep knowledge of many varieties of character class systems. As Solemni's player put it the fourth survey:

Getting spells from personality is a different method of choosing how your PC interacts with the world — like a class. Not having direct control over your class may be a difficult pill to swallow.

This highlights an important difference between a trait-based and class-based character systems. In traditional RPGs, the character class defines which abilities become available to the player during the progression of their PC in the game world. In contrast, instead of 'rolling' a new character as in a traditional RPG or MMORPG, the

¹¹I formulated this guiding principle because the research questions of this project seldom concern issues of monetary economy. The moment it is possible to pick up an item, or receive it from an other entity, and be able to give it to another, or dropping it on the ground available for another, an economy is created even if no currency is available in the game system. As a side effect, this principle also simplified the development of the digital prototype, eliminating for example the task of creating an inventory feature.

¹²The response text of Question 6 in survey 4 concerns personality based spells. Only two of the participants raise the issue of choosing spells in the response text. All three discussed it during the play-test. The response text on Question 6 in Survey 4 is presented in Appendix C.14

WoM player who would like to try another play style will instead create a character with a different personality. Since personality-based capabilities (such as mind magic spells) are not organised under classes, but instead rely on relationships between the different traits, the combination space of the possible actions for an individual PC is larger than in a traditional class-based RPG. A player will actively have to experiment with multiple characters to begin to gain a sense of the strengths and weaknesses of different trait combinations.

However, given that players in PI and WoM create their personalities in the beginning of the game they cannot, given the current implementation, affect the traits of their personality in order to modify their abilities. Instead they can learn during the progress of the character development about what this specific VGW gives them in terms of potential behaviour given the specified personality.

An alternative design which had to be discarded due to the large implementation effort required to realise it was to let players make a self-assessment of the five personality factors in the beginning of the game. During game-play different actions and challenges would be designed with inspiration from the Five Factor Model in order to define the value of each trait as results of players' actions. Each time a trait node received a value as a result of players' actions the personality would become more refined, and the action potential of the PC would be modified. This approach might provide a more challenging and interesting way of, 'becoming oneself' during game-play as one would 'be' in the given environment. In this way the progression of a character in terms of levels and abilities might be closer to 'the journey as a route to self-knowledge' as discussed in Section 3.9.2.

8.7 Conclusions: Design Implications Relevant to the Pataphysic Institute

The relevance of results from a test of a paper prototype to a computational system cannot be taken for granted. For instance, in the WoM play-test the graphical representation of a PCs mood was represented in a way that differed a lot from the designed graphical representation of the mood in the digital PI prototype.

In the test, players were asked about their opinion of the colours representing moods in the mood co-ordinate system. In the WoM play-test, the mood was represented by hues and shades of red and blue. The position in the mood co-ordinate system was marked by a relatively large marker. Six of the participants were happy with it as it was, while five suggested using other, or several, colours (see Appendix C.13). In the implementation of PI a colour wheel is used, with the full spectrum of colours. Since the mood of other characters are signalled by an aura which is not that large, and transparent around the head of characters, I believe that the mood nuances would be easier to distinguish if more colours are used.

Another example where results from the paper prototype play-test did not yield useful advice for the design of the digital prototype were the two open-ended questions that started both interviews which were part of the play-test; ‘What do you think will happen next?’. The tightly scripted scenarios in the paper prototype were in most cases not representative enough for an open-ended VGW environment. Many answers were concerned with the interface; in the paper prototype pieces of yellow carton were used as symbols for buttons that the players could ‘click’ (by pointing at them). When they had their brown carton side up they signified that they were ‘greyed out’ and

not usable. As the test progressed more ‘buttons’ were turned up on their yellow side and became accessible to players. At the end of the last scenario there were still unused buttons left, among them ‘social contracts’, a feature which was discarded for the current PI design. The majority of the players correctly assumed that the next portion of the game would follow the same principle, and that they would get introduced to the mechanics underlying the greyed out buttons.

Norman (2005) noted a potential pitfall of user-centred design in that sometimes listening too closely to users may lead to overly complex solutions and lack of cohesion in a design. Norman argued for an approach that focussed on activities as compromised by tasks, which themselves are comprised of actions. The following sections summarise results from the test which have given pointers that were helpful for the design of the digital prototype. These results are guided by the feedback and the critique given by the participants, but also by observations of what types of activities the users accepted at face value and how they carried out these activities.

8.7.1 Sentiments and Attributing Meaning to them

In the discussion in Section 8.6.3 I concluded that if sentiments are to be used in meaningful way they need to be rooted in the deep structure of the world which is the base for story construction. The way the sentiment objects that were given to the participants as random choice and as result of interviews did not make sense to the players, who actively used their imagination in order to tie them into the world by giving them meaning. This was a hard task given the arbitrary nature of the objects. In the WoM prototype the sentiment that did make sense to the players were the one towards Teresa, which was a result of their interactions with

her. In PI, mechanics for the creation of sentiments as results of interactions were implemented, as well as the mind magic spell Sentiment Curse/Blessing, which is still in an experimental phase. The use of sentiment objects which are inanimate (that is, ‘things’ rather than expressive agents) holds a lot of potential however, given that the VGW they are to exist in caters for the functionality and that the crafting of the world incorporates the objects in ways that can be perceived as meaningful by the players. The sentiment nodes, or emotional attachments, can in WoM and PI emerge and decay as a world is inhabited, and would in the ideal case have meanings for those performing, playing and inhabiting the virtual world because they would be directly based on the interactions between them.

At the time of the play-test conducted with WoM the back-story was not worked out in detail. Several players requested more information of the back-story during the play-test. In those cases the test leader could explain events in the test relying on the back story. This gave the players better understanding of the systemic mechanics. The players’ understanding of the mechanics seemed to be intertwined with the meaning they could attribute to the events in terms of the back story of the world. The unconscious assumption that I had made while designing the play-test, that it would be enough to only provide the ‘skeleton’ (the system) for the understanding of the system, without giving the ‘meat’ (the back-story), proved to be false. It seems to be essential that any sentiment objects used — even for a testing situation — is anchored in the deep structure of the game world, even if it is a small one, in order to receive representative results regarding the systemic aspects of the design. For the PI prototype a more detailed back story was written as presented in Section 7.4.

8.7.2 Agency and Co-creation

During the tests, the interviews and the surveys there was an inclination among the participants to, when given alternatives related to issues of agency, prefer the alternatives with the highest possible agency. In this context the term agency conforms to Murray's definition (1997, p. 126): 'Agency is the satisfying power to take meaningful action and see the results of our decisions and choices'.

In the second survey, conducted after the IPIP-NEO test and before the play-test the participants were asked hypothetical question of how they would prefer their PC's personality to be created. They were asked to rate three alternatives; a personality test in the beginning of the game, a series of interviews done by short dialogues with NPCs spread out during the game, and a series of game activities where their actions define the personality traits of their PCs. The participants rated the third choice highest and the first choice lowest on a scale of preference.

Section 8.6.2 discussed survey and interview results regarding sentiments that players preferred. Participants had a particularly positive attitude towards sentiments that had been created as results of players' actions. The more impact they had had on the creation of a sentiment, the more meaning they could read into it, and the more 'sense' did it make.

The high perceived agency in the second scenario (where players interact with Teresa using AAs and sentiments are instantiated) might be an explanation for its popularity among the participants. However, an alternative interpretation could be that it was popular because the players in this scenario were welcomed to participate in the design process by suggesting new AAs. The satisfaction of co-creation can in PI potentially be experienced in the creation of compound manifestations, but perhaps

a possible future feature for implementation and testing would be the authoring AAs that could be either individual, as means of self-characterisation, or for departments, where specific AAs could be part of characterising the behaviour of a group.

8.7.3 Core Game Mechanics

The third scenario where the players navigated sentiment objects on a board had the main purpose of testing whether it would be feasible to use game mechanics where character's emotions are affected by the mere proximity of an entity that the PC has a sentiment towards. Also, when players met Teresa for the second time their PCs' emotions were affected by the sentiment created at their first meeting. The effect of the mechanics of sentiment by geographical proximity was accepted at face value — players seemed to view it as 'natural' that it would be so. This promising feature has therefore been used more in the PI design where PCs are not only affected by sentiments in proximity which are results of interaction or authoring, but also by formalised social relationships. PCs in PI 'feel' Belonging in proximity to friends and members of the same department.

Another feature which was accepted at face value by the participants was the 'spawning' of single-sentiment manifestation as results of emotions going 'out of bounds'. One player was careful to not become so 'scared' while navigating the board of sentiments in the third scenario. She did not want not leave Terror Trolls behind on the board for the next participant in the play-test to deal with. Based on the direct acceptance of the mechanics of the birth of single sentiment manifestations showed by the participants the design was implemented as planned in PI.

The play-test gave important pointers to introducing AAs to players. As described

in Section 8.6.4, the results from the play-test affected which AAs became part of the current set and in what pace they are introduced to players in PI. When players interacted using AAs the constraints of which AAs they could use (depending on their own) mood, and which ones they could use on Teresa (depending on her mood) was understood instantly. In the test, no mood constraints were applied for the use of spells except for the available amount of mental energy. The direct understanding of mood constraints for AAs displayed by the participants in the test confirmed that this type of mechanics would be feasible to use. It was therefore used in the reiteration of the mind-magic spell system whose constraints builds upon 13 different spaces in the mood co-ordinate system as described in Section 7.6.4. As mentioned in Section 8.4.2, the spell system for PI was modified such that the action potential would characterise the current mood of the character as well as its personality. Furthermore, the system was balanced in a way that aims to make sure that introvert and neurotic characters not would be ‘gimped’ given the social character of many features in the game by giving them powerful spell options only usable in depressed states of mind. This design decision was directly based on the worries expressed by players regarding personality types, that in fact had a bearing on the game mechanics. Furthermore, as discussed in Section 8.6.5, the test results indicated that players found it ‘natural’ to receive spell-abilities that were characterising for the PC, a feature which was further developed in PI (as described in Section 7.6.5).

8.8 General Conclusions

The approach for play-testing WoM was inspired by methods from user-centred design as well as from iterative game design. Play-test sessions and interviews were

videotaped. Additional data were collected using web surveys. Data from the video-recorded material was gathered using the transcription and analysis tool Transana. The data was analysed using the model advocated by Miles and Huberman (1994). In addition, results from web surveys were used for potential refutations of the findings. Also, the activity-centred approach presented by Norman (2005) was taken into account when design implications of the findings were considered.

Generally, the findings indicated that participants were able to formulate ‘correct’ mental models of the MM-derived game-play mechanics in that they constructed meshed sets of patterns of action potential that allowed them to act in a way that had the effects on their PCs that they desired. Participants used the ‘mental physics’ of the MM to discover alternative strategies for completing scenarios that had not been foreseen by the test leader. Players used mental models of mood and personality from their ordinary lives to understand the MM-derived mechanics when information given in the play-test did not contradict these models. These results indicate that if the game-play mechanics differ from the mental models that players apply to a VGW using the MM, game-mechanics at odds with the players’ preconceptions need to be communicated clearly. Participants had the inclination to reason more about the personality factor extraversion than other factors. Therefore it appears that the mechanics of this factor would be particularly easy to communicate if its use resembles players’ preconceptions of it, but if it is used at odds with players’ preconceptions its mechanics need to be carefully designed and communicated.

Participants were generally of the opinion that the personalities of their PCs had been reflected in a ‘true’ way by the results of the IPIP-NEO. This indicates that this method of character creation can yield personalities for PCs that correlate with the

nature players intend for their PCs to have. The issue of privacy of the personality trait values were by players not considered to be more important than the potentially interesting strategic elements that revelation of these values might result in. That is, if personality trait values of a PC are visible to other players in certain contexts, and this adds to the game-play experience, this is more important than the lack of privacy because the PC's personality traits are revealed.

Players with extensive knowledge of role-playing computer games expressed reservations regarding the trait-based character system. This indicates that a trait-based system for characters can initially be difficult to understand for players who use mental models of traditional class-based character system of role-playing computer games in a context where a trait-based system is used. If the intended target group of a VGW using the MM include avid computer role-playing game players this needs to be taken into account, and the game-mechanics at odds with their preconceptions need to be communicated clearly.

When participants were asked about their preferences regarding different game-play elements they responded that they generally preferred those options that gave them the highest possible agency. This reinforces the well-known design approach where a high sense of agency is a desirable goal for a design, assuming that it makes game-play experiences more enjoyable for players.¹³

In the play-test participants accepted several game-play mechanics at face value. That geographical proximity of their PC to a sentiment object would affect their PC's state of mind was one such mechanic. Another was that the 'spawning' of a single sentiment as an externalisation of a strong emotion was perceived as 'natural'. A third

¹³For extended discussions concerning the concept of agency in games with narrative elements, please see (Wardrip-Fruin *et al.* , 2009; Mallon, 2007).

mechanic that was accepted at face value was that the mood a PC could restrain what types of action were possible to perform at a given moment. Fourth, it was perceived as natural by the participants that the availability of certain abilities could depend on the personality of their PC. These results indicate that these mechanics are feasible to use in the design of a VGW using ‘mental physics’ of the MM.

8.9 Summary

This chapter has described the guided paper-prototype play-test of World of Minds, in which the game mechanics build upon the MM’s model of personality and emotion. In a case study of AI-based game design, lessons learned from the test have been presented. The players were able to form and communicate mental models of the mind module and game mechanics, giving valuable feedback for the digital prototype PI. Despite the constrained scenarios presented to test players, they discovered interesting, alternative strategies, indicating that the ‘mental physics’ of the Mind Module may open up new possibilities for game design.

Chapter 9

Conclusions

Contents

9.1 Summary	268
9.2 Challenges in the Design of Virtual Game Worlds	274
9.3 Concluding Discussion	275
9.4 Limitations	285
9.5 Conclusion	289

9.1 Summary

In Chapter 1 a number of qualities of virtual game worlds (VGWs) were identified as particularly interesting. Firstly, VGWs are *places* where players interact with and create elements carrying narrative potential. Secondly, players add goals, motives and driving forces to the narrative potential of the VGW which sometimes originates from the ordinary world. Thirdly, the protagonists of the world are players, and when acting in the world their characterisation is not carried out by an author, but expressed by players characterising their PCs. How players can express their PCs in

way that characterise them depends on what they can do, and how they can do it, which depends on the design of a particular VGW. This is the characterising action potential (CAP) of a VGW. Fourth, in VGWs Caillois' notions of modes of play *paida* and *ludus* exist in combination and side by side, something Caillois did not think possible.

In Chapter 1, I also suggested that the often discussed lack of narrative and lack of role-playing elements in VGWs are perceived problems rather than real ones, originating from notions of what VGWs 'should' be rather than from what they are. I approach these questions, among others, from the perspective of what VGWs 'could' be. Relying on the thoughts of Mateas and Stern (2005), the design space of VGWs was identified as a wicked problem space. Exploring game design consists of 'navigating complex relationships and constraints among individual design features, while at the same time discovering or inventing new features that expand the design space' (p.8). In order to explore these design spaces it is necessary to not only study existing games but to build games. In other words, as put by Mateas and Stern (p. 2): 'Models about the nature of games and their features run the risk of being incomplete or wrong, simply because certain design spaces has not yet been explored.'

Two main questions are explored in this thesis. Firstly, how can CAP can be designed to support players in expressing consistent characters in VGWs? Secondly, how can VGWs better support role-play in their rule-systems? By using iterative design, I have explored the wicked design space of CAP by building a semiautonomous agent structure, the Mind Module (MM) and applied it in VGW prototypes where the design of the CAP and other game features is derived from the MM.

In Chapter 2, VGWs were discussed as spaces for construction of narrative potential. Terms used in this thesis were introduced: story, narrative, discourse, narrative potential, agency and story construction. Expressive agents and semiautonomous agents, created and controlled by developers, in-game creators and players, were introduced as constructors and realisers of narrative potential. A four-layered model of text levels in VGWs was described, where the Code Level and the Story Level were recognised as the levels where the designed, or authored, narrative potential is created. The played narrative potential is created at the Discourse Level and the Narrative Level. The story construction is performed at the Story Level and the Discourse Level through persons using expressive agents for signification. Finally, the open story structure of VGWs was discussed by providing examples showing that the narrative potential is affected by a multitude of goals of which many are derived from motivations outside the narrative potential authored by the world creators.

In Chapter 3 the importance of the playable character (PC) was stressed. The concept of characterising action potential (CAP) was described as encompassing both characterisation and true character, as defined by McKee, designating what a player can do at a given moment in a VGW that characterises their PC. Role-playing, self-playing and identity construction in VGWs was discussed as well as immersion, presence and Bartle's concept of persona. It was stated that current VGWs have elaborate tools for characterisation of PCs, but less for bringing out their true character. The expression of true character in game worlds could lead to deeper and more meaningful dramatic experiences as well as supporting a higher degree of immersion into a game world via

closer identification with a particular PC which, in turn, could support the development of a persona. It was suggested that expression of true character in VGWs may be achieved partly by game mastering and partly by developing more sophisticated architectures for CAP.

Chapter 4 introduced the concept of the bleeding circle as the situation where strong interpersonal relationships seep between VGWs and the ordinary world. A number of design questions which I find important for the evolution of VGWs were introduced, with the reservation that some of them may be ‘holy-grail questions’, that is, questions to which there may be no answer, but that are important because they provide the driving force to navigate wicked problem spaces. The questions are presented in their full length in Section 9.2 and discussed in Section 9.3.

Chapter 5 described the Mind Module (MM), a semiautonomous agent architecture built to be used in a VGW as a part of PCs. The MM gives PCs personalities based on the Five Factor Model, and a set of emotions that are tied to objects in the environment by attaching emotional values to these objects, called sentiments. The strength and nature of a PC’s current emotion(s) depends on the personality of the PC and is summarised by a mood. The MM consists of a spreading activation network of affect nodes that are interconnected by weighted relationships. The values of the nodes defining the personality traits of characters governs an individual PC’s state of mind through these weighted relationships, ideally resulting in values characterising a PC’s personality.

While describing the MM, an account was given for which sources of inspiration have been used in the construction: spreading activation theory, trait theory, affect

theory and Moffat's model of how emotion can relate to personality. The approach used in the design of the MM was compared to the approach of Dynemotion People Engine and to that of the OCC model.

Chapter 5 also provided a brief history of the development of the MM as well as an overview of related work in the areas of believable agents and expressive AI, emotion modelling, applications for story construction and related work which use trait theory when constructing autonomous agents.

Chapter 6 described the early prototypes where the MM was used as part of the implementations. In Ouroboros an important focus was to explore the use of expressive gestures of 3-D characters. Different gestures were available for use depending on the state of mind of the PCs and were consistent with their personalities. In relation to this, early sources of inspiration for the implementation of the MM were described. Ouroboros was developed at the Zero Game Studio, part of the Interactive Institute in Sweden.

Garden of Earthly Delights (GED) was the demonstrator of the work package Massively Multiplayer Reaching Out (MMRO) of the Integrated Project for Pervasive Gaming (IPeRG). The focus of MMRO was to explore ways to integrate massively multiplayer gaming with the play via cell phones with geographical location data. A guided paper prototype play-test was conducted where issues of player-control of a semiautonomous PC was discussed. Test results showed that players with live-action role-playing experience were particularly positive towards the MM-derived game-play in the test. The Mind Music application, also a part of MMRO, focussed on how music can be used to express complex states of mind to players, communicating mood

and emotions of their own PC via leitmotifs and groove.

In Chapter 7 the game design of the prototypes the Pataphysic Institute (PI) and World of Minds (WoM) was described. A background to the practical work of developing the prototype and an overview of the game design was given. Next, the core game mechanics were described briefly: then the main features of the design were described in detail. What PCs can do in a given moment is largely governed by their mood. Depending on PCs' mood space they can cast different spells, which affect values of mental energy, resistance and emotion in their targets. The position in the mood co-ordinate system also governs which affective actions they can perform towards other PCs and what affective actions they are receptive to. By performing affective actions on each other, PCs can affect each others' emotions, which if they are strong, may result in sentiments towards each other. PCs' personalities govern the trend in the individual fluctuations of mood and emotions, and define which types of spell PCs can cast. Formalised social relationships such as friendships and protector-protégé relationships also affect the CAP, giving players more energy and resistance, as well as activating the emotion nodes Belonging and Pride. PCs' states of mind are reflected in the world in the form of physical manifestations that emerge if an emotion 'goes out of bound'. These manifestations are entities which cast different spells on approaching PCs, depending on the emotion that the manifestations represent. PCs can also partake in authoring manifestations which become part of the world and the game-play in it. There was a strong focus of the design of the CAP in PI on expression of character — to both self and others — through fluctuations of CAP and of manifestations of the own mental state that become part of the game

world. The expression of true character may be facilitated by the designed CAP, but is ultimately dependent how players use the CAP while constructing and realising narrative potential.

Chapter 8 described a guided paper prototype play-test of World of Minds, in which the game mechanics build upon the MM's model of personality and emotion. In a case study of AI-based game design, lessons learned from the test were presented. The participants in the test were able to form and communicate mental models of the mind module and game mechanics, giving valuable feedback for the digital prototype PI. Despite the constrained scenarios presented to test players, they discovered interesting, alternative strategies, indicating that the 'mental physics' of the MM may open up new game design possibilities. However, it must be noted that the test, while it was fruitful for the future work in PI, does not prove the MM's general applicability to game worlds.

9.2 Challenges in the Design of Virtual Game Worlds

Six design questions which I find important for the evolution of VGWs were introduced in Chapter 4. The questions are presented here in their full length because they will be further expanded upon in the next section, referred to by number. The questions, whose relevance is based on assumptions presented in Chapters 2, 3 and 4, are as follows:

1. In what ways can VGWs be designed to facilitate situations that involve challenges, conflicts and choices that would express the true character — the very essence of a person's nature — of a player — or a playable character (PC)?
2. In what ways can VGWs by their system design and game-play rules further support players' development of personas to — as Bartle described it — reach the 'final level of immersion'?
3. In what ways can means be provided for all players to be heroes, protagonists, in their own drama, that is, integrated in the very story construction and deep structure of VGWs?
4. The role-playing in current VGWs relies on meta-game rules since role-play is poorly supported by rule-sets and game mechanics. In what ways can VGWs support role-play in their rule systems?
5. How can characterising action potential (CAP) be designed to support players in expressing consistent and interesting characters in VGWs?
6. Players in VGWs often develop strong interpersonal relationships. Identity construction is affected by individuals' relationships to and mirroring of each other. How can the power of these relationships be harnessed by design of the CAP to make the game mechanics more interesting?

9.3 Concluding Discussion

Characterising Action Potential (CAP) was described as what a PC can do in a VGW at a given moment that has characterising effects. CAP encompasses both

characterisation the way McKee describes it, as what is merely observable about a character, as well as what McKee calls true character — a character's essential nature, expressed by choices of the PC. CAP is the means that players have for expressing the character of their PCs to other players, but it is also via CAP the players gets to know and develop their own PCs - a process which is an interplay between a particular player and the game system.

The nature of CAP defines what role and what impact a PC can have in the creation and realisation of the narrative potential in a VGW. It is also defining for the progress of the PC in terms of achievement and role-differentiation in a VGW, and for how this process is interpreted by the player while potentially constructing the identity of the PC, the player's second self. How the PC and its CAP is integrated in the underlying story construction system of a VGW is defining for to what extent PCs can make truly dramatic choices as part of the deep story structure of the VGW. If they can, the PCs are protagonists in the world.

CAP is essential to addressing the question of how PCs in VGWs can be supported in expressing consistent and interesting characters (Question 5 in the list of design challenges in Section 9.2). This is also crucial for addressing how role-play can be supported by the rule-systems of VGWs (Question 4).

While the Ouroboros prototype focussed on expression of character performed to other players through gestures and the Mind Music prototype explored expression of players' own PCs to the players themselves, the focus of PI was on expression of character — to both self and others — through fluctuations of CAP and of manifestations of the PC's mental state that become part of the game world.

In Section 2.2.3, PCs were described as semiautonomous expressive agents, partly

controlled by their players, and partly controlled by context-sensitive action potential and possibilities of expression as well as by varying degrees of autonomous reactions to in-game situations specific to the VGW they inhabit. A well known rule-of-thumb in game design is to make sure that the players feels in control (Höysniemi *et al.* , 2004). Autonomous behaviour in PCs is rare in VGWs while the restraining of action potential of PCs is inherent in all designs.

The degree of player-control which would result in enjoyable game-play for players, the sweet spot of semiautonomy, could vary with the specific design of a VGW on a sliding scale of control as illustrated in Figure 9.1. It is also important to take preferences of player target groups into account. For instance, the play-test of GED (see section 6.2.2) indicated that VGW players with live-action role-playing (LARP) experience were more positive to a higher degree of autonomy of PCs than VGW players who did not have LARP experience. The players with LARP experience were particularly positive to those autonomous aspects that would support role-playing potentially interesting characters. For the design of CAP using semiautonomous agents it is important, in the design, to clearly distinguish between properties and features that characterise the PC to the PC's player and which parts that are tools for the player to characterise the PC to other players. In the first case the CAP is an interplay between a system and a player, in the latter a player uses the CAP of a system to perform the role of a PC in relation other players and their PCs.

The behaviour of a PC equipped with a MM is two-layered: one layer is provided by the MM, which through integration with the architecture of a VGW provides the action potential. The other layer is the actions performed by the player controlling the PC, actions performed within the provided action potential. Ideally the bottom layer

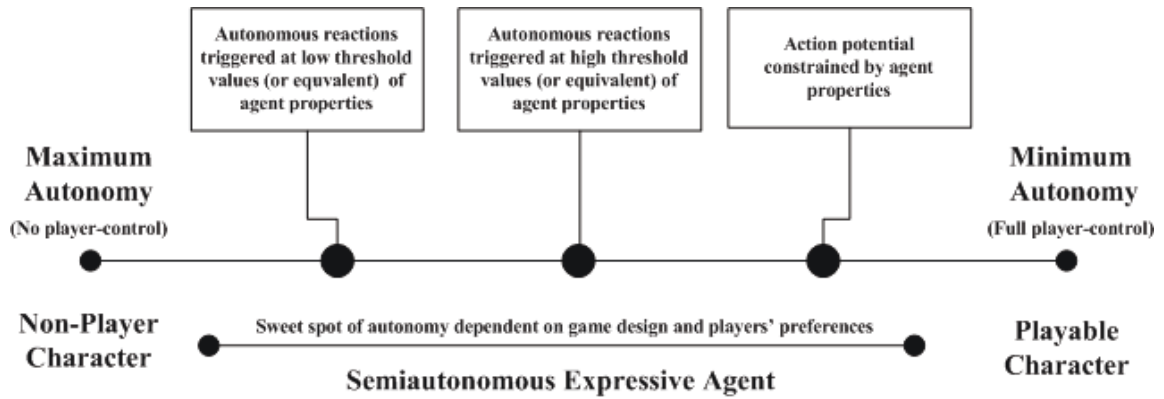


Figure 9.1: Semiautonomy

of the semiautonomous agent structure of the MM would facilitate players' expression of personality, in Moffat's (1997) words 'the name we give to those reaction tendencies that are consistent over situations and time' (p. 133).

The restrictions of the action potential depend on both the context and the values of the personality trait nodes of an agent. Whether the values of the personality trait nodes are chosen by the player or authored by a world creator or game master is a design choice. Also, the level of player-control is a design choice which needs to be made according to specific designs of VGWs.

The social multiplayer aspect of the prototype worlds in which the MM is used makes it possible to use game-play mechanics that emphasise social aspects. Through game mechanics such as 'affective actions', and 'mind magic spells' described in Chapter 7 emotions are affected by the full range of traits of the Five Factor Model. In the PI prototype, players can themselves set their PCs' node values of personality traits by completing the IPIP-NEO test consisting of 120 rating scale items in order to create a personality for their PCs, or they can choose a ready-made personality template. In the Ouroboros prototype the PCs were instead authored, designed to tie

into an authored plot that players could develop during play, possessing for instance the character Greyhowl (see Section 6.1.2).

The use of the MM in PI for PCs operates by design on the right-hand side of the scale of semiautonomy (Figure 9.1), that is, the autonomy is used in a fairly low degree, limited to constrictions of action potential guided by personality and current mood. If the degree of autonomy for PCs was to be increased in PI, autonomous reactions of PCs could be triggered at threshold values of various MM properties. For instance, a PC could laugh (or rather an animation of the PC laughing could be triggered) if the emotion node Amusement reached a certain value. Another example could be that if the emotion node Fear reaches a certain value a PC could be caused to either flee or attack, where the involuntary reaction would depend on a particular PC's personality. In relation to the degree of autonomy used for PCs, it has to be noted that autonomous reactions performed by players' representations may be potential barriers to players' experience of immersion, especially if the reactions of the PCs are at odds with players' own emotional states.

While the architecture of the MM to a large extent relies on theoretical work from the field of psychology it has been an important design goal to make the MM into more than an experiment of different theories of psychology applied to agent structures, that is, to integrate the MM to VGW prototypes, with emphasis on the gaming aspect. Another important aspect of the design has been, to use Bates' expression, the 'believability' of the semiautonomous PCs to their players.

CAP ties into Glenberg and Schubert et al.'s work about presence in virtual environments, where they propose that representation of users is understood by what

actions are possible to perform in the environment. The users construct, by assessing their action potential, meshed sets of patterns of action. This is comparable to strategies of action in VGWs which rely on the nature of the CAP of PCs. The meshed sets of patterns of actions are constructed by the users, constituting the mind models the users have of their action potential. The mental construction of CAP in VGWs is crucial since this governs how players use it. This is one of the reasons that the play-test of WoM had a strong focus of evaluating whether players could construct mental models, or ‘reverse-engineer’, the game mechanics derived from the MM. The test players’ understanding of the impact of personality trait nodes on their CAP in WoM was very important for the design of the digital PI prototype.

Interestingly, for some players the constructed meshed patterns of actions in the play-test of WoM was dependent on information about PI’s back-story. If they could relate game mechanics to the back-story, and also construct a mental image of the deep structure of the story it was easier for them construct the meshed patterns of action. In other cases the construction of meshed patterns of actions was hindered by the players’ preconception of role playing games, especially regarding the fact that the CAP was not dependent on character classes but rather on a combination space of personality trait nodes.

The CAP and the mental model of it are highly individualised in VGWs since it is normally possible to play in very different ways, depending on the chosen and developed action potential of PCs. The combination space of action potential results in highly differentiated patterns of behaviour. These patterns of actions characterise particular PCs to other players, but also to the players themselves. As mentioned, personality is in this context, in Moffat’s words, ‘the name we give to those reaction

tendencies that are consistent over situations and time'. In VGWs, these reaction tendencies are the results of players' strategies and habits they develop by inhabiting VGWs, but they are ultimately constrained by the action potential that a particular player has chosen in the character creation stage, and how the player has refined the action potential during the development of differentiated skills of his or her PC, and by what types of action potentials are provided by a specific VGW. In PI, the action potential of players is provided by the design of the prototype VGW, but the individual CAP is governed by the combination space of the trait nodes in combination with the types of activity that are available in PI, mainly affective actions and spells. That is, the reaction tendencies are developed by players, but the range of action is restrained by the characters' combinations of personality-trait-node values. The values of the trait nodes are used to decide what type of emotion spells PCs can cast. The trait nodes are also the elements governing the tendencies of the mood fluctuations of the character. The CAP also depends on the position in the mood co-ordinate system towards which a PC's mood has the tendency to fluctuate. This position governs the types of spells that they can perform that can affect mental energy and resistance in their targets. The CAP can guide players' choice of role for their PC in situations where players co-operate. A player might find that his or her PC's personality is specially useful in certain situations, while co-operating with players that have either compatible strategies or personalities which complement each other in certain situations. The reaction tendencies in PI are partly given by the personality, but players have the ultimate control of how they act in order to influence the mood of their PCs and that of other PCs.

Summarising, the nodes defining the personality traits of characters governs an

individual PC's state of mind through individually weighted relationships to the other affect nodes, including the sentiments which are results of interactions with and relationships to other PCs, resulting in values characterising the PC's personality. The participants of the WoM play-test, who all played as themselves rather than role-played, expressed that the results of their IPIP-NEO personality trait evaluation were close to their own self-images of their personalities. Perhaps, if players in a system can develop patterns of action while being provided CAP profoundly tying into a game world and its deep structure, it can facilitate players' development of persona in Bartle's sense. This was the concern of Question 2 in Section 9.2. Another potential method for facilitating players development of persona is the use of personalised sound tracks of mood-inducing music as described in Section 6.3. As mentioned, Pignatiello's (1986) studies supports that music can induce different moods in listeners. If the mood induced by a PC's personal soundtrack matches the way a player interprets musical expression of emotion this perhaps can facilitate a closer identification with the PC for the player. Ideally 'musical personalities' of players would render mood-inducing music facilitating emotions in players which are connected to the emotions of their PCs.

In the play-test of WoM, participants expressed the worry that, in using the personality trait nodes of the MM as a base for action potential, introvert and neurotic characters may be disadvantaged given the social nature of many game-play features. The action potential for spell-use for different personality types was a special concern when designing the spell system for PI. The mood of PCs who have dominant facets of introversion or neuroticism fluctuate towards depression more easily than for other

types of personalities. The spells available to players in the depressed mood-state are both powerful and versatile enough that a depressed PC who regenerates energy slowly is still of good use, even essential, to a group of players facing a challenge. Care was also taken to make sure that the actions possible to take in different mood spaces could be characteristic actions for PCs in these moods.

The well-known notions of role taking from VGWs where PCs normally have functions such as ‘tank’, ‘healer’ or ‘damage dealer’ are comparable to possible PC-roles in PI. However, where in VGWs the role normally is given by character class, it is in PI given by a PC’s personality.¹ That is, a neurotic introvert PC would be an eminent damage dealer since the PC’s current mood would easily move towards the depressed mood spaces which are required in order to cast spell decreasing the mind energy of opponents. Another type of effective damage dealer would be a PC with a neurotic extravert personality, who could quickly generate both energy and resistance if in a mood of fury while damaging the pool of resistance of the opponent. A PC prone to extraversion in general might function especially well as a healer if in a jubilant mood, being able to give mind energy to group members. PCs who naturally gravitate towards inner harmony might be able to function especially well as tanks given that they would regenerate mental resistance quicker than others.

Potentially, the elements of CAP outlined in the discussion above could support

¹The role of tank in a group of PCs engaging in combat in VGW means that the PC tanking takes the damage dealt by opponents. The tank protects the other members of the group by making sure that the opponent’s aggression is directed to them. The damage dealer normally lacks health and resistance to be able to be in direct contact with the opponent, but may be located a bit further away from the tank and the opponent while using powerful ranged attacks. The role of the healer is to heal the tank and, if needed, also the damage dealer or themselves. For an extensive explanation of the game-play strategies involved in these roles, please refer to Musse Dolk’s MMORPG Gamer’s handbook (2008).

players in expressing consistent characters, their second selves, and perhaps help them to stay in character while acting in the VGW. However, in role-playing the characterising of the PC is not the only concern, building story lines that a group of role players can enact as well as establishing dramatic plots involving the PCs is equally important. Potential answers to Question 4 concerning the support of role-playing activity are thus tied into issues of story construction and plot-modelling in VGWs.

In the work presented in this thesis, Fencott's notion of narrative potential as the integration of agency and narrative has been useful. In PI and WoM, the deep structure of potential story structures is governed by the relations the sentiment nodes constitute between entities (as expanded upon in Sections 2.3.2 and 8.6.3). In the play-test of WoM, sentiments were instantiated in three ways: randomly, by choice of a particular player and as results of interactions between a PC and an NPC. The sentiments instantiated as results of interactions gave players the highest sense of agency and were those that the players found to make most 'sense'. In PI, all interactions between PCs and between PCs and NPCs potentially result in sentiment nodes where the emotional quality of the sentiment is dependent on the nature of the interaction, that is, the emotions that interactions have evoked. In PI, characters automatically add elements of narrative potential, reflecting their emotional state to the VGW by the instantiation of single-sentiment manifestations. For example, if a PC's emotion node confusion reaches its maximum value, a Colossus of Confusion is instantiated close to the PC. In PI, PCs can take part in the story construction of the world by creating compound manifestations. A fictive example of this was described in Section 7.9.4, where the PC Adam created Grandmother, a manifestation spreading guilt to

other entities in proximity by custom-written actions authored by Adam's player. The instances of manifestations are part of the CAP in PI because the single-sentiment manifestations reflect the emotional states of PCs. The characterisation expressed by the creation of compound manifestations is potentially even more characterising for the PC, but depends on players' authoring style.

Relying on the discussion in Chapter 3, which took a stance in Bartle's extensive work on VGWs (2003), it can be argued that players who develop second selves or personas are heroes and main protagonists in current VGWs given that they go through the 'player's journey', where the development of persona is the very pinnacle of the climb through identity space. Likewise, it can be argued that the player's journey in a current VGW can encompass challenges and choices that express the true character of a player's second self, her PC or persona.

However, the Questions 1 and 3 in the list of design questions, concerning true character and heroship have for me the nature of holy-grail questions and are as such worthy of further systemic exploration. These, and other areas of interest are expanded upon in the next section.

9.4 Limitations

A document called the Morgue holds discarded design features of WoM and PI. Many of these features concerns Question 1 and 3 (see Section 9.2). Question 1 concerns the creation of an architecture which can cater for situations where players need to make truly dramatic choices — choices that can express the true character of their PCs. I believe that if these dramatic choices are tied into the deep structure of

stories underlying and evolving in a VGW, a sense of heroship might emerge, the subject addressed in Question 3. In this context I mean heroship as it is regarded in a structuralist perspective as discussed Section 2.3.2, but for each PC, as discussed in Section 3.9.1.

The dramatic choices I have attempted to model have mostly been concerned with conflicts of loyalty. I have modelled systems of social contracts (contracts made between PCs), contracts of dedication (contracts towards certain activities or achievements related to the back-story and deep structure of the world) and contracts of group loyalty (contracts towards factions or guilds). If a contract was signed by a PC it would render benefits in terms of game-play but it would also entail formalised responsibilities. The varieties of design have resulted in potential conflicts, but they have not necessarily catered for dramatic conflicts and choices, but in conflicts of resource- and time management for the intended players. In my functional testing of these, I have found situations where the game-play is not enjoyable or dramatic for players, but instead frustrating. To me, this area constitutes a space for further inquiry.

A promising approach to addressing Questions 1 and 3 might be further use of sets of sentiments, which is catered for in the MM and the PI prototype. By enabling sets of sentiments among PCs game masters can create plots which are defined by the emotional values of the sentiment sets, such as ‘infatuation’ or ‘jealousy’. As described in Section 5.3.4, the MM also caters for ‘objects of desire’, that is, sentiments of the emotional quality Desire can be directed among characters and objects. This is useful for investigating how plots involving several characters with conflicting emotions among each other may strive in questing towards acquiring objects of desire.

The objects of desire do not need to be physical objects, they could be symbolised abstract principles or certain states expressed by relationships between entities: eliminating, modifying or creating sets of sentiments between entities in the world. (such as, ‘help A and B to reconcile their romantic relationship after A has broken the social contract of loyalty to B by a liaison to C, but make sure that C is not miserable and lonely’.) PI caters functionality for the conduction of guided prototype play testing where potentially useful approaches, including those described above, can be identified for further implementation.

Another promising approach is that of Question 6, which is how interpersonal relationships can be used in the design of VGWs. The MM provides short-term sentiments of different emotional qualities between characters as results of interactions, but in PI there are also sentiments tied to formalised relationships. In PI, the permanent grouping system derived from the protector-protégé relationship allows for membership in two Departments, a system inspired by the structure of parental relationships and that of work environments. In PI, there are no formalised duties attached to these relationships, but, if used, they are of benefit to PCs in terms of additional mental energy and resistance as well as the activation of the emotion nodes Belonging and Pride (in another’s achievement). Another feature related to Question 6 is that of friendships. The maximum number of formalised friendships a PC can have (typically between 3 and 10) is tied to the CAP, given by the values of the personality trait nodes. The relationship-type ‘special friend’ is singular, that is, each PC can only have one relationship of this type, reciprocal with another PC. Again, this

relationship does not come with duties, but opens up for a strong reciprocal sentiment of Belonging, an emotion desirable for being in mood spaces where mental resistance and energy is regenerated quickly. Potentially, the choice of friends and the singular choice of a special friend, as well as the potential double membership in Departments can render interesting situations, potentially tying in interpersonal relationships spanning over the borders of VGWs and the ordinary world while they are part of the VGWs' deep structure via the sentiments.

An additional area of further investigation could be to utilise the autonomous layer of the MM in order to further aid role-players by adding automated expressions of emotions in PI. This means not only using the MM for the modification of action potential, which for role-players can have an advisory function, but for autonomous action. Yet another possible area to investigate could be using the MM for autonomous emotional expressions of NPCs. In the current implementation of PI, all NPCs are equipped with MMs, having their action potential modified by their personalities, but given the focus on the CAP of PCs in the work presented in this thesis, the implementation efforts in the prototype construction was not directed towards the NPCs.

Summarising the concluding discussion by approaching the six design questions presented in Section 9.2, I consider Questions 5 (support of players' expression of consistent characters) and 4 (support of role-play by the rule system of a VGW) to be addressed to some extent by the work presented in this thesis. These questions were discussed in section 9.3 in relation to the concepts of semiautonomous agents, CAP and players' mental models of CAP. The other four questions were also discussed but

any conclusions regarding them remain to be confirmed by evidence from empirical studies of actual game-play. In Section 9.4 potentially useful approaches for further exploration of these and other potentially relevant questions were identified.

9.5 Conclusion

In the work presented in this thesis the concept of characterising action potential (CAP) has been explored by iterative design of a semiautonomous-agent architecture called the Mind Module (MM) in order to address how role-play and the expression of consistent interesting playable characters (PCs) can be supported in virtual game worlds (VGWs.) The MM has been part of several experimental game prototypes of which five are reported in this thesis. Play-testing has indicated that players with previous live-action role-playing experience are particularly positive to CAP that may help them to express consistent characters when role-playing. A number of experimental features have been implemented. Music has been used as a means to convey an accessible representation of a complex emotional state of a PC to its player. Availability of expression of emotion through body language has been adapted by design to particular characters' personality and current mood as a mean to support players expressing the character of their PCs to others in a VGW.

The CAP of PCs has been constrained to actions that characterise PCs in terms of personality and current mood. These actions have been implemented in the VGW prototype Pataphysic Institute (PI) where the nature of the actions is profoundly interconnected with the game mechanics, facilitating players' choice of characterising functional roles in co-operation with other players.

PCs' relationships and emotionally loaded memories of entities in PI are results

of PCs' experiences in the VGW. These relationships and emotional attachments are called sentiments, and constitute the semantic syntax of the dynamic deep story-structure in PI.

In PI, relationships among PCs have systemic effects, modifying the CAP of PCs — in this way the identity of a particular PC can be developed in relation to social groups and to other PCs. Players may cross the borders of the bleeding circles of VGWs by integrating real-life relationships to the game-play and deep story structure of the world.

PI is structurally open to elements of narrative potential originating from the ordinary world. By authoring compound manifestations players can add elements of narrative potential, symbolising significant elements of their ordinary lives which become part of the game-play in PI. PCs also leave their mark in the world automatically if they experience strong emotions — manifestations of corresponding emotions are in those cases instantiated and become part of the game-play. Through these mechanics the world of PI is characterised by its inhabitants. In play-tests, the 'mental physics' of the MM allowed players, in constrained scenarios, to create mental models of the CAP provided by the MM to discover interesting alternative strategies not foreseen in the design, as such indicating the emergent properties of the MM.

Glossary

Agency is generally considered as a philosophical concept where an agent has the capacity to act in a world. The agency belongs to the agent. In contexts of interactive narrative and story-driven games, agency is usually referred to as a capacity of a player who, through a representation in a game, can experience as Murray described it: ‘the satisfying power to take meaningful action and see the results of our decisions and choices.’ (Murray, 1997, p. 126)

Bleeding Circle: in situations where interpersonal relationships move between the real world and virtual worlds, they cross the borders of the ‘magic circles’ of VGWs. Through bleeding circles relationships seep between ordinary and virtual worlds. I use the word bleeding because it is the very heart blood that is flowing over the borders. The dramatic associations to the expression are appropriate for the type of processes involved in the situations.

The **characterising action potential (CAP)** defines what characters can do at a given moment that characterise them, both in terms of observable behaviour and in expression of true character — a character’s essential nature, expressed by the choices a character makes. The observable characteristics include visual appearance,

what body language characters use, what sounds they make, what they say, and most important, what they do and how they behave.

Game Master (GM): a player who in a VGW acts as officiant and organiser in situations where rules apply. The game master is often part of the Live Team. In role-playing games (RPGs) in general, the GM's role is to help with rules, to moderate, and to act as story-teller. Some RPG types require the GM to create environments where players can interact, as well as weave together the other participants' character-back-stories.

Gimped characters: playable characters with combinations of properties that are to their disadvantage in terms of success in achieving game-play related goals.

Guild: a permanent grouping of playable characters in a VGW.

Guild Leader: a player who (acting through his or her playable character) is the leader of a permanent group of players in a VGW.

Holy-grail questions are philosophical questions in which one, to use a game analogy, goes on a quest for the holy grail. One does not know whether it really exists, or if it is one's strong wish that it should exist. Since it is so difficult to find, one does not get proof that it does not exist and thus the search can continue in new directions. Holy-grail questions fuel the navigation of wicked problem spaces.

A **life-path system** is a formalised way to provide a character with a back-story at the character creation stage. In the table top RPG MechWarrior 3 the following information is asked for: ‘early childhood, age 10’, ‘Late Childhood, age 16’, and 6 additional paths (Path 3 to 8) concerning ‘higher education and real life’. Another table top RPG using a life-path system is BattleTech Solaris.

Live Team: the people who maintain a VGW. Tasks include resolving any still existing errors in the game world, managing the community of the player population, and handling conflicts between players according to the rules of the specific game world.

Magic circle: in the context of games the magic circle is most often taken to constitute the border between the ordinary life and the playing of a game, where the playing activity is performed within the circle. The expression was coined by Huizinga (1938, 2006, p. 113): ‘We found that one of the most important characteristics of play was its spacial separation from ordinary life. A closed space is marked out for it, either materially or ideally, hedged off from the everyday surroundings. Inside this space the play proceeds, inside it the rules obtain.’

Narrative potential: Laurel (1994) used the expression narrative potential to describe ‘environments imbued with narrative potential’ as places that can be experienced and marked through narrative activity. Fencott (2003) describes narrative potential as the ‘accumulation of meaningful experience as a result of agency — allows participants to construct their own appropriate narratives. Narrative potential thus arises from agency but is not determined by it.’

Pervasive game: a game that has one or more features which expand the magic circle of play. Location-based games are often labelled as pervasive games, where the real-life geographical position of a player, often traced through a player's cell-phone, is used in the game mechanics.

The **playable character (PC)**, also called player character or avatar, is a player's representation in a VGW. All interaction with the world and with other players is done through the PC.

In **role-playing** persons change their behaviour to assume a role. In role-playing games (RPGs) players act according to adopted fictional roles. Participants in a RPG determine their actions in a game based on the characteristics of the adopted role. The actions' success depend on formal systems of rules specific to a particular game. In table-top RPGs a game master can create settings for participants, and can also interpret the rules of specific games in ways that are fitting for the setting. In live-action role-playing (LARP) players perform their characters' physical actions, and the playable character (PC) is the player, enacting a character in ways similar to improvisational theatre. In single-player role-playing computer games the rule-systems are provided by computational operations rather than game masters. Role-playing in single player games has a different meaning, since there are no other players to perform with. The concentration on the role-aspect is that of a playable characters' advancement within a game world, where choices made by players affect the properties and action potential of the PC. In multi-player and massively

multi-player role-playing computer games (virtual game worlds) the game rules are computed, but sometimes scenarios and settings can be designed by game masters for groups of players.

Semiautonomous agents are partly controlled by their players, and partly controlled by context-sensitive action potential and expression possibilities, as well as by varying degrees of autonomous reactions to in-game situations specific to the VGW the agents inhabits.

Story construction: a game system that allows for story construction provides players with building blocks and functionalities that form the narrative potential in the world, and can be used by players for creating experiences and traversals of events that are individually potentially meaningful and dramatic.

Virtual Game Worlds (VGWs) are realised by networked computers that simulate environments. In these worlds players have graphical representations, playable characters (PCs), that represent them in the world. All interaction with the world and with other players is done through the PC. The interaction in the world is in real time and the world is persistent, that is, the world is still there even though a particular PC is not active in the world. VGWs are often called Massively Multiplayer Online (MMO) games or Massively Multiplayer Role Playing Games (MMORPGs), but in this thesis the expression VGW is used. The term VGW is considered more representative because not all VGWs feature role-playing elements, nor always cater for several thousands of players, which is what is meant by ‘massive’.

Wicked problems are problems where every attempt at producing a solution changes the understanding of the problem.

Wizard of Oz is a method used in user-studies in the field of human-computer interaction. A person simulates computational operations that participants in studies interact with.

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**CHARACTERISING ACTION POTENTIAL
IN VIRTUAL GAME WORLDS
APPLIED WITH THE MIND MODULE**

Volume 2

MIRJAM PALOSAARI ELADHARI

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Appendix A

Mind Module UML

Figure A.1 shows the architecture of the MM as class diagram expressed in Unified Modelling Language (Fowler, 2003).

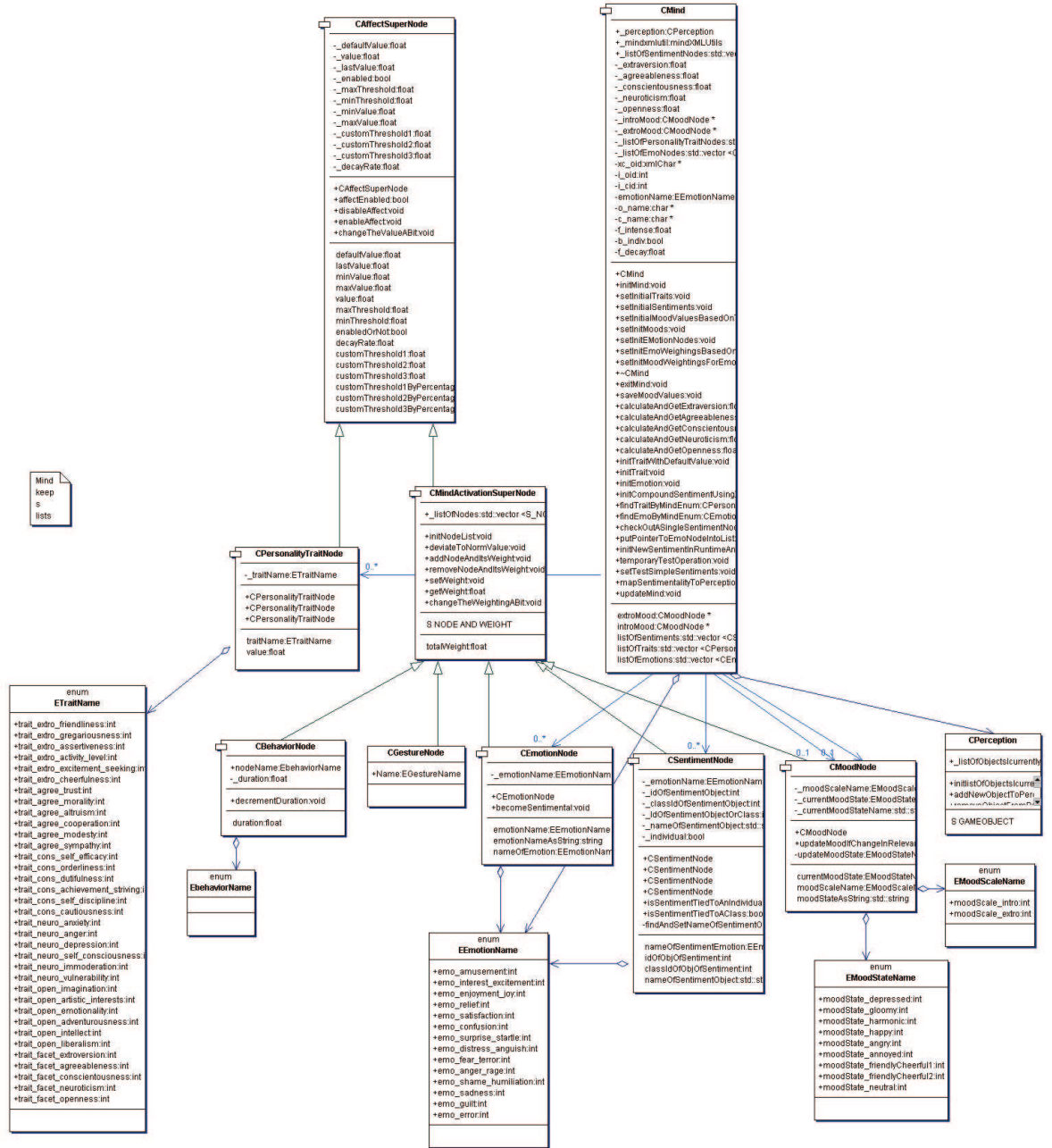


Figure A.1: Mind Module UML Diagram

Appendix B

Game Design Documentation

B.1 Learning New Abilities

Player Character Progression - Learning New Abilities

Learning Spells

Level 0

- MRME Spells with single Targets. (5 spells with different strengths depending on mood)
- First emotion Spells that decrease negative emotions

Level 5

- Second Emotion Spell that decrease a negative emotion

Level 8

- MRME AOE Spell, based on traits Altruism and Activity Level.

Level 10

- Two emotion spells that increase negative emotions

Level 15

- One spell that increase a positive emotion
- One spell that decrease a positive emotion

Design Note

At level 15 the player character will have access to 12 spells.

The MRME Spells with single targets, which are the ones that are spells that can be used in various situations, can only be used in certain moods. In order to affect the mood the player can employ different strategies, such as interacting with other players using affective actions, or deliberately seeking out mobs and NPCs that affect the mood.

11 spells can seem as a small amount of spells, but the player also need to master the affective actions. Play tests need to be conducted in order to evaluate whether the number of spells available at different levels need to be modified.

List of AAs ordered as player learns them

A small functional play test was done 2009-03-09 by Mirjam P Eladhari, Musse Dolk and Ola Persson. The purpose was to work out in what order the player learn different AAs, and to see if any were redundant or missing. Also AAs that are exclusive for the most extreme moods were formulated.

Levels for learning

The mind magic spells are learned at level 0, 5, 8 10 and 15.

The learning points for the AAs are distributed in between.

AA Batch 2 – level 3

AA Batch 3 – level 7

AA Batch 4 – level 12

AA Batch 5 level 17

AA Batch 6 level 22

Design note about the pace of learning:

In the play test of the digital prototype it will be important to find out whether this learning distribution is too condensed. It will depend on how long it may take a player to level up.

1st batch of AAs - known from the start of the game

2	'good/Joke with someone'
3	'conter/Refuse to laugh at joke'
4	'conter/Laugh at joke'
23	Small Talk
28	Look at target with dismay
14	'good/Be attentive'
34	Calm down
13	'bad/Ignore'

2nd batch of AAs to learn

25	hug
26	Be hugged
27	Shrink away
22	Stunned Silence
30	Agree
31	Tell a small secret
36	Disagree
37	Angry Discussion about mutual nuisance

3rd batch of AAs to learn

38	Deep Lament
39	Radiate Bliss
40	Exultant Jubilation dance
41	Uncontrolled Wrath

4th batch

6	good/Cheer up'
11	'good/Compliment'
24	Thank
10	'bad/Insult'
1	Bad/Misunderstand on purpose'
47	Funny Walk

5th batch of AAs to learn

32	Share a memory
12	'bad/Interrupt'
18	'bad/Show aversion'
19	'good/Show affection'
7	'good/Give affirmation'
8	'bad/Threaten'
5	'bad/Comfort'

33	Mumble unintelligibly in sulky tone
----	-------------------------------------

6th batch of AAs to learn

35	Let off Steam
29	Talk
9	'bad/Blame'
15	'bad/Make feel guilty'
16	'bad/Be Martyr'
17	'good/Forgive'
20	'good/Flaunt Big Secret'
21	'good/Reveal Big Secret'

AAs to learn when PC gets a protector or a protégé

42	Respect	0.5 pride
43	Praise	0.5 pride
44	Reproach	0.5 shame

AAs to learn when PC gets a friend

45	Squeeze hand
46	Group Hug

B.2 Playable Character Personality Templates

1.1 The Extrovert

Level 1: ES "Laser Pen of Clarity"
 Level 5 ES: 'Spine of Confidence
 Level 8: AOE: Lowest difference value is toward max activity level: gives MR ME AOE Spell 'Alacrity Alarm
 Level 10: ES: "Trumpet Irrelevant Questions
 Veil of Humiliation
 Level 15: Cheer Contagion
 Woe

EXTRAVERSION.....

..Friendliness.....80
 ..Gregariousness.....80
 ..Assertiveness.....80
 ..Activity Level.....80
 ..Excitement-Seeking.....80
 ..Cheerfulness.....80

AGREEABLENESS.....

..Trust.....40
 ..Morality.....40
 ..Altruism.....40
 ..Cooperation.....40
 ..Modesty.....40
 ..Sympathy.....40

CONSCIENTIOUSNESS.....

..Self-Efficacy.....30
 ..Orderliness.....30
 ..Dutifulness.....30
 ..Achievement-Striving.....30
 ..Self-Discipline.....30
 ..Cautiousness.....30

NEUROTICISM.....

..Anxiety.....25
 ..Anger.....25
 ..Depression.....25
 ..Self-Consciousness.....30
 ..Immoderation.....25
 ..Vulnerability.....25

OPENNESS TO EXPERIENCE.....

..Imagination.....40
 ..Artistic Interests.....40
 ..Emotionality.....40
 ..Adventurousness.....40
 ..Intellect.....40
 ..Liberalism.....40

1.2 The Friendly one

Level 1: ES: Dull Pain

Level 5 ES: Forgive

Level 8: AOE: difference value is toward max altruism level: gives MR ME AOE Spell 'All Out Resistance'

Level 10: ES: "Song of Pain" and "True Sounding Accusation"

Level 15: "Threads of Salvation" and "Problematisation".

EXTRAVERSION.....

..Friendliness.....40

..Gregariousness.....50

..Assertiveness.....40

..Activity Level.....40

..Excitement-Seeking.....40

..Cheerfulness.....

AGREEABLENESS.....

..Trust.....80

..Morality.....80

..Altruism.....80

..Cooperation.....80

..Modesty.....80

..Sympathy.....82

CONSCIENTIOUSNESS.....

..Self-Efficacy.....30

..Orderliness.....30

..Dutifulness.....30

..Achievement-Striving.....30

..Self-Discipline.....30

..Cautiousness.....30

NEUROTICISM.....

..Anxiety.....25

..Anger.....25

..Depression.....25

..Self-Consciousness.....25

..Immoderation.....31

..Vulnerability.....32

OPENNESS TO EXPERIENCE.....

..Imagination.....40

..Artistic Interests.....40

..Emotionality.....40

..Adventurousness.....40

..Intellect.....30

..Liberalism.....40

1.3 The Dutiful one

Level 1: ES Hold Hand

Level 5 ES: Cooling Cloth

Level 8: AOE: Lowest difference value is toward min altruism: gives MR ME AOE Spell 'All Out Agression'

Level 10: ES: "Cold Ripple of Fear" and "Primal Fury"

Level 15: "toss secretive glossy parcels" and "drabby humdrum"

EXTRAVERSION.....	
..Friendliness.....	40
..Gregariousness.....	40
..Assertiveness.....	40
..Activity Level.....	40
..Excitement-Seeking.....	40
..Cheerfulness.....	40
AGREEABLENESS.....	
..Trust.....	40
..Morality.....	40
..Altruism.....	35
..Cooperation.....	40
..Modesty.....	40
..Sympathy.....	40
CONSCIENTIOUSNESS.....	
..Self-Efficacy.....	80
..Orderliness.....	80
..Dutifulness.....	80
..Achievement-Striving.....	80
..Self-Discipline.....	80
..Cautiousness.....	80
NEUROTICISM.....	
..Anxiety.....	32
..Anger.....	31
..Depression.....	25
..Self-Consciousness.....	25
..Immoderation.....	25
..Vulnerability.....	25
OPENNESS TO EXPERIENCE.....	
..Imagination.....	40
..Artistic Interests.....	45
..Emotionality.....	40
..Adventurousness.....	40
..Intellect.....	30
..Liberalism.....	40

MPE

1.4 The Neurotic

Level 1: ES Accommodate Sorrow

Level 5 ES: Dull Pain

Level 8: AOE: Lowest difference value is toward min activity level: gives MR ME AOE Spell 'Damp Dough of Catatonia'

Level 10: ES: Wet net of tears and Song of Pain.

Level 15: "Sudden Blipp! Astonishers" and "Blotch of Same-Bores"

EXTRAVERSION.....

..Friendliness.....30

..Gregariousness.....30

..Assertiveness.....30

..Activity Level.....25

..Excitement-Seeking.....40

..Cheerfulness.....30

AGREEABLENESS.....

..Trust.....40

..Morality.....40

..Altruism.....40

..Cooperation.....40

..Modesty.....40

..Sympathy.....40

CONSCIENTIOUSNESS.....

..Self-Efficacy.....30

..Orderliness.....30

..Dutifulness.....30

..Achievement-Striving.....30

..Self-Discipline.....30

..Cautiousness.....30

NEUROTICISM.....

..Anxiety.....80

..Anger.....80

..Depression.....85

..Self-Consciousness.....80

..Immoderation.....80

..Vulnerability.....83

OPENNESS TO EXPERIENCE.....

..Imagination.....40

..Artistic Interests.....40

..Emotionality.....40

..Adventurousness.....60

..Intellect.....40

..Liberalism.....40

MPE

1.5 The Open Minded One

Level 1: ES Laser Pen of Clarity

Level 5 ES: Hold Hand

Level 8: AOE: Lowest difference value is toward min altruism: gives MR ME AOE Spell 'All Out Aggression'

Level 10: ES: Trumpet irrelevant questions and Cold Ripple of Fear

Level 15: "Burst of wittiness" and "Blotch of Boredom"

EXTRAVERSION.....

..Friendliness.....40

..Gregariousness.....40

..Assertiveness.....40

..Activity Level.....40

..Excitement-Seeking.....40

..Cheerfulness.....40

AGREEABLENESS.....

..Trust.....40

..Morality.....40

..Altruism.....35

..Cooperation.....40

..Modesty.....40

..Sympathy.....40

CONSCIENTIOUSNESS.....

..Self-Efficacy.....30

..Orderliness.....30

..Dutifulness.....30

..Achievement-Striving.....30

..Self-Discipline.....30

..Cautiousness.....30

NEUROTICISM.....

..Anxiety.....32

..Anger.....25

..Depression.....25

..Self-Consciousness.....25

..Immoderation.....25

..Vulnerability.....25

OPENNESS TO EXPERIENCE.....

..Imagination.....85

..Artistic Interests.....80

..Emotionality.....80

..Adventurousness.....80

..Intellect.....80

..Liberalism.....80

MPE

B.3 Non-Playable Character Mind Module-Properties

1. Teresa 's Mind Module

1.1 Sentiments

Teresa has a reciprocal friendship with the Gate Keeper, giving her a permanent sentiment of belonging.

Since Teresa is exposed to a lot of PCs and exchanges AAs with them it is likely she will have many short term sentiments.

1.2 Personality Trait Values

```
EXTRAVERSION.....18 *****
..Friendliness.....3 ***
..Gregariousness.....25 *****
..Assertiveness.....28 *****
..Activity Level.....52 *****
..Excitement-Seeking.....61 *****
..Cheerfulness.....12 *****

AGREEABLENESS.....6 *****
..Trust.....39 *****
..Morality.....10 *****
..Altruism.....5 *****
..Cooperation.....34 *****
..Modesty.....40 *****
..Sympathy.....0 *****
CONSCIENTIOUSNESS.....26 *****
..Self-Efficacy.....49 *****
..Orderliness.....16 *****
..Dutifulness.....19 *****
..Achievement-Striving.....16 *****
..Self-Discipline.....54 *****
..Cautiousness.....50 *****
NEUROTICISM.....49 *****
..Anxiety.....21 *****
..Anger.....52 *****
..Depression.....83 *****
..Self-Consciousness.....57 *****
..Immoderation.....42 *****
..Vulnerability.....33 *****
OPENNESS TO EXPERIENCE.....77 *****
..Imagination.....74 *****
..Artistic Interests.....39 *****
..Emotionality.....44 *****
..Adventurousness.....98 *****
*****
..Intellect.....47 *****
..Liberalism.....78 *****
```

2. The Gate Keeper's Mind Module

The gatekeeper is mostly extrovert and conscientious.

2.1 Sentiments

Gate Keeper has a reciprocal friendship with the Teresa, giving him a permanent sentiment of belonging.

2.2 Personality Trait Values

```
EXTRAVERSION.....80 *****
..Friendliness.....90 *****
..Gregariousness.....99 *****
*****
..Assertiveness.....60 *****
..Activity Level.....93 *****
..Excitement-Seeking.....20 *****
..Cheerfulness.....9 *****
AGREEABLENESS.....3 ***
..Trust.....26 *****
..Morality.....1 *
..Altruism.....41 *****
..Cooperation.....32 *****
..Modesty.....12 *****
..Sympathy.....26 *****
CONSCIENTIOUSNESS.....67 *****
..Self-Efficacy.....62 *****
..Orderliness.....94 *****
..Dutifulness.....28 *****
..Achievement-Striving.....21 *****
..Self-Discipline.....95 *****
..Cautiousness.....35 *****
NEUROTICISM.....49 *****
..Anxiety.....71 *****
..Anger.....53 *****
..Depression.....69 *****
..Self-Consciousness.....3 ***
..Immoderation.....28 *****
..Vulnerability.....81 *****
OPENNESS TO EXPERIENCE.....6 *****
..Imagination.....2 **
..Artistic Interests.....24 *****
..Emotionality.....10 *****
..Adventurousness.....32 *****
..Intellect.....26 *****
..Liberalism.....23 *****
```

B.4 Single-Sentiment Manifestations

Contents

1. General Properties for Single Sentiment Mobs.....	5
1.1 Mind Module Properties	5
1.1.1 Implementation note	5
1.2 Behavior.....	5
1.3 Birth	5
1.4 Life conditions	5
1.5 Vulnerability	6
1.6 Dialog – Exclamations.....	6
1.7 Naming Convention.....	6
1.8 A note about Emotions.....	6
1.9 Dialog for SS Mobs - Exclamations	7
1.9.1 Threshold values for SS Mob Exclamations in PI.....	7
1.9.2 Dialog Exclamations about MR and ME	7
1.9.3 Implementation note:	7
2. Single Sentiment Mobs in PI – Concept Art, Spells and Exclamations	8
2.1 Amusement Article.....	8
2.1.1 Concept Art.....	8
2.1.2 Spells.....	8
2.1.3 Exclamations.....	8
2.2 Interest Integral.....	9
2.2.1 Concept Art.....	9
2.2.2 Spells.....	9
2.2.3 Exclamations.....	9
2.3 Joy Jumbo	10
2.3.1 Concept Art.....	10
2.3.2 Spells.....	10
2.3.3 Exclamations.....	10
2.4 Relief Raptor.....	11

2.4.1	Concept Art.....	11
2.4.2	Spells.....	11
2.4.3	Exclamations.....	11
2.5	Satisfaction Shell	12
2.5.1	Concept Art.....	12
2.5.2	Spells.....	12
2.5.3	Exclamations.....	12
2.6	Surprise Singleton.....	13
2.6.1	Concept Art.....	13
2.6.2	Spells.....	13
2.6.3	Exclamations.....	13
2.7	Colossus of Confusion	14
2.7.1	Concept Art.....	14
2.7.2	Spells.....	14
2.7.3	Exclamations.....	14
2.8	Anguish Abomination	15
2.8.1	Concept Art.....	15
2.8.2	Spells.....	15
2.8.3	Exclamations.....	15
2.9	Terror Troll.....	16
2.9.1	Concept Art.....	16
2.9.2	Spells.....	16
2.9.3	Exclamations.....	16
2.10	Rage Roughneck	17
2.10.1	Concept Art.....	17
2.10.2	Spells.....	17
2.10.3	Exclamations.....	17
2.11	Shame Shell	18
2.11.1	Concept Art.....	18

2.11.2	Spells.....	18
2.11.3	Exclamations.....	18
2.12	Sail of Sorrow.....	19
2.12.1	Concept Art.....	19
2.12.2	Spells.....	19
2.12.3	Exclamations.....	19
2.13	Guilt Ghost.....	20
2.13.1	Concept Art.....	20
2.13.2	Spells.....	20
2.13.3	Exclamations.....	20

1. General Properties for Single Sentiment Mobs

Manifestations, or Single Sentiment Mobs (SSMs), are entities that have their origin in a single emotion. They have a limited amount of mental resistance and energy. If the value of the emotion they represent equals zero they dissolve.

Properties: N mind energy, N mind resistance, N emotion pool, Spell ability, Exclamations at threshold values.

Instantiation: Either at designated spawn points or due to emotional threshold values reached in player characters.

1.1 Mind Module Properties

SS Mobs have full mind modules.

A single sentiment mob is instantiated with its emotion at 99% of max, and with full MR and ME. Max MR and ME is modded to its level.

The norm value for the emotion is set to 90% of max. This means that a mob that is wounded in its emotion will recuperate over time in this respect.

Example: Sail of Sorrow is instantiated with sadness at 99% of max, and with full MR and ME. Max MR and ME is modded to its level.

1.1.1 Implementation note

SS Mobs currently have their personality traits at middle values. Possibly they could have customized personality templates instead. These would need to be set so that the mob can cast "their" ES spell according to the same principle as the player characters are assigned spells. It would also be possible to assign sentiments to the mob that upholds an extreme emotional value instead of setting a norm value of 90% of max.

1.2 Behavior

Targets PC if PC in proximity. Spell to cast is chosen randomly from its known spells.

Example: Sail of Sorrow randomly alters between casting Wet Net of Tears, Drain Energy, and Aggression.

1.3 Birth

- a) Spawn point in the game world. Level defined in scripting.
- b) Instantiated if a max-level of the emotion it represents is reached in a player characters MM. Level: 50% of the PC's level.

1.4 Life conditions

An SS mob dissolves if the emotion it represents or MR reaches 0.

Example: A Sail of Sorrow Dissolves if its Sorrow or MR reaches 0.

1.5 Vulnerability

An SS mob is especially vulnerable to spells that decreases the value of the emotion it represents.

Example: Sails of Sorrows are especially vulnerable to spell “Accommodate Sorrow”.

1.6 Dialog – Exclamations

SS Mobs make exclamations – lines of dialog which are displayed as speech bubbles in the client.

The exclamations are made when the values of MR, ME and “their” emotions reach certain threshold values. These values and the dialog lines are available in the appendix PI-Dialog-SS-Mobs.

1.7 Naming Convention

Alliteration.

1.8 A note about Emotions

Pride, Belonging and Desire do not have representations in the form of SS mobs.

1.9 Dialog for SS Mobs - Exclamations

The SS mobs of PI exclaim lines of dialog when their MR, ME and the emotion they represent reach threshold values. The text is shown in the client as speech bubbles.

For information about other properties of the SS Mobs, please refer to the appendix “IP-single-sentiment-mobs”.

1.9.1 Threshold values for SS Mob Exclamations in PI

Threshold values		
Mental Resistance	Mental Energy	Emotion
0.0% of max (when they dissolve)	0.0% of max (when they can't cast any spells)	0.0% of max (when they dissolve)
10% of max	10% of max	10% of max
30% of max	30% of max	30% of max
60% of max	60% of max	60% of max

1.9.2 Dialog Exclamations about MR and ME

All the SS Mobs say the same thing regarding their MR and ME. Individual exclamations are used for threshold values of the emotions they represent. For these, please refer to the descriptions of the SS Mobs.

MR	Dialog Line	ME	Dialog Line
0.0% of max	I can't resist anymore.	0.0% of max	I'm exhausted. I'll just sit here.
10% of max	Please! You hurt me!	10% of max	I'm so tired! Why you doing this to me?
30% of max	I feel so vulnerable.	30% of max	Oh no, you must be one of those energy vampires!
60% of max	Think you can wear me down?	60% of max	You may be an energy eater, but I can still do things!

1.9.3 Implementation note:

It might be worth it to write individual dialog for each SS regarding ME and MR. TBD.

2. Single Sentiment Mobs in PI – Concept Art, Spells and Exclamations

2.1 Amusement Article

2.1.1 Concept Art



2.1.2 Spells

Casts Spell	Effect on target	Effect on self
Burst of Wittiness	+ Amusement	-ME
Resistance Aid	+MR	-ME
Energy Rush	+ME	-ME

Vulnerable to Spell	Effect on target (ie self)
Blotch of Boredom	- Amusement

2.1.3 Exclamations

Emotion: Amusement	Exclamation
0.0% of max	This is it! I'm so bored that I die! I quit! You tell your own jokes!
10% of max	Mercy! You don't really want this! I know where the bucket is!
30% of max	Are you out of your wit? Don't you want to hear the one about the nun?
60% of max	Ha! I still have tons of dry jokes to tell you!

2.2 Interest Integral

2.2.1 Concept Art



2.2.2 Spells

Casts Spell	Effect on target	Effect on self
Toss Secretive Glossy Parcels	+ Interest	-ME
Resistance Aid	+MR	-ME
Energy Rush	+ME	-ME

Vulnerable to Spell	Effect on target (ie self)
Drabby Humdrum	- Interest

2.2.3 Exclamations

Emotion: Interest/Excitement	Exclamation
0.0% of max	I don't want to know. Ever! Anything! I'm out of here.
10% of max	I can't remember what I was so interested in just a moment ago.
30% of max	If you continue like that I won't give you any more glossy parcels!
60% of max	Oooh, you can try be monotonous on me all you like! I'm still making wonderful parcels!

2.3 Joy Jumbo

2.3.1 Concept Art



2.3.2 Spells

Casts Spell	Effect on target	Effect on self
Rejoice (Cheer Contagion)	+ joy	-ME
Resistance Aid	+MR	-ME
Energy Rush	+ME	-ME

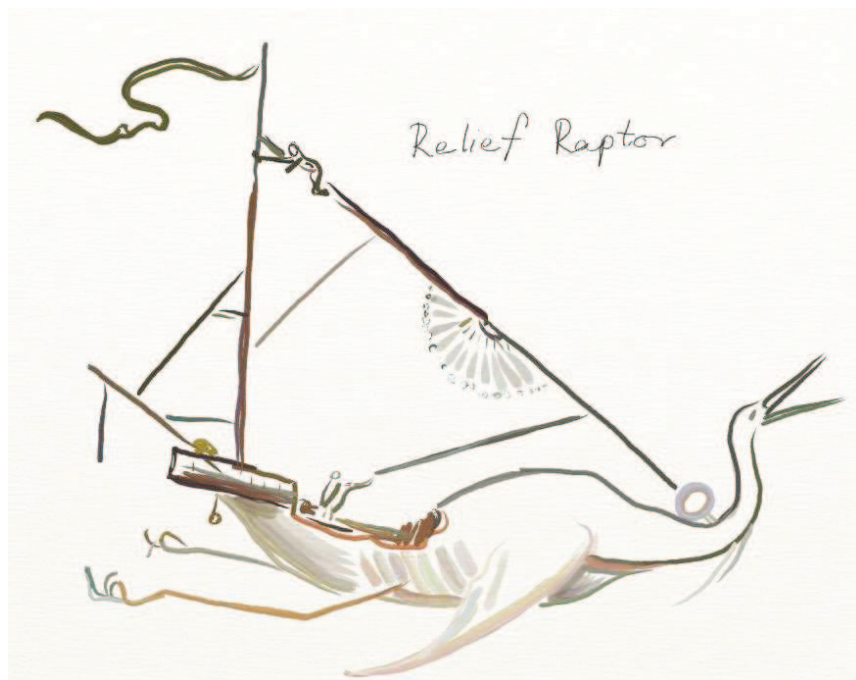
Vulnerable to Spell	Effect on target (ie self)
Woe	-joy

2.3.3 Exclamations

Emotion: Joy	Exclamation
0.0% of max	I can't live without joy.
10% of max	Yff. The world suddenly seems so gray.
30% of max	My joy is decreasing! But there is so much to celebrate!
60% of max	I frolic at any woes! My well-being is still almost supreme!

2.4 Relief Raptor

2.4.1 Concept Art



2.4.2 Spells

Casts Spell	Effect on target	Effect on self
Threads of Salvation	+ Relief	-ME
Resistance Aid	+MR	-ME
Energy Rush	+ME	-ME

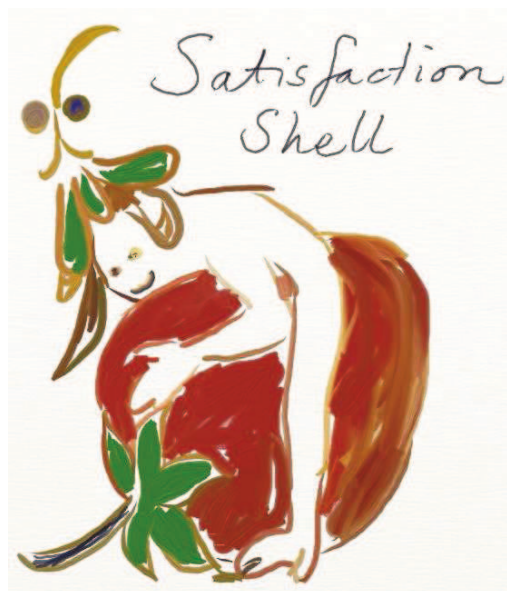
Vulnerable to Spell	Effect on target (ie self)
Problematization	- Relief

2.4.3 Exclamations

Emotion: Relief	Exclamation
0.0% of max	I'm sorry I couldn't do more for you.
10% of max	I'm seeing troubles where I know there is none. It's difficult to help when this weak!
30% of max	What do you mean it's not that easy? I don't care about every facet; I just want to save you!
60% of max	When the cavalry comes it doesn't care about words. Stand aside!

2.5 Satisfaction Shell

2.5.1 Concept Art



2.5.2 Spells

Casts Spell	Effect on target	Effect on self
Cloud of Complacency	+ Satisfaction	-ME
Resistance Aid	+MR	-ME
Energy Rush	+ME	-ME

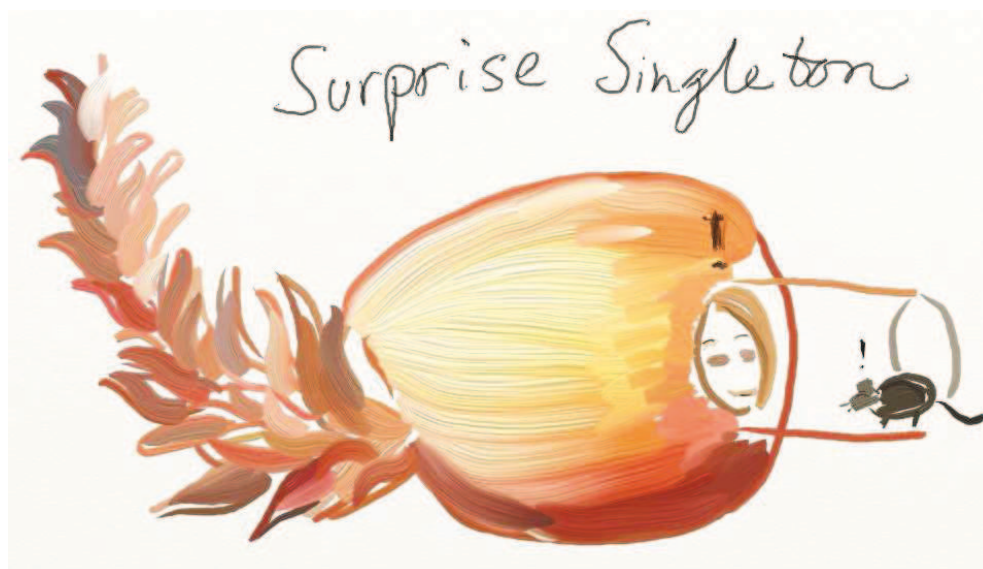
Vulnerable to Spell	Effect on target (ie self)
Greed Golps	- Satisfaction

2.5.3 Exclamations

Emotion: Satisfaction	Exclamation
0.0% of max	If strife and greed is all there is I see no point in going on.
10% of max	I must try harder, I try and I try and I try... and I try.
30% of max	I don't require much... could you let me keep the little contentment I have?
60% of max	All might not be perfect anymore, but I'm satisfied!

2.6 Surprise Singleton

2.6.1 Concept Art



2.6.2 Spells

Casts Spell	Effect on target	Effect on self
Sudden Blipp! Astonishers	+ Surprise	-ME
Resistance Aid	+MR	-ME
Energy Rush	+ME	-ME

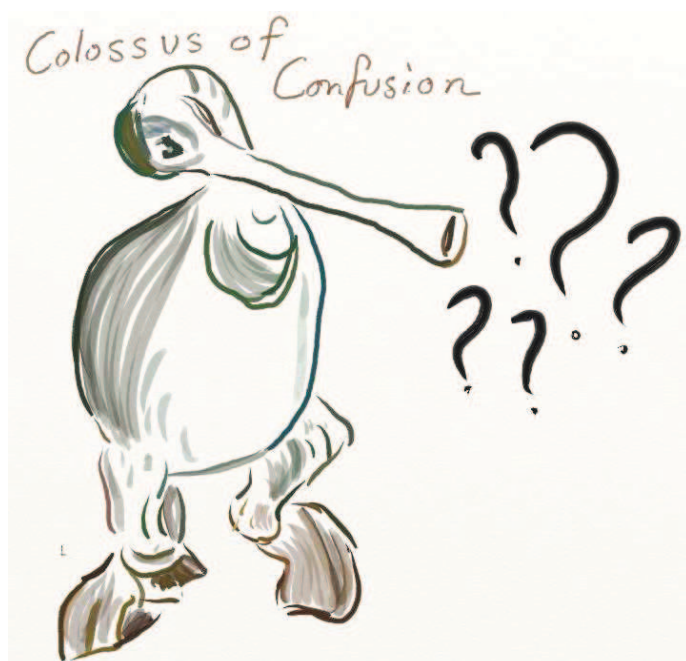
Vulnerable to Spell	Effect on target (ie self)
Blotch of Same-Bores	- Surprise

2.6.3 Exclamations

Emotion: Surprise	Exclamation
0.0% of max	If I've seen it all there is no point anymore.
10% of max	Same same same... and same. Bleh.
30% of max	I guess for SOME things it's enough to see one and you've seen them all.
60% of max	Every little thing we see around us is a wondrous miracle! Nothing changes that!

2.7 Colossus of Confusion

2.7.1 Concept Art



2.7.2 Spells

Casts Spell	Effect on target	Effect on self
Trumpet Irrelevant Questions	+ Confusion	-ME
Aggression	-MR	-ME
Drain	-ME	-ME

Vulnerable to Spell	Effect on target (ie self)
Laser Pen of Clarity	- Confusion

2.7.3 Exclamations

Emotion: Confusion	Exclamation
0.0% of max	Everything makes sense! Oh the agony! I can't stand it!
10% of max	The clarity hurts! It is too much to take in. The patterns, the enormity – STOP!
30% of max	Oh no! I used the pataphysics of Sophrotatos! God seems equal to the tangent between nihility and infinity!
60% of max	Are you telling me that the pataphysical counterpoint to the rational axiology of mathematics makes sense!?

2.8 Anguish Abomination

2.8.1 Concept Art



2.8.2 Spells

Casts Spell	Effect on target	Effect on self
Song of Pain	+ Distress/Anguish	-ME
Aggression	-MR	-ME
Drain	-ME	-ME

Vulnerable to Spell	Effect on target (ie self)
Dull Pain	- Distress/Anguish

2.8.3 Exclamations

Emotion: Distress/Anguish	Exclamation
0.0% of max	I feel nothing now. I don't understand. I must say goodbye.
10% of max	It feels like I'm disappearing! Is pain all that define me? That hurts!
30% of max	Oh no, don't you try! Anguish is what I am. It is all I have!
60% of max	What is happening!? That constant anguish... It lessens!

2.9 Terror Troll

2.9.1 Concept Art



2.9.2 Spells

Casts Spell	Effect on target	Effect on self
Cold Ripple of Fear	+ Fear	-ME
Aggression	-MR	-ME
Drain	-ME	-ME

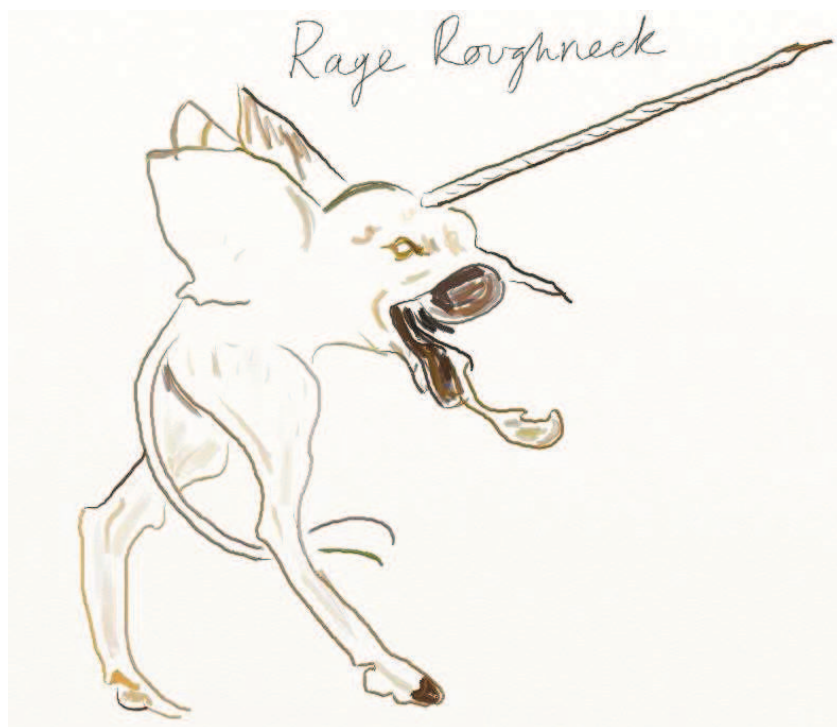
Vulnerable to Spell	Effect on target (ie self)
Hold Hand	- Fear

2.9.3 Exclamations

Emotion: Fear/terror	Exclamation
0.0% of max	The terror... gone. I can rest now.
10% of max	You don't look so dangerous anymore. But all is so blurry. My fear... I don't have any other perspective!
30% of max	Where is my paranoia!? It was the only protection I had! Give it back!
60% of max	What.... is a shadow... just a shadow? Where did the dark ones go?

2.10 Rage Roughneck

2.10.1 Concept Art



2.10.2 Spells

Casts Spell	Effect on target	Effect on self
Primal Fury	+ Anger	-ME
Aggression	-MR	-ME
Drain	-ME	-ME

Vulnerable to Spell	Effect on target (ie self)
Cooling Cloth	- Anger

2.10.3 Exclamations

Emotion: Anger	Exclamation
0.0% of max	Now I go gentle into that good night.
10% of max	I'm cold. My anger burns so weakly.
30% of max	Don't make me understand! I WANT to be angry!
60% of max	You can try to cool be, but I burn! I rage against the dying of the light.

2.11 Shame Shell

2.11.1 Concept Art



2.11.2 Spells

Casts Spell	Effect on target	Effect on self
Veil of Humiliation	+ Shame	-ME
Aggression	-MR	-ME
Drain	-ME	-ME

Vulnerable to Spell	Effect on target (ie self)
Spine of Confidence	- Shame

2.11.3 Exclamations

Emotion: Shame	Exclamation
0.0% of max	Finally free. I'm so glad it is over.
10% of max	My veil of shame is failing. Please, don't look at me.
30% of max	I don't deserve this! My place is under the earth.
60% of max	Nothing you say changes the facts. My entire being is a disgrace to the creation.

2.12 Sail of Sorrow

2.12.1 Concept Art



2.12.2 Spells

Casts Spell	Effect on target	Effect on self
Wet Net of Tears	+ Sadness	-ME
Aggression	-MR	-ME
Drain	-ME	-ME

Vulnerable to Spell	Effect on target (ie self)
Accommodate Sorrow	- Sadness

2.12.3 Exclamations

Emotion: Sadness	Exclamation
0.0% of max	Goodbye friend. You taught me to use my sails.
10% of max	I can see the color of the world now. The lump in my throat is melting.
30% of max	I don't know who I am when the sorrow diminishes. I have been crying for so long.
60% of max	You may try, but my sorrow goes too deep. It is impossible to accommodate a world devoid of color.

2.13 Guilt Ghost

2.13.1 Concept Art



2.13.2 Spells

Casts Spell	Effect on target	Effect on self
True Sounding Accusation	+ Guilt	-ME
Aggression	-MR	-ME
Drain	-ME	-ME

Vulnerable to Spell	Effect on target (ie self)
Forgive	- Guilt

2.13.3 Exclamations

Emotion: Guilt	Exclamation
0.0% of max	You helped me let go. Thank you.
10% of max	Circumstances...? Maybe I couldn't control them all. Maybe I was megalomaniac to think I could.
30% of max	I know what I did. I can never forgive myself. I live to atone.
60% of max	Forgiveness changes nothing. I know my responsibility. I am to blame.

B.5 Back-story

Table of Contents

Back Story in Game Design Documentation.....	1
Text on log in pages (visible to players).....	2
Short Introduction Text.....	2
Introduction - Katherine's Diary.....	2
More from Katherine's Diary.....	4

Back Story in Game Design Documentation

At the Pataphysic Institute (PI) no conflicts surfaced. Bullies were left to bully. No one dared confront them out of fear to become a target. Victims learned to keep quiet and not show their suffering. The lack of vents for expressing emotions the behavior of the staff got stuck in vicious circles of passive aggression. Boundaries were twisted, roles deformed, and responsibilities abandoned. Conflicting rule sets were propagated. Victims became perpetrators.

In the minds of the staff paranoia became the normal state. Each person developed a different interpretation of the situation to hold for real in order to function. A lot of energy was spent on maintaining mental pictures and projections supporting the individual world views. These also served to justify actions that in other contexts would be defined as crimes. This situation was maintained for many years.

The first death that was not possible to classify as an accident at the Institute caused the central committee to instigate an inquiry. The Lead Investigator sent three psychologists under oath of professional secrecy to interview the staff.

The report was presented in the main conference room. As point by point was projected in the power point presentation the mental pictures of each person were challenged. In order to protect the pictures, their personal versions of the reality, the audience individually strengthened their mental pictures.

Point by point the results of the investigation were rejected. Not a single person in the staff let the facts of the situation alter their interpretation of the situation.

The Lead Investigator, not succeeding to reach her audience, grew desperate. At an impulse, she suddenly pulled up a photograph from the police investigation of the deceased on the projection screen.

In that moment, when the collected staff was confronted with the brutal evidence of the suicide, the membrane between reality as we know it and the projections of mind was ripped apart. The Lead Investigator fled. In the confidential report she filed she speculated:

“In that moment, it was as if they collectively chose to reject reality, and that reality in response, shunned them. Or maybe the manifestations became too strong. This event is unprecedented. Irrespective of the reason of this sequence of

events the consequence for the staff of the Institute of Pataphysics is that they can continue to avoid understanding the consequences of their actions and non actions. As a personal note I think they made a devils bargain. They sentenced themselves to live with the manifestations and projections from their own minds. If just one of them had reached out for the other, dared to trust, maybe this would not have happened.”

The emergency response group sent from the central committee sealed off the building and established channels to continuously provide the remaining staff at IPP with food and other necessary supplies. The first field agents returning from a reconnaissance mission reported:

“As we entered the facilities of IPF we encountered several unexpected phenomena. The man known as Karl Sundgren had gone through a most peculiar transformation and acted as some kind of gate keeper. He only let us in if he got to make his personality tests on us. He used to be head of the Human Resource Department and claimed “it was for our own good”. Karl was, despite the obvious trauma and his transformation, a valuable informant. As he expressed it, when inside the IPP “it is as if all that was inside our minds are suddenly on the outside”. There is a system to how to use the mind that needs to be investigated further [...] We recommend that colleagues venturing into the facilities take the utmost caution. Depending on what you bring in and how you act the IPP can be either your personal purgatory or your personal paradise. We also recommend colleagues to be prepared to help each other – the expression ‘No man is an island’ has never been more true.”

The board of the central committee encouraged to former Lead Investigator to draft a confidential policy document regarding the situation at IPP. She wrote, late in the night:

“It falls under both the jurisdiction and responsibility of the Central Committee (CC) to investigate the situation at the Institute for Pataphysics (IPP). Opportunities include investigating the “Mind System” and gain an understanding of a possible solution to the system. It is advised to use investigators of various backgrounds in order to gain a multitude of nuanced perspectives. The first objective of the investigation is to determine whether the “Outbreak” is only dangerous. It cannot be ruled out that we could learn about potentially beneficial... “

Then she stopped writing, thinking “I want to see those manifestations again”. She glanced at her archive, which contained the transcribed interviews of the staff of the IPP. “And those people need help. But I can’t do it alone.”

Text on log in pages (visible to players)

Short Introduction Text

Welcome to the Pataphysic Institute! The inhabitants need your help dealing with the manifestations that have materialized from their minds due to the mysterious “Oubreak”. What you can do depends on your personality. [Read More]

Note: link to next part of text. “Read More” leads to text “Introduction”

Introduction - Katherine's Diary

When I was called in it was already too late.

We in the Central Committee had had our eyes on the Pataphysic institute for years. It was when the first death that was impossible to classify as an accident that I was sent there to lead the inquiry.

I and my three co-workers, all psychologists, interviewed the whole staff under oath of professional secrecy.

I presented our report in the main conference room. They rejected the results, point by point, as they appeared on the slides. Not a single person on the staff let the facts of the situation alter their interpretation of the situation.

I grew desperate. I wanted to reach through to them. On an impulse, I pulled up a photograph of the deceased from the police investigation on the large projection screen. Suicide.

In that moment, when the collected staff was confronted with the brutal evidence of the suicide, the membrane between reality as we know it and the projections of mind was ripped apart.

I had to flee.

It was as if they collectively chose to reject reality, and that reality in response shunned them. Or maybe the manifestations became too strong.

From my confidential report:

“This event is unprecedented. Irrespective of the reason for this sequence of events the staff of the Institute of Pataphysics can not continue to avoid understanding the consequences of their actions and in actions. On a personal note, I think they made a devils bargain. They sentenced themselves to live with the manifestations and projections from their own minds. If just one of them had reached out for the other, dared to trust, maybe this would not have happened.”

The emergency response group sent from the central committee sealed off the building and established channels to provide the remaining staff at IP with food and other necessary supplies. The first field agents returning from a reconnaissance mission reported:

“As we entered the facilities of IPP we encountered several unexpected phenomena. The man known as Karl Sundgren had gone through a most peculiar transformation and acted as some kind of gate keeper. He only let us in if he got to run his personality tests on us. He used to be head of the Human Resource Department and claimed ‘it was for our own good’.

Karl was, despite the obvious trauma and his transformation, a valuable informant. As he expressed it, when inside the PI ‘it is as if all that was inside our minds are suddenly on the outside’.

There is a system for how to use the mind that needs to be investigated further [...] We

recommend that colleagues venturing into the facilities take the utmost caution. Depending on what you bring in and how you act the PI can be either your personal purgatory or your personal paradise.

We also recommend colleagues to be prepared to help each other – the expression ‘No man is an island’ has never been more true.”

The board of the central committee asked me to draft a confidential policy document regarding the situation at PI.

It's late in the night now, and this is what I'm putting in the policy doc:

“It falls under both the jurisdiction and responsibility of the Central Committee (CC) to investigate the situation at the Institute for Pataphysics (IPP). Opportunities include investigating the “Mind System” and gaining an understanding of a possible solution to the situation. It is advisable to use investigators of various backgrounds in order to gain a multitude of nuanced perspectives. The first objective of the investigation is to determine whether the ‘Outbreak’ is only dangerous. It cannot be ruled out that we could learn about potentially beneficial... “

I want to see those manifestations again.

I have the transcribed interviews of the staff here on my desk.

Those people need help. But I can't do it alone.

[More from Katherine's Diary]

Note: [link to next part of text.](#)

More from Katherine's Diary

I can't stop thinking of PI. From what I have gathered from the interviews no conflicts surfaced there. Bullies were left to bully. No one dared confront them out of fear of becoming a target. Victims learned to keep quiet and not show their suffering. Because of the lack of vents for expressing emotions the behavior of the staff got stuck in vicious circles of passive aggression. Boundaries were twisted, roles deformed, and responsibilities abandoned. Conflicting rule sets were propagated. Victims became perpetrators.

In the minds of the staff, paranoia became the normal state. Each person developed a different interpretation of the situation “real” in order to function. A lot of energy was spent on maintaining mental pictures and projections supporting individual world views. These also served to justify actions that in other contexts would be defined as crimes.

Maybe the Oubreak wasn't so mysterious after all. Maybe it just went too far.

What I don't get now is how they whole place has gone into this weird bubble, and how all the ordinary every-day things look so different. I have to go back in.

B.6 Dialogue of Non-Playable Characters

NPC Dialogue

Gate Keeper Dialog

1.1 Gate Keeper Dialog 1 - Arriving to PI

GK 1-1.

Welcome to the Pataphysic Institute. I'm so glad you are here, we really NEED YOU.

GK 1-2

It has been so different since the Outbreak. I don't know if it is a curse or a blessing. You see since this outbreak, all that we used to keep INSIDE our mind is now on the OUTSIDE. Roaming free! Weird MANIFESTATIONS!

GK 1-3

If you click that M-symbol you have there up to your left - it will show your MIND! Beg your pardon - it shows the mind as good as we know how to watch it. This is a university after all, and we do look at things through the knowledge we have.

GK 1-4

You see, we need this knowledge to HELP EACH OTHER. When the outbreak came...

So many of us just fell through, and the manifestations of our pains and fears make it ...quite challenging to be here.

Just look at me! My name used to be Karl Sandgren...and I used to look normal - whatever that is.

I used to be the head of the Human Resource Department. Now I'm the Gate Keeper, just as you are (avatar name)

GK 1-5

I have your PERSONALITY FILE here... I'm trying to understand... It seems depending on the strengths a person has she can do different things... things that are not normal. I call it MIND MAGIC.

Oh thank god, your dominant facet is [FACET]

[EXTROVERSION]

[AGREEABLENESS]

[CONSCIENTOUSNESS]

[NEUROTICISM]

[OPENNESS]

NPC Dialogue

GK 1-6

We need people just like you. We can talk about the [FACET] later on, but right now I'm looking for any extreme values I can find here that soothe some of the more problematic manifestations... oh yes! This is perfect. I think I have worked this one out. You have an interesting value here on the trait... hm...

GK 1-7

Implementation note: See appendix to GDD 'pi-mind-magic-spells', section "emotion spells - which PC gets which spell?" the player is to get her [FIRST ES]

...[intellect, which is part of the Openness facet. Good. You will be able to wield the LASER PEN OF CLARITY. Ah good, this will be effective against the COLOSSUSES OF CONFUSION. They are so... well. Confused.]

...[vulnerability, which is part of the Neuroticism facet. Good. You know about pain, you'll be able to DULL PAIN. Excellent against ANGUISH ABOMINATIONS. They are really... well. Pained.]

...[anxiety, which is part of the Neuroticism facet. Good. You know a thing or two about fear, and what to do about it. You'll be able to HOLD HAND. Excellent against TERROR TROLLS. They are really... well. Terrified.]

...[immoderation, which is part of the Neuroticism facet. Good. It seems this is somehow connected to shame, and how to battle it. You'll be able to cast a SPINE OF. Excellent against SHAME SHELLS. They are really... well. Ashamed.]

...[depression, which is part of the Neuroticism facet. Good. You might have a about clue how to deal with sadness. You'll be able to ACCOMODATE SORROW. Excellent against SAILS OF SORROW. They are so... well. Sad.]

GK 1-8

There is something else... I'm trying to come to terms with this whole thing...

All that seems to matter here , in terms of what I CAN and CAN'T do is tied to my MOOD!

The MOOD seems to be connected to my PERSONALITY and to my EMOTIONS. I think it's like that for all of us. But we seem to be able to gain more resistance and energy as we learn and act in this world.

GK 1-9

Try clicking that S-symbol at your lower left. Those are the mind magic spells you can do. But be attentive on what mood you are in! Mood has a significant effect on what spells you can cast!

Oh dear. We can't stand here and chat all day. Would you mind CLEANING UP SOME MANIFESTIONS... over there in the corridor?

NPC Dialogue

//HERE ENDS THE CONTINUOUS CONVERSATIONS. IF THE PLAYER COMES BACK BEFORE 5 NEGATIVE SINGLE SENTIMENT MOBS (ANY 5) THE FOLLOWING DIALOGS COME:

GK 1-9

You might want to try your [FIRST ES] on [CORRESPONDING MOB]. If we can get rid of 5 of those negative manifestations it would be good.

GK 1-10

Just concentrate on those manifestations close by, don't go to the lecture hall! There is a confused and traumatized guest lecturer in there! He'll swat you with his irrelevant questions.

GK 1-10 (repeat)

Let's talk more later, I can't concentrate with those manifestations in the corridor!

1.2 Gate Keeper dialog 2 - 5 dead manifestations later.

//Conditions - 5 negative (any) single sentiment mobs evaporated.

GK 2-1

I can actually feel the difference. Well done! Look, as Gate Keeper I can give you experience points! That's a new thing too! I feel quite empowered.

[PC awarded "medium amount" xp]

//GK-short alternatives. Gets available at this point, stays available until read.

GK 2-2

Experience points?

It's my own term! I might have heard it somewhere before though. I used to administer people getting promoted before... now I have a much better system. I give you experience points, the more you get the higher 'level' you get! It is a numerical value that designates how strong your mind is. Level. My term too. Yup. Very practical. I gave myself some points too.

GK 2-3

My level?

Much higher than the principals. But he doesn't now that. I feel we can work on a need-to-know basis now, I'm sure he'll understand. Well. If he wants to discuss it I will talk to him about quality and quantity. Oh yes. He'll make my day.

Quality?

Well, what do you mean by that? I know exactly what I mean with levels! A sweet quantitative value. And representative! Isn't THAT quality? A beautiful way of managing human resources. Very sexy.

NPC Dialogue

1.3 GK Dialog 3 - opens after GK 2-1

Opens when player has killed 5 mobs, and closes when player has completed dialog 2 with Teresa

GK 3-1

You might have noticed the effect mood had on... what should I call it... your action potential! That you need to be in certain moods to cast certain spells. We found that social interactions have a profound effect on the mood.

GK 3-2

If you are interested, you should go see Teresa. She is one of our PHD students; she is studying the effects of social actions. She calls them affective though. That's also a new thing - all of a sudden it's acutely concrete how social acts affect us! If she knows I sent you she will talk to you. I'll send her a notification.

[HERE - SET VALUE THAT OPENS UP TERESA DIALOG 2]

1.4 GK Dialog 4 - opens after GK 2-1, closes when player reaches level 5

GK 4-1 [opens after GK 4-3 and after GK 2-1]

Those manifestations just keep respawning in the corridor! You'd think they feel old traumas in the wall or something! If you could do something about them, I'd be really grateful.

GK 4-2 (If player back with less than 5 killed SS Mobs)

I see, you have more important things to do. Never mind me. I guess 5 less of those manifestations were too much to ask for.

[GK makes AA 15 "Guilt" on PC]

GK 4-3 (if player completed 5 more SS mobs)

Aren't you the shiny asset! Well done!

[GK gives "medium amount" xp to PC]

[GK sets AA 7 "affirm" on PC]

GK 4-4 (if GK 4-1 is open, this alternative comes up and disappear when read)

Corridor?

Yes, that green grassy area over there. Oh yes, that's true, you weren't here when it happened. It USED to be a corridor and I somehow think it still is. But it looks different.

GK 4-5 (after GK 4-4, disappears when read)

Different?

Yes... It's strange, even though it looks completely different it FEELS the same here in the

NPC Dialogue

house, same corridors, offices, the lecture halls, you know. Sometimes I have this unnerving feeling of being in an environment that is not physical. Maybe I'm just being silly, not used to having buttons hanging in the edges of my field of vision.

1.5 GK Dialog 5 - Opens after Dialog 2 with Teresa (unwritten)

1.6 Implementation note

GK Animation:

Looking at (invisible) papers, moving hand in (invisible) folder-archive, and taking out new papers. (OLA IF THIS IS INCOMPREHENSIBLE I WILL SHOW YOU)

GK characteristics for dialog:

As former head of HR he suffers from some management style phrasing. For more details please refer to the main GDD.

1.6.1 GK Dialog to write:

Dialog for each new spell the player can learn.
Intertwined dialog that gives clues about PI

Teresa Dialogs

1.7 Teresa Dialog 1 - busy

T1-1

Hmm... another manifestation are you?

T1-2

No, don't recognize you from any memories. Or emotions! And apparently my headphones are invisible.

T1-3

I think you got the wrong person here... Try Karl... the Gate Keeper, you could be one of his mind figments.

T1-4

Grumble. Can't believe he has so many figments. Hmf. Figures.

T1-5

(sings falsely) Staying alive staying alive who ho hoo

NPC Dialogue

T 1-6

(sings falsely) Aliiiiiive

//After T1-6 repeat T1-5 - T1-6

1.8 Teresa Dialog 2 - O hai

Dialog accessible after GK 3-2

T2-1

Another manifestation...? You wouldn't be [Avatar name], would you? Oh you are. Hi.

T2-2

I got the notification from Karl. That's the Gate keeper, he calls himself that. Clutching those personality files as if his life depended on them and going all Cerberus on us. Not that he shuts anyone out of here... we really need all the help we can get.

T2-3

I guess he told you about these affective actions I'm studying. I'm starting to see some patterns. Not literally...but speaking about that - I do see certain things in the edges of my vision. You might do it too. Up to you left - Do you see an A-symbol? If you do, try clicking it.

T2-4

Affective Actions are quite remarkable. They force an emotional reaction! If you are in a receptive mood that is. Try one on me! The joke for example.

*IF player "joke"
then Teresa(T) "laugh at joke"*

*IF player "small talk"
then T "be attentive"*

*If player "look at target with dismay"
then T "ignore"*

*If player "ignore"
then T "look at target with dismay"*

Implementation note: These AAs will be possible to use with Teresa at any point after T2-4

T2-5

I felt that! You know, how much we feel depends on our personalities. Karl and I discovered that when we were comparing notes.

T2-6

NPC Dialogue

My notes are in the notebook here, if you are interested. Karl has one too.

T2-7

Another thing. I discovered there is a limit to how many AAs we can do on each other. Karl and I have been using them a lot. We need to be in certain moods when we try to weed out some of the nastier manifestations.

T2-8

Who thought I'd become friends with Karl. Maybe that's the strangest thing with the whole Outbreak! I guess he kind of grew on me. He's got some management lingo, but that's fine, he can't help it.

T2-9

Somehow, this friendship with Karl, it seem to make me stronger. It gave me this sense of belonging. Being here together when it happened, trying to understand it... You'll meet people like that too. It feels quite nice.

T2-10 (IF Teresa develops a sentiment toward the player)

Oh my! Another one of those sentiments! Just like that! I feel [EMOTION] towards you!

T2-11

It's interesting, to get it in black and white like that, how you feel toward another being. These sentiments come and go, but if I still have it when I see you next time I'll feel [EMOTION]!

T2-12

Do you have a sentiment toward me? Oh never mind... you don't need to answer. That's private. Oh, that's another thing. People won't be able to see your personality and emotions and sentiments and what not. I for example can only see what mood you are in. And that goes for all of us. The only one else who knows your personality is Karl. Hm... maybe there IS a point in that way he hoards and guards those files...

T2-13

Speaking about Karl... I have some stuff to do. But do pop by! I'd love to hear a "joke" every now and then!

T2-14

I'll see you again later! Don't forget to "joke" and do the other AA's on people in here!

T2-15 (Repeat until Dialog T3 opens up)

...Ma Baker she told all her sons ... hmmmhmmhmm... handle their guns...

NPC Dialogue

1.9 Teresa Dialog 3 - After seeing the GK again

// Opens up when player has been back to the GK. (AAs still available from T2-4) Dialog available until read by player. At level 3 another dialog option becomes available.

T3-1

Oh hi [PC name].

T3-1-2 (IF Teresa has sentiment toward player ELSE go to T3-2)

Oh dear, I just got a small flutter of [EMOTION] because of you!

T3-2

There was something I wanted to tell you... Have you noticed that emotions can go out of bounds sometimes? It's like they become so intense that we can't contain them!

T3-3

There is that poor guest lecturer in the lecture hall. He seems to be spawning these Colossuses of Confusion the whole time! You wouldn't be able to wield the laser pen of clarity, would you? Or know someone who can? I can't. I'm only good for those Sails of Sorrows.

//T does AA "tell small secret" on player

T3-4

I need to get back to the AAs here. So much I still don't understand.

T3-5 (repeat if all other dialog options locked)

...I'm crazy like a fool... hmhm daddy... daddy cool?

1.10 Implementation notes

Animation on Teresa:

Stands still when in dialog.

When not in dialog: Animation where she stuffs around in a busy but confused way, as if scribbling and moving around invisible post-it notes. She also sings falsely to the disco songs she hears in her invisible headphones.

Dialog to write:

dialog for levels where players learn more AAs.

Intertwined with information about PI and the Outbreak.

Teresa dialog Characteristics

Friendly toward players. Sometimes confused, busy, and ignoring them. For more details please refer to the main GDD.

NPC Dialogue

1.10.1 Dialog to Write:

Lines for the learning of new AAs as player character levels up.
Clues about the history of PI before the outbreak.

The Gate Keeper's Scrap Book

This is a utility item that the player's can browse at any time. Information in the book becomes available as the player character levels up. The rationale is that the Gate Keeper wants to operate in what he calls a "need-to-know-basis".

Teresa's Notebook

This is a utility item that the player's can browse at any time. Information in the book becomes available as the player character levels up. The rationale is that Teresa wants to meet the character more before she is comfortable with giving access to her notes about the first period after the outbreak. (Implementing a trust system for this might be overkill)

Versions

Version 01, 2009-03-20: GK Dialog batches 1 - 5. Teresa Dialog Batches 1 - 3. (MPE)

Version 02, 2009-03-25: Proofreading and minor changes of version 01. (MPE)

Version 03, 2009-03-30 Changes after proofreading by Musse Dolk's friend Daniel Goodman.

B.7 The Gate Keeper's Book

Table of Contents

..... 4

Dialog - The Gate Keepers Scrap Book..... 4

[1.1 Chapter 1 - Personality Facets and Traits.4](#)

[1.2 GKB 1-1 Old PI policy note from the Gate Keeper about The Big Five.....4](#)

[1.3 GKB 1-2 About personality Traits.....4](#)

[1.3.1 GKB 1-3 Extraversion..... 5](#)

[1.3.2 Agreeableness.....6](#)

[1.3.3 Conscientiousness..... 8](#)

[1.3.4 Neuroticism.....10](#)

[1.3.5 Openness to Experience..... 11](#)

Dialog - The Gate Keepers Scrap Book

This is a utility item that the player's can browse at any time. Information in the book becomes available as the player character levels up. The rationale is that the Gate Keeper wants to operate in what he calls a "need-to-know-basis".

1.1 Chapter 1 - Personality Facets and Traits.

//Chapter 1 is available from start.

1.2 GKB 1-1 Old PI policy note from the Gate Keeper about The Big Five

After careful consideration it seems the most suitable system for us at PI is the Five Factor Model (FFM). The board of directors came to an unanimous conclusion after my recommendations to store FFM data on employees of PI. Furthermore any individual resident at PI in any form will be requested for FFM data. This is part of the general PI Policy document as adapted after board meeting 117-B4.

The FFM is considered to be the most comprehensive empirical or data-driven enquiry into personality. For individual assessment the HR department of PI is required to use the short version of the IPIP-NEO (International Personality Item Pool Representation of the NEO PI-R), consisting of 120 items.

PI is grateful to Professor John A. Johnson, Professor of Psychology, Penn State University, for the public domain scoring and report routines developed for this version, which builds upon the full IPIP, which in turn contains 2,413 items assembled by Dr. Lewis R. Goldberg.

1.3 GKB 1-2 About personality Traits

Personality traits describe, relative to other people, the frequency or intensity of a person's feelings, thoughts, or behaviors. Possession of a trait is therefore a matter of degree. We might describe two individuals as extraverts but still see one as more extraverted than the other.

"Low," "average," and "high" scores on a personality test are neither absolutely good nor bad. A particular level on any trait will probably be neutral or irrelevant for a great many activities, be helpful for accomplishing some things, and detrimental for accomplishing other things.

As with any personality inventory, scores and descriptions can only approximate an individual's actual personality. High and low score descriptions are usually accurate, but average scores close to the low or high boundaries might misclassify you as only average. On each set of six subdomain scales it is somewhat uncommon but certainly possible to score high in some of the subdomains and low in the others. In such cases more attention should be paid to the subdomain scores than to the broad domain score.

The text in this chapter is adapted from Jhon A. Johnson's descriptions of the five domains and thirty subdomains.

1.3.1 GKB 1-3 Extraversion

Extraversion is marked by pronounced engagement with the external world. Extraverts enjoy being with people, are full of energy, and often experience positive emotions. They tend to be enthusiastic, action-oriented, individuals who are likely to say "Yes!" or "Let's go!" to opportunities for excitement.

In groups they like to talk, assert themselves, and draw attention to themselves.

Introverts lack the exuberance, energy, and activity levels of extraverts. They tend to be quiet, low-key, deliberate, and disengaged from the social world. Their lack of social involvement should not be interpreted as shyness or depression; the introvert simply needs less stimulation than an extravert and prefers to be alone. The independence and reserve of the introvert is sometimes mistaken as unfriendliness or arrogance. In reality, an introvert who scores high on the agreeableness dimension will not seek others out but will be quite pleasant when approached.

If your score on Extraversion is low, it indicates that you are introverted, reserved, and quiet. You enjoy solitude and solitary activities. Your socializing tends to be restricted to a few close friends.

If our score on Extraversion is average, it indicates that you are neither a subdued loner nor a jovial chatterbox. You enjoy time with others but also time alone.

If your score on Extraversion is high, it indicates that you are sociable, outgoing, energetic, and lively. You prefer to be around people much of the time.

1.3.1.1 GKB 1-3-1 Friendliness

Friendly people genuinely like other people and openly demonstrate positive feelings toward others. They make friends quickly and it is easy for them to form close, intimate relationships. Low scorers on Friendliness are not necessarily cold and hostile, but they do not reach out to others and are perceived as distant and reserved.

1.3.1.2 GKB 1-3-2 Gregariousness

Gregarious people find the company of others pleasantly stimulating and rewarding. They enjoy the excitement of crowds. Low scorers tend to feel overwhelmed by, and therefore actively avoid, large crowds. They do not necessarily dislike being with people sometimes, but their need for privacy and time to themselves is much greater than for individuals who score high on this scale.

1.3.1.3 GKB 1-3-3 Assertiveness

High scorers Assertiveness like to speak out, take charge, and direct the activities of others. They tend to be leaders in groups. Low scorers tend not to talk much and let others control the activities of groups.

1.3.1.4 GKB 1-3-4 Activity Level

Active individuals lead fast-paced, busy lives. They move about quickly, energetically, and vigorously, and they are involved in many activities. People who score low on this scale follow a slower and more leisurely, relaxed pace.

1.3.1.5 GKB 1-3-5 Excitement-Seeking

High scorers on this scale are easily bored without high levels of stimulation. They love bright lights and hustle and bustle. They are likely to take risks and seek thrills. Low scorers are overwhelmed by noise and commotion and are adverse to thrill-seeking.

1.3.1.6 GKB 1-3-6 Cheerfulness

This scale measures positive mood and feelings, not negative emotions (which are a part of the Neuroticism domain). Persons who score high on this scale typically experience a range of positive feelings, including happiness, enthusiasm, optimism, and joy. Low scorers are not as prone to such energetic, high spirits.

1.3.2 Agreeableness

Agreeableness reflects individual differences in concern with cooperation and social harmony. Agreeable individuals value getting along with others. They are therefore considerate, friendly, generous, helpful, and willing to compromise their interests with others'. Agreeable people also have an optimistic view of human nature. They believe people are basically honest, decent, and trustworthy.

Disagreeable individuals place self-interest above getting along with others. They are generally unconcerned with others' well-being, and therefore are unlikely to extend themselves for other people. Sometimes their skepticism about others' motives causes them to be suspicious, unfriendly, and uncooperative.

Agreeableness is obviously advantageous for attaining and maintaining popularity. Agreeable people are better liked than disagreeable people. On the other hand, agreeableness is not useful in situations that require tough or absolute objective decisions. Disagreeable people can make excellent scientists, critics, or soldiers.

Your score on Agreeableness is low, indicating less concern with others' needs than with your own. People see you as tough, critical, and uncompromising.

Your level of Agreeableness is average, indicating some concern with others' needs, but generally, unwillingness to sacrifice yourself for others.

Your high level of Agreeableness indicates a strong interest in others' needs and well-being. You are pleasant, sympathetic, and cooperative.

1.3.2.1 Trust

A person with high trust assumes that most people are fair, honest, and have good intentions. Persons low in trust see others as selfish, devious, and potentially dangerous.

1.3.2.2 Morality

High scorers on this scale see no need for pretense or manipulation when dealing with others and are therefore candid, frank and sincere. Low scorers believe that a certain amount of deception in social relationships is necessary. People find it relatively easy to relate to the straightforward high-scorers on this scale. They generally find it more difficult to relate to the unstraightforward low-scorers on this scale. It should be made clear that low scorers are not unprincipled or immoral; they are simply more guarded and less willing to openly reveal the whole truth.

1.3.2.3 Altruism

Altruistic people find helping other people genuinely rewarding. Consequently, they are generally willing to assist those who are in need. Altruistic people find that doing things for others is a form of self-fulfillment rather than self-sacrifice. Low scorers on this scale do not particularly like helping those in need. Requests for help feel like an imposition rather than an opportunity for self-fulfillment.

1.3.2.4 Cooperation

Individuals who score high on this scale dislike confrontations. They are perfectly willing to compromise or to deny their own needs in order to get along with others. Those who score low on this scale are more likely to intimidate others to get their way.

1.3.2.5 Modesty

High scorers on this scale do not like to claim that they are better than other people. In some cases this attitude may derive from low self-confidence or self-esteem. Nonetheless, some people with high self-esteem find immodesty unseemly. Those who are willing to describe themselves as superior tend to be seen as disagreeably arrogant by other people.

1.3.2.6 Sympathy

People who score high on this scale are tenderhearted and compassionate. They feel the pain of others vicariously and are easily moved to pity. Low scorers are not affected strongly by human suffering.

They pride themselves on making objective judgments based on reason.

They are more concerned with truth and impartial justice than with mercy.

1.3.3 Conscientiousness

Conscientiousness concerns the way in which we control, regulate, and direct our impulses. Impulses are not inherently bad; occasionally time constraints require a snap decision, and acting on our first impulse can be an effective response. Also, in times of play rather than work, acting spontaneously and impulsively can be fun. Impulsive individuals can be seen by others as colorful, fun-to-be-with, and zany.

Nonetheless, acting on impulse can lead to trouble in a number of ways. Some impulses are antisocial. Uncontrolled antisocial acts not only harm other members of society, but also can result in retribution toward the perpetrator of such impulsive acts. Another problem with impulsive acts is that they often produce immediate rewards but undesirable, long-term consequences. Examples include excessive socializing that leads to being fired from one's job, hurling an insult that causes the breakup of an important relationship, or using pleasure-inducing drugs that eventually destroy one's health.

Impulsive behavior, even when not seriously destructive, diminishes a person's effectiveness in significant ways. Acting impulsively disallows contemplating alternative courses of action, some of which would have been wiser than the impulsive choice. Impulsivity also sidetracks people during projects that require organized sequences of steps or stages. Accomplishments of an impulsive person are therefore small, scattered, and inconsistent

A hallmark of intelligence, what potentially separates human beings from earlier life forms, is the ability to think about future consequences before acting on an impulse. Intelligent activity involves contemplation of long-range goals, organizing and planning routes to these goals, and persisting toward one's goals in the face of short-lived impulses to the contrary. The idea that intelligence involves impulse control is nicely captured by the term prudence, an alternative label for the Conscientiousness domain. Prudent means both wise and cautious. Persons who score high on the Conscientiousness scale are, in fact, perceived by others as intelligent.

The benefits of high conscientiousness are obvious. Conscientious individuals avoid trouble and achieve high levels of success through purposeful planning and persistence. They are also positively regarded by others as intelligent and reliable. On the negative side, they can be compulsive perfectionists and workaholics. Furthermore, extremely conscientious individuals might be regarded as stuffy and boring. Unconscientious people may be criticized for their unreliability, lack of ambition, and failure to stay within the lines, but they will experience many short-lived pleasures and they will never be called stuffy.

Your score on Conscientiousness is low, indicating you like to live for the moment and do what feels good now. Your work tends to be careless and disorganized.

Your score on Conscientiousness is average. This means you are reasonably reliable, organized, and self-controlled.

Your score on Conscientiousness is high. This means you set clear goals and pursue them with determination. People regard you as reliable and hard-working. <P><P>

1.3.3.1 Self-Efficacy

Self-Efficacy describes confidence in one's ability to accomplish things. High scorers believe they have the intelligence (common sense), drive, and self-control necessary for achieving success. Low scorers do not feel effective, and may have a sense that they are not in control of their lives.

1.3.3.2 Orderliness

Persons with high scores on orderliness are well-organized. They like to live according to routines and schedules. They keep lists and make plans. Low scorers tend to be disorganized and scattered.

1.3.3.3 Dutifulness

This scale reflects the strength of a person's sense of duty and obligation. Those who score high on this scale have a strong sense of moral obligation. Low scorers find contracts, rules, and regulations overly confining. They are likely to be seen as unreliable or even irresponsible.

1.3.3.4 Achievement-Striving

Individuals who score high on this scale strive hard to achieve excellence. Their drive to be recognized as successful keeps them on track toward their lofty goals. They often have a strong sense of direction in life, but extremely high scores may be too single-minded and obsessed with their work. Low scorers are content to get by with a minimal amount of work, and might be seen by others as lazy.

1.3.3.5 Self-Discipline

Self-discipline-what many people call will-power-refers to the ability to persist at difficult or unpleasant tasks until they are completed. People who possess high self-discipline are able to overcome reluctance to begin tasks and stay on track despite distractions. Those with low self-discipline procrastinate and show poor follow-through, often failing to complete tasks-even tasks they want very much to complete.

1.3.3.6 Cautiousness

Cautiousness describes the disposition to think through possibilities before acting. High scorers on the Cautiousness scale take their time when making decisions. Low scorers often say or do

first thing that comes to mind without deliberating alternatives and the probable consequences of those alternatives.

1.3.4 Neuroticism

Freud originally used the term *neurosis* to describe a condition marked by mental distress, emotional suffering, and an inability to cope effectively with the normal demands of life. He suggested that everyone shows some signs of neurosis, but that we differ in our degree of suffering and our specific symptoms of distress. Today neuroticism refers to the tendency to experience negative feelings. Those who score high on Neuroticism may experience primarily one specific negative feeling such as anxiety, anger, or depression, but are likely to experience several of these emotions. People high in neuroticism are emotionally reactive. They respond emotionally to events that would not affect most people, and their reactions tend to be more intense than normal. They are more likely to interpret ordinary situations as threatening, and minor frustrations as hopelessly difficult. Their negative emotional reactions tend to persist for unusually long periods of time, which means they are often in a bad mood. These problems in emotional regulation can diminish a neurotic's ability to think clearly, make decisions, and cope effectively with stress.

At the other end of the scale, individuals who score low in neuroticism are less easily upset and are less emotionally reactive. They tend to be calm, emotionally stable, and free from persistent negative feelings. Freedom from negative feelings does not mean that low scorers experience a lot of positive feelings; frequency of positive emotions is a component of the Extraversion domain.

Your score on Neuroticism is low, indicating that you are exceptionally calm, composed and unflappable. You do not react with intense emotions, even to situations that most people would describe as stressful.

Your score on Neuroticism is average, indicating that your level of emotional reactivity is typical of the general population. Stressful and frustrating situations are somewhat upsetting to you, but you are generally able to get over these feelings and cope with these situations.

Your score on Neuroticism is high, indicating that you are easily upset, even by what most people consider the normal demands of living. People consider you to be sensitive and emotional.

1.3.4.1 Anxiety

The "fight-or-flight" system of the brain of anxious individuals is too easily and too often engaged. Therefore, people who are high in anxiety often feel like something dangerous is about

to happen. They may be afraid of specific situations or be just generally fearful. They feel tense, jittery, and nervous. Persons low in Anxiety are generally calm and fearless.

1.3.4.2 Anger

Persons who score high in Anger feel enraged when things do not go their way. They are sensitive about being treated fairly and feel resentful and bitter when they feel they are being cheated. This scale measures the tendency to *feel* angry; whether or not the person *expresses* annoyance and hostility depends on the individual's level on Agreeableness. Low scorers do not get angry often or easily.

1.3.4.3 Depression

This scale measures the tendency to feel sad, dejected, and discouraged. High scorers lack energy and have difficult initiating activities. Low scorers tend to be free from these depressive feelings.

1.3.4.4 Self-Consciousness

Self-conscious individuals are sensitive about what others think of them. Their concern about rejection and ridicule cause them to feel shy and uncomfortable around others. They are easily embarrassed and often feel ashamed. Their fears that others will criticize or make fun of them are exaggerated and unrealistic, but their awkwardness and discomfort may make these fears a self-fulfilling prophecy. Low scorers, in contrast, do not suffer from the mistaken impression that everyone is watching and judging them. They do not feel nervous in social situations.

1.3.4.5 Immoderation

Immoderate individuals feel strong cravings and urges that they have difficulty resisting. They tend to be oriented toward short-term pleasures and rewards rather than long-term consequences. Low scorers do not experience strong, irresistible cravings and consequently do not find themselves tempted to overindulge.

1.3.4.6 Vulnerability

High scorers on Vulnerability experience panic, confusion, and helplessness when under pressure or stress. Low scorers feel more poised, confident, and clear-thinking when stressed.

1.3.5 Openness to Experience

Openness to Experience describes a dimension of cognitive style that distinguishes imaginative, creative people from down-to-earth, conventional people. Open people are intellectually curious, appreciative of art, and sensitive to beauty. They tend to be, compared to closed people, more aware of their feelings. They tend to think and act in individualistic and nonconforming ways. Intellectuals typically score high on Openness to Experience; consequently, this factor has also been called *Culture* or *Intellect*. Nonetheless, Intellect is probably best regarded as one aspect of

openness to experience. Scores on Openness to Experience are only modestly related to years of education and scores on standard intelligent tests.

Another characteristic of the open cognitive style is a facility for thinking in symbols and abstractions far removed from concrete experience. Depending on the individual's specific intellectual abilities, this symbolic cognition may take the form of mathematical, logical, or geometric thinking, artistic and metaphorical use of language, music composition or performance, or one of the many visual or performing arts.

People with low scores on openness to experience tend to have narrow, common interests. They prefer the plain, straightforward, and obvious over the complex, ambiguous, and subtle. They may regard the arts and sciences with suspicion, regarding these endeavors as abstruse or of no practical use. Closed people prefer familiarity over novelty; they are conservative and resistant to change.

Openness is often presented as healthier or more mature by psychologists, who are often themselves open to experience. However, open and closed styles of thinking are useful in different environments. The intellectual style of the open person may serve a professor well, but research has shown that closed thinking is related to superior job performance in police work, sales, and a number of service occupations.

Your score on Openness to Experience is low, indicating you like to think in plain and simple terms. Others describe you as down-to-earth, practical, and conservative.

Your score on Openness to Experience is average, indicating you enjoy tradition but are willing to try new things. Your thinking is neither simple nor complex. To others you appear to be a well-educated person but not an intellectual.

Your score on Openness to Experience is high, indicating you enjoy novelty, variety, and change. You are curious, imaginative, and creative.

1.3.5.1 Imagination

To imaginative individuals, the real world is often too plain and ordinary. High scorers on this scale use fantasy as a way of creating a richer, more interesting world. Low scorers on this scale are more oriented to facts than fantasy.

1.3.5.2 Artistic Interests

High scorers on this scale love beauty, both in art and in nature. They become easily involved and absorbed in artistic and natural events. They are not necessarily artistically trained nor talented, although many will be. The defining features of this scale are *interest in*, and *appreciation of natural* and artificial beauty. Low scorers lack aesthetic sensitivity and interest in the arts.

1.3.5.3 Emotionality

Persons high on Emotionality have good access to and awareness of their own feelings. Low scorers are less aware of their feelings and tend not to express their emotions openly.

1.3.5.4 Adventurousness

High scorers on adventurousness are eager to try new activities, travel to foreign lands, and experience different things. They find familiarity and routine boring, and will take a new route home just because it is different. Low scorers tend to feel uncomfortable with change and prefer familiar routines.

1.3.5.5 Intellect

Intellect and artistic interests are the two most important, central aspects of openness to experience. High scorers on Intellect love to play with ideas. They are open-minded to new and unusual ideas, and like to debate intellectual issues. They enjoy riddles, puzzles, and brain teasers. Low scorers on Intellect prefer dealing with either people or things rather than ideas. They regard intellectual exercises as a waste of time. Intellect should not be equated with intelligence.

Intellect is an intellectual style, not an intellectual ability, although high scorers on Intellect score slightly higher than low-Intellect individuals on standardized intelligence tests.

1.3.5.6 Liberalism

Psychological liberalism refers to a readiness to challenge authority, convention, and traditional values. In its most extreme form, psychological liberalism can even represent outright hostility toward rules, sympathy for law-breakers, and love of ambiguity, chaos, and disorder. Psychological conservatives prefer the security and stability brought by conformity to tradition. Psychological liberalism and conservatism are not identical to political affiliation, but certainly incline individuals toward certain political parties.

B.8 Dialog System

Dialog System

The dialog system used in PI is implemented by Christoph Pech (CP) according to the needs specified by Mirjam P Eladhari. This section builds upon information provided CP and describe how the system is used.

1.1 Expression Evaluator

In order to make the system flexible an Expression Evaluator was added. This Evaluator is stack based and can solve mathematical functions. Its number format is floating point. It is 32Bit but could be easily changed to 64Bit if necessary.

Logical operators on floating point values assume that 0.0 == false any other number is true.

It supports following operations: (some of them are accessible by operators, C++ like)

2 parameters: func(a,b)

add +

sub -

mul *

div /

mod % -> modulo

pow ^ -> power

min

max

logand &&

logor ||

equal ==

notequal !=

less <

greater >

lessequal <=

greaterequal >=

assign =

assignadd +=

assignsub -=

assignmul *=

assigndiv /=

1 parameter func(a)

not !

sin

cos

tan

sinh

cosh

tanh

asin

acos

atan

sqrt

abs

fabs

exp

neg

log

log10

floor

ceil

tolower (string)

toupper (string)

contains (string)

find (string)

LogPrint (string) -> logging for debugging to Console and Logfile
(Server/Log/ptoLog_ptoPI_[date].txt)

1.1.1 Implementation note

More function can be added easily.

Drawbacks of the Expression Evaluator:

1. slow performance
2. operator precedence doesn't work well.

The latter one (2) can easily be worked around with bracing like this:

instead of: $2+2*3$ write: $2+(2*3)$

instead of: $1==1 || 2+2==4$ write $1==1 || (2+2)==4$

instead of: $a=b=2$ write $a=(b=2)$

instead of: $1==1 \&\& 1<2$ write $(1==1) \&\& (1<2)$

1.2 Expression Parser

The dialogue system will use the Expression Parser on 3 Items:

1.2.1 Pre

- simple precondition, checks previous answers in the current conversation, any numbers are replaced by the result of these answers.

- for example: "0 | 1" is true if Item0 or Item1 were answered with any answer

- for example: "0.2 | 1.2" is true if Item0 or Item1 were answered with 2nd answer

1.2.2 CheckVars

- result determines if dialogue item can be used by NPC

1.2.3 SetVars

- variables are written back to DB and local vars

1.2.4 CheckVars and SetVars

With CheckVars and SetVars you can access freeform variables which are stored in a SQLite DB. There are some Placeholders for these Vars:

%D - DialogName

%P - PlayerObjectID

%O - NPC-ObjectID

%C - NPC-ClassID

1.3 Database Storage

The Place holders are stored in separate fields inside the Database, which makes it easier to modify these Vars with SQL statements inside the Admin Panel (see `sqlite_browser.png`)

Variables beginning with "_" are Local Variables, local means local to the current conversation.

To access mind data a third set of Variables comes into play, beginning with "#"

1.3.1 Traits:

#trait_e_friend, #trait_e_greg, #trait_e_assert, #trait_e_activ, #trait_e_excite,
#trait_e_cheer, #trait_a_trust, #trait_a_moral, #trait_a_altru, #trait_a_coop, #trait_a_modes,
#trait_a_sympa, #trait_c_slfeff, #trait_c_order, #trait_c_duti, #trait_c_achiev, #trait_c_slfdis,
#trait_c_cauti, #trait_n_anx, #trait_n_anger, #trait_n_depr, #trait_n_slfcon, #trait_n_immod,
#trait_n_vuln, #trait_o_imag, #trait_o_art, #trait_o_emot, #trait_o_adven, #trait_o_intel,
#trait_o_liber

1.3.2 Emotions:

#emo_amuse, #emo_excite, #emo_joy, #emo_relief, #emo_satis, #emo_confus,
#emo_surprise, #emo_distress, #emo_fear, #emo_anger, #emo_shame, #emo_sad, #emo_guilt,
#emo_pride, #emo_belong, #emo_desire, #emo_i, #emo_o

1.3.3 Facets:

#facet_e, #facet_a, #facet_c, #facet_n, #facet_o

1.3.4 Implementation Note (CP)

New Emotions are already added, the inner and outer mood are inside the special-pseudo-emotions "i" and "o". Also Traits and Emotion Variables are written back to Mind on "SetVars", facets not, because they are calculated on the fly.

Checking Sentiments and spawning Sentiments or ShorttimeEvents (like in AA) are still missing.

I hope it's not too confusing, that the flow control is more like a "come from" than a "go to" behavior. And I hope also, that it's not too complicated, but to make arbitrary complex dialogues possible, an Expression Parser is necessary.

1.4 Test Interface

The dialogue UserInterface can be started by Pressing "T" after selecting a NPC (UI Icon can be added later). This UI will also show the history of the current conversation.

1.5 Screen dump

www.pixeltamer.net - Admin Panel - Mozilla Firefox

http://pi.chp2.intranet.pixeltamer.net/admin/index.shtml?page=SQLite

Summary Users IPBan IPTracking Groups Forum Events EventsCur VisStats RscStats Shell Actions DBBrowser SQLite Chat Schedule Speed Profile Premium Dashboard ACL Usertool

SQL Database browser - Select DB: pi_test.db Open...

DB: pi_test.db (3)

- @ mind_sents
- @ mind_traits
- @ >>>mind_vars

System: (2)

- @ sqlite_master
- @ sqlite_sequence

Table: mind_vars <<< 0 >>> to 3 of 4 Limit: 100 GO

*m_iID	m_sName	m_sDialog	m_iOwnerPLY	m_iOwnerNPC	m_iClass	m_fVal
0 65	ended_s	Chit_Chat	0	-100001	0	2.0
1 73	ended	Chit_Chat	0	-100001	0	14.0
2 74	ended_n	Chit_Chat	0	-100001	0	12.0
3 75	started	Chit_Chat	0	-100001	0	15.0

SELECT * FROM mind_vars WHERE m_iOwnerNPC=-100001;

Execute

Result: Ok. Rows returned:4

*m_iID	m_sName	m_sDialog	m_iOwnerPLY	m_iOwnerNPC	m_iClass	m_fVal
0 65	ended_s	Chit_Chat	0	-100001	0	2.0
1 73	ended	Chit_Chat	0	-100001	0	14.0
2 74	ended_n	Chit_Chat	0	-100001	0	12.0
3 75	started	Chit_Chat	0	-100001	0	15.0

1.6 Demonstration

In the mind_dialog.txt is a demonstrating dialogue. It consists of multiple Items, every Item has Choices for the Player to answer. If the Player starts the Dialogue the NPC chooses an Item based on the Prerequisites (CheckVars and Pre). If the Player chooses an answer the SetVars is executed, and the NPC chooses a new Item (random if multiple are fitting). If there are no more Items left, or the chosen answer was marked with "Exit=1", the dialogue ends.

1.6.1 Mind.txt Demonstration

```

Root {
  Mind {
    Dialog {
      0 {
        Name = 'Chit Chat'
        Users = 'NPC_Travel'
        Items {
          0 {
            Text = 'Hey, what\'s up?'
            CheckVars = 'LogPrint("_s="+_s);(%D%Ostarted==0)&&((1==1)||
((2+2)==4))&&(_s<1)'
            _comment = '%D -> DialogName, %P -> PlayerObj, %O ->
ObjectID, %C -> ObjectClass'
            _comment = 'demonstrate expression solver ;)'
            _Pre = '!(0||1||2)'
            Choices {
              0 {
                Text = 'Nothing'
                SetVars = '%D%Ostarted+=1;_s=1;#emo_anger+=10;'
              }
              1 {
                Text = 'Something'
                SetVars = '%D%Ostarted+=1;_s=1;#emo_satis+=10;'
              }
            }
          }
        }
      }
      1 {

```

```
Text = 'Hey, what\'s up this time?'
Pre = '!(0||1||2)'
CheckVars = '%D%Ostarted>=1&&%D%Ostarted<10'
Choices {
    0 {
        Text = 'Nothing'
        SetVars = '%D%Ostarted+=1;_s=1;#emo_anger+=10;'
    }
    1 {
        Text = 'Something'
        SetVars = '%D%Ostarted+=1;_s=1;#emo_satis+=10;'
    }
}
}
2 {
Text = 'Hey, what\'s up this time ... again?'
Pre = '!(0||1||2)'
CheckVars = '%D%Ostarted>=10'
Choices {
    0 {
        Text = 'Nothing'
        SetVars = '%D%Ostarted+=1;_s=1;#emo_anger+=10;'
    }
    1 {
        Text = 'Something'
        SetVars = '%D%Ostarted+=1;_s=1;#emo_satis+=10;'
    }
}
```

```
    }
  }
}
3 {
  Text = 'Nothing? Then good bye!'
  Pre = '0.0|1.0|2.0'
  Choices {
    0 {
      Text = 'Ok.'
      SetVars = '%D%Oended+=1;%D%Oended_n+=1'
      Exit = 1
    }
  }
}
4 {
  Text = 'Nothing? I\ve heard that to often!'
  CheckVars = '%D%Oended_n>4'
  Pre = '0.0|1.0|2.0'
  Choices {
    0 {
      Text = 'Ok.'
      SetVars = '%D%Oended+=1;%D%Oended_n+=1'
      Exit = 1
    }
  }
}
```

```
5 {
    Text = 'Something? Really? I don\'t believe you!'
    CheckVars = '%D%Oended_s<%D%Oended_n'
    Pre = '0.1||1.1||2.1'
    Choices {
        0 {
            Text = 'Ok.'
            SetVars = '%D%Oended+=1;%D%Oended_s+=1'
            Exit = 1
        }
    }
}
6 {
    Text = 'Something? As always!'
    CheckVars = '%D%Oended_s>%D%Oended_n'
    Pre = '0.1||1.1||2.1'
    Choices {
        0 {
            Text = 'Ok.'
            SetVars = '%D%Oended+=1;%D%Oended_s+=1'
            Exit = 1
        }
    }
}
7 {
    Text = 'Something?'
```

```
CheckVars = '%D%Oended_s==%D%Oended_n'  
Pre = '0.1||1.1||2.1'  
Choices {  
    0 {  
        Text = 'Ok.'  
        SetVars = '%D%Oended+=1;%D%Oended_s+=1'  
        Exit = 1  
    }  
}  
}  
}  
}  
}  
}  
}
```


Appendix C

World of Minds Play-Test

C.1 Overview of Qualitative Data Analysis Processes

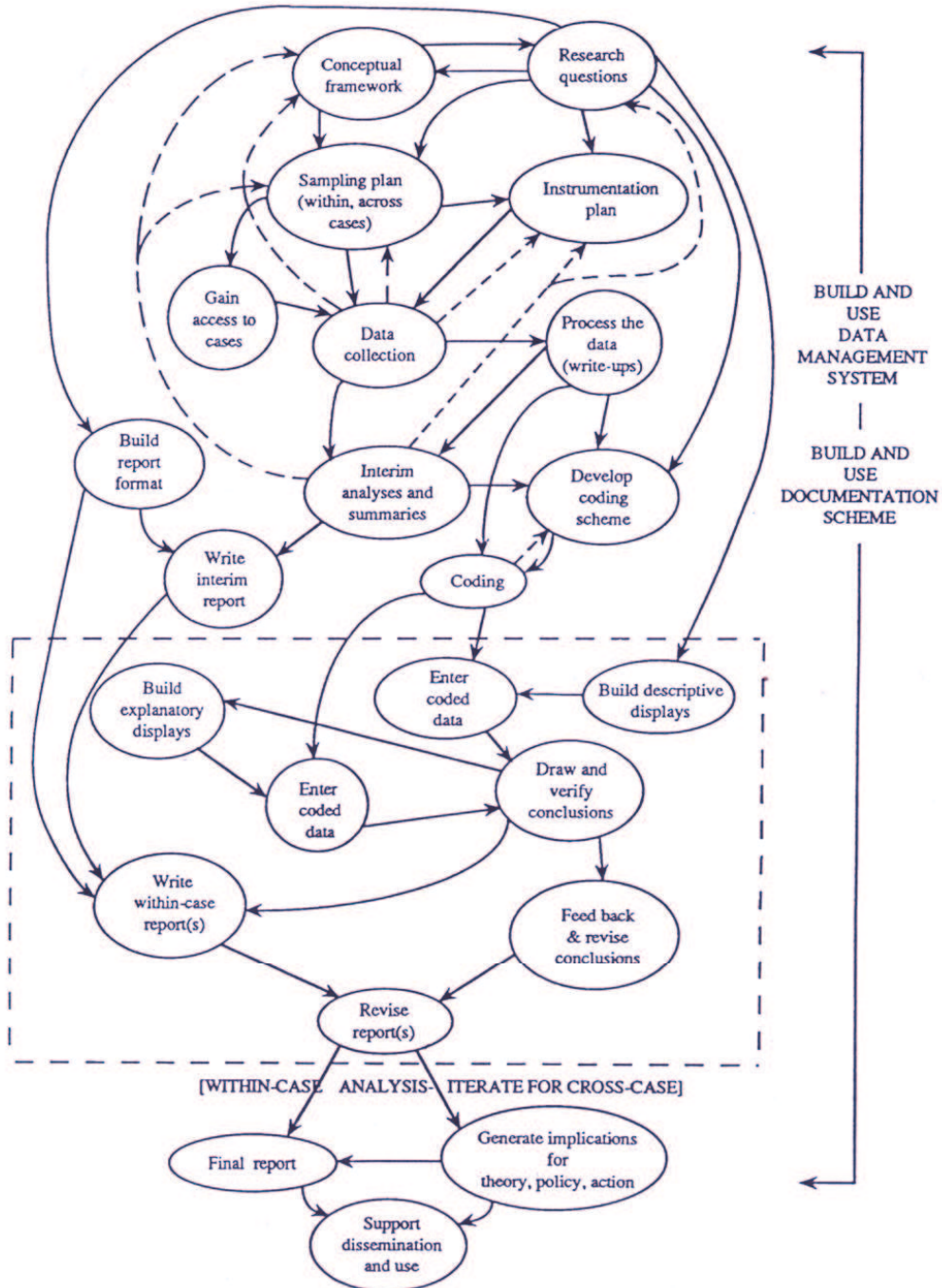


Figure C.1: Overview of Qualitative Data Analysis Processes recommended by Miles and Huberman (1994), p. 308.)

C.2 Presentation to Participants

Method: Guided prototype playtesting

User Centered Design, Wizard of OZ method

- For functional design:
The participants behavior is observed. Design issues and UI issues gets revealed. Time: Either by direct observation, or by video taping and later analysis.
- For evaluation of features in terms of user's subjective experience: participants are interviewed, either through forms or voice-interview. Time: Immediately after the scenario.

example of previous test:

User Evaluation of a Pervasive MMORPG Concept. by Kovisto E., Eladhari M. DIME Conference 2006, 25 - 27 October 2006, Bangkok, Thailand.

Would you like to participate in my study?



Mirjam Palosaari Eladhari

Series of steps

- Collection of demographical data from players
- Guided session of character creation
- Collection of NEOAC data – players choice to make RP Avatar or Self Avatar
- One or several guided scenarios using a mix of paper prototype and instantiated Mind Modules.

Pen and Paper test combined with a running mind module.

- Test and tweak play features with pen and paper before implementation. Functional

Interview with participants, documented as part of the dev-process.

- Get indications whether the planned implementation may achieve it's goals in the current design.

Step 1

1. Fill in the form at [surveyMonkey](http://www.surveymonkey.com/s.aspx?sm=874Lr1t1VGdWUET3D13hug_3d_3d),
(http://www.surveymonkey.com/s.aspx?sm=874Lr1t1VGdWUET3D13hug_3d_3d)
I need to know some demographical data, but most important is
 1. previous experience of RP and MMO
 2. Whether you will role play/self play/mixed approach

If you would like to roleplay a character, think about what that person is like.

Your Data on avatar personality

- Your data stays with me.
- If your input it used in a publications the name of you avatar will be used.
- Any other use: I will explicitly ask for permission prior to possible publication.

After your MM is instantiated "you" are your avatar's player

Step 2

- Play a guided scenario for character creation with me. This will be video taped.
(You will meet the Gate Keeper and embark on a quest that will shed some light on the nature of your avatar)

Pictures and Video

- Pictures and video are necessary documentation tools in the evaluation process.
- Pictures/videos with a participant are not shown publicly without the consent of the participant. (example: photograph in a publication, videoclip in a conference session)
- Video tapes that have not been approved for public view by depicted participants are treated as confidential material.



Figure 6. A player celebrating after winning a battle. One interesting detail in the game design is that each character has

The IPIP-NEO

(International Personality Item Pool Representation of the NEO PI-R™)

- The original IPIP-NEO inventory contains 300 items.
- Most people complete the inventory in 40-60 minutes.

Step 3

1. Fill in the IPIP NEO Short Version test at <http://www.personal.psu.edu/faculty/j/5/j5j/IPIP/ipipneo120.htm> This takes 15 - 25 minutes.
2. Save the result page and send it to me.

IPIP and IPIP NEO

The full IPIP contains 1,699 items assembled by Dr. Lewis R. Goldberg. The URL for Dr. Goldberg's IPIP is <http://ipip.ori.org/>. The IPIP is in the public domain and its items can be freely downloaded from that site.

The IPIP-NEO is not equivalent to the commercial inventory on which it is based, the NEO PI-R™, authored by Paul T. Costa, Jr. and Robert R. McCrae. The genuine NEO PI-R™ (240 items) is considered by many psychologists to be the best inventory for measuring traits within the Five Factor Model (FFM) of personality. The NEO PI-R™ is copyrighted by Psychological Assessment Resources (PAR) in Florida, and can only be ordered by professionals and used by permission.

Step 4 Test scenario

- I instantiate a Mind Module for each Player Character (PC)
- I game-master a scenario that we play together. Think-aloud technique.
- After test scenario: questions and/or teach back tasks to the participants. I may use teach-backs task for certain features.

Results look like this

example from my result on the extraversion facet

Extraversion
 Extraversion is marked by pronounced engagement with the external world. Extraverts enjoy being with people, are they like to talk, assert themselves, and draw attention to themselves.
 Introverts lack the exuberance, energy, and activity levels of extraverts. They tend to be quiet, low-key, deliberate, alone. The independence and reserve of the introvert is sometimes mistaken as rudeness or arrogance. In reality
 Dominant/Passive Score 0 30 40 50 60 70 80 90 99

Extraversion 67
 .. Friendship 73
 .. Gregariousness 65
 .. Assertiveness 73
 .. Activity Level 65
 .. Excitement-Seeking 73
 .. Dominance 59

Your scores on Extraversion is average, indicating you are neither a subdued loner nor a jocular chatterbox. You enjoy

About IPIP NEO Short version

- The short IPIP-NEO was designed to measure exactly the same traits as the original IPIP-NEO, but more efficiently with fewer items.
- The short version of the IPIP-NEO inventory uses 120 items from the original inventory.
- Most people complete the inventory in 15-25 minutes.
- Responses from over 20,000 persons were used to insure that the short version possesses acceptable measurement reliability.

IPIP NEO you say?

Be careful.
 You are about to decide who to be in the world of minds.
 Will you go in as a copy?
 Will you reinvent yourself?

Test looks like this...

Sex: Male Female
 Age:
 When selecting your country, please indicate the country to which you feel you belong the most, whether by virtue of citizenship, length of residence, or acculturation.
 Country:

1. Worry about things.	Very Inaccurate	Moderately Inaccurate	Moderately Accurate	Very Accurate
2. Make friends easily.	Very Inaccurate	Moderately Inaccurate	Moderately Accurate	Very Accurate
3. Have a vivid imagination.	Very Inaccurate	Moderately Inaccurate	Moderately Accurate	Very Accurate
4. Trust others.	Very Inaccurate	Moderately Inaccurate	Moderately Accurate	Very Accurate
5. Complete tasks successfully.	Very Inaccurate	Moderately Inaccurate	Moderately Accurate	Very Accurate

C.3 Request for an Exemption from IRB Review

REQUEST FOR AN EXEMPTION FROM IRB REVIEW

UCSC Institutional Review Board
439 Clark Kerr Hall ~ Campus Mail Stop: OMIP

PROJECT

Title: World of Minds

Funding Agency: Gotland University

PRINCIPAL INVESTIGATOR

Name (Last, First): Palosaari Eladhari Mirjam Phone: 831 334 05 74
E-mail: mirjam@mimmi.net Department: CMPS
 Faculty Staff Post-doc Graduate student Undergraduate student

FACULTY SPONSOR

Name (Last, First): Mateas Michael Phone: 831 600 5117
E-mail: michaelm@soe.ucsc.edu Department: CMPS

RESEARCH INFORMATION QUESTIONS

- Does this research involve interaction with prisoners or prisoner's private information?
 No Yes – If yes, the research does not qualify for an exemption. Please submit a full protocol.
- Specify the population(s) that will be included in the research: *check all that apply.*
 Adults Pregnant Women/Fetuses/Neonates
 Adults unable to consent for themselves Children (< 18 years)
 Students Non-English speaking
- If the research includes surveys, interviews, or questionnaires, do they seek information about possibly illegal activities or highly personal aspects of the subjects' behavior, experiences, or attitudes that may be painful or very embarrassing to reveal? (This might include sexual attitudes or practices; the use of alcohol or drugs; information that if released could reasonably be damaging to an individual's financial standing, employability, or reputation within the community; or information pertaining to an individual's psychological well-being or mental health.)
 No Yes N/A
- Refer to the last page of this form to complete the following statement: I claim this research to be exempt from review by the Human Subject Institutional Review Board under Exemption Category(s): 1 2 3 4 5 6

HIPAA QUESTIONS

If you answer "Yes" to any of the questions, you do not qualify for an exemption and are subject to HIPAA requirements.

- Will private health information (PHI) be obtained from a covered entity (a health care provider that bills health insurers such as the Santa Cruz Medical Clinic and the Student Health Center)? (PHI is individually identifiable health information that is transmitted by electronic media, maintained in electronic media, or transmitted or maintained in any other form or medium.)
 No Yes
- Will the study involve the provision of healthcare in a covered entity?
 No Yes
- If the study involves the provision of healthcare, will a health insurer or billing agency be contacted for billing or eligibility?
 No Yes

CONFLICT OF INTEREST

If your research is sponsored, do you have a relationship with the sponsor that might require conflict of interest disclosure? (e.g stock purchases, salary, royalty payments, patents, Board position, etc.)

No Yes

RESEARCH DESCRIPTION

Provide a **DESCRIPTION OF YOUR RESEARCH**: Include enough information to justify how your study qualifies for an exemption under the exemption category(s) that you are claiming.

For example, if you claim exemption #2, you must explain either how (a) the information obtained is recorded in such a manner that human subjects cannot be identified, directly or through identifiers linked to the subjects; or (b) describe the data obtained to demonstrate that any disclosure could not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

World of Minds (WoM) is a virtual game world where the personalities of the inhabitants are the base for the game mechanics. Personality, likes and dislikes, define a characters individual story. When interacting with other characters, the reactions depend upon your character's current mood and personality. It is the player's choice whether the character is a reflection of herself.

Nature of test: Guided protope playtesting. Pen and paper prototype test combined with running of the software "Mind Module". This involves 1) a survey of demographic used data, 2) video taping of user interaction with prototype 2) interview and survey of of the user's experience.

Method: Think-aloud technique during the playtest (Wizard of OZ style where the researcher emulates parts of the software that is still not implemented), possible teach-back tasks after interaction with prototype.

The purpose of the test is two-fold: 1) Result for functional design. The participants behavior is observed. Design Issues and UI issues may get revield. 2) Evaluation of features in terms of user's subjective experience according to the success criterias of the project. The method that is going to be used is described in detail in "User Evaluation of a Pervasive MMORPG Concept", by Kovisto E., Eladhari M. DIME Conference 2006, 25 - 27 October 2006, Bangkok, Thailand.

The user data will be treated as confidential material and be used for analysis. It will only be used and in scientific publications/conferences if the participant has given his/her explicit consent.

All participants have been given a presentation that explains the purpose of the experiment and how the data is going to be used.

Signature(s)

The undersigned accept(s) responsibility for the study, including adherence to federal, state and UCSC policies regarding the rights and welfare of human participants participating in this study. In the case of student protocols, the faculty sponsor and the student share responsibility for adherence to policies.

Signature of Principal Investigator

Date

Signature of Faculty Sponsor

Date

EXEMPTION CATEGORIES

1	<p>Research conducted in established or commonly accepted educational settings that involves normal educational practices, such as (i) research on regular and special education instructional strategies or (ii) research on the effectiveness of or the comparison among institutional techniques, curricula, or classroom management methods.</p>
2	<p>Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior, unless:</p> <ul style="list-style-type: none"> a) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and b) any disclosure (including accidental disclosure) of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation. <p>EXCEPTION: This exemption does not apply to research with children, except for research involving observations of public behavior when the investigator(s) do not participate in the activities being observed.</p>
3	<p>Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under Exemption #2 if:</p> <ul style="list-style-type: none"> a) the human subjects are elected or appointed public officials or candidates for public office; or b) federal statutes(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
4	<p>Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, (a) if these sources are publicly available; or (b) if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. (Existing means existing before the research is proposed to an IRB).</p>
5	<p>Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine:</p> <ul style="list-style-type: none"> (a) public benefit or service programs; (b) procedures for obtaining benefits or services under those programs; (c) possible changes in or alternative to those programs or procedures; or (d) possible changes in methods or levels of payment for benefits or services under those programs.
6	<p>Taste and food quality evaluation and consumer acceptance studies, if wholesome foods without additives are consumed or if a food is consumed that contains a food ingredient at or below the level, and for the use found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.</p>

Please submit this form to the UCSC IRB
Campus mail stop: OMIP

For questions, contact the Office of Research Compliance Administration at orca@ucsc.edu

C.4 Approval of an Exemption from IRB Review

UNIVERSITY OF CALIFORNIA, SANTA CRUZ

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

OFFICE OF RESEARCH COMPLIANCE

1156 High Street, Santa Cruz, CA 95064
Phone: (831) 459-1473 FAX: (831) 459-1452

April 9, 2008

RE: Project Title: World of Minds
Protocol # HS0801165
UCSC Principal Investigator: Palosaari Eladhari, Mirjam
Exempt Determination Date: 4/9/08

Dear Investigator:

The Institutional Review Board (IRB) has reviewed the proposed use of human subjects in the project referenced above and has determined that the project is approved and is exempt from further IRB review.

Please note that you should consult with the Office of Research Compliance Administration if questions arise about whether any planned changes to the study might make the study nonexempt human subjects research. Additionally, if an adverse event or unanticipated problem occurs during the research, it is your responsibility to notify the IRB immediately.

The UCSC IRB operates under a Federalwide Assurance approved by the DHHS Office for Human Research Protections, FWA00002797. Our DHHS IRB Registration Number is IRB00000266.

Sincerely,

A handwritten signature in black ink that reads "Caitlin D. Deek".

Caitlin D. Deek
Director, Office of Research Compliance Administration
orca@ucsc.edu

C.5 Research Consent Form

Gotland University
Project Title: World of Minds
Investigator: Mirjam Palosaari Eladhari

Research Consent Form

You are being asked to be a volunteer in a research study.

Purpose:

The purpose of this study is to assess an interactive video game and gather survey information for evaluation.

Procedures:

If you decide to be in this study, your part will involve using a paper prototype of an interactive computer gaming system which is under development. You will be introduced to the game and the method of interaction. Instructions on how to use the game will be given to you. Any questions you may have will be answered and then you will play through the game to an ending.

When you have completed the scenarios in the paper prototype, you will be asked to fill in a survey about your experience.

You will be video-taped during this session, which will last no longer than 2 hours. You will be asked to sign a Video Taping Agreement where you can choose to grant or not grant the right to use the material in conferences/scientific publications.

Risks/Discomforts:

The risks involved in this study are no greater than typical use of a computer for gaming.

Benefits

There are no direct benefits; however we hope that future video games will benefit from this opportunity to evaluate the strengths and weaknesses of this system, which you are assisting us in identifying.

Confidentiality:

The following procedures will be followed to keep your personal information confidential in this study:

- The data that is collected about you will be kept private to the extent allowed by law.
- To protect your privacy, your records will be kept under the name of your choosing (avatar name) a code number rather than by your real name.
- Your records will be kept in locked files and only study staff will be allowed to look at them.
- Your name and any other facts that might point to you will not appear when results of this study are presented or published.
- The video tape of your session will be used only for analysis and only study personnel will have access to it. Tapes will be stored in a secure location to which only the study personnel will have access. When the study has ended, the tapes will no longer be needed and shall be erased.

Costs to You:

There are no costs to you.

Subject Rights:

- Your participation in this study is voluntary. You do not have to be in this study if you don't want to be.
- You have the right to change your mind and leave the study at any time without giving any reason, and without penalty.
- Any new information that may make you change your mind about being in this study will be given to you.

- You will be given a copy of this consent form to keep.
- You do not waive any of your legal rights by signing this consent form.

Questions about the Study or Your Rights as a Research Subject:

- If you have any questions about the study, you may contact Mirjam Palosaari Eladhari at telephone (831) 334 05 74.

If you sign below, it means that you have read (or have had read to you) the information given in this consent form, and you would like to be a volunteer in this study.

Subject Name

Subject Signature Date

Signature of Person Obtaining Consent Date

C.6 Video Taping Agreement

Video taping agreement

I _____ agree to participate playtesting arranged by Mirjam Palosaari Eladhari. I also agree that the playtesting session will be video taped. I will not require any further rewards for doing this.

The video will be only used only for analyzing the test.

Place

Date

Signature

_____. _____. 200__

Name

- I also grant a right to use the video materials in conferences / scientific publications
 - I do not grant a right to use the video materials in conferences / scientific publications
-

C.7 Script for the Guided Prototype Play-Test of World of Minds

Before Playtest

- Prior to test
- Player to fill in player data survey
- Player fill in IPIP NEO test.
- Player fill in survey about personality traits for CC
- When coming to test
- Sign paper "agreement for video taping"
- Sign privacy policy
- 2 minute explanation (ask to verbalise, think aloud protocol)

Scenario 1 – sentiment retrieval

Single Player Scenarios

Explain

- Think aloud protocol – try to verbalise what one is doing, and thinking.
- Feedback – to not try to be nice – critique is valuable feedback!
- To use a pen or finger to point with to interact.
- If you feel insecure or don't know what to do, tap "manual button" and ask anything you like.
- "A friend talked you into installing a multiplayer role playing game. To enter you had to fill in a personality test. This is the first time you log on."

Scenario 1

Meeting the Gate Keeper.
Seeing avatar mind
Getting Sentiments

First screen

- Player is represented by a marker on the board.
- Board: Area with figurine for Gate Keeper and a door. A red button for "Mind". Show picture of the Gate Keeper.
- Player instructed to move by moving the avatar and interact by using a pencil as a pointing device.

Initial material presented to the player

- Character sheet for the avatar.
 - Overview with facets emotion mood and sentiments. On this, buttons that lead to detailed pages of
 - Personality
 - Sentiments
- Explain to player that for this test we are interested in the sentiment objects. Active windows will be Emotions, Sentiments and Mood.
- A picture of the Gate Keeper (when ready player can choose to interact with the gatekeeper)

Possible Actions Screen 1

- If the player points at "mind" button, give interface Mind:
- Overview with facets emotion mood and sentiments.
 - If player points at Gate Keeper, start dialog 1.
 - If player points at door it is locked until GK is spoken to. (he says: You have to go through me.)

GK Dialog 1

- GK: Welcome to this institution. I don't know what to call us anymore... but thank god you are here, we really NEED YOU.
- I don't know where to start... things have been so different since the Outbreak. All I knew... You see this outbreak - I don't know if it is a curse or a blessing: what happened was that all that we used to keep INSIDE our mind is now on the OUTSIDE. Roaming free! Weird MANIFESTATIONS!
- If you click that BUTTON thing you have there - it will show you your MIND! Beg your pardon - it shows the mind as good as we know how to watch it... This is a university after all, and we do look at things through the knowledge we have.
- You see, we need this knowledge to HELP EACH OTHER. When the outbreak came... There are situations where I don't know how to help. So many of us just fell through, and the manifestations of our pains and fears make it...quite challenging to be here. Just look at me! My name used to be Kai Sangren...and I used to look normal - whatever that is. Now I'm the Gate Keeper, just as you are (avatar name)
- Things are different here from what you may be used to... For one thing... let me see, what did I do with that BUCKET.

Random Sentiment

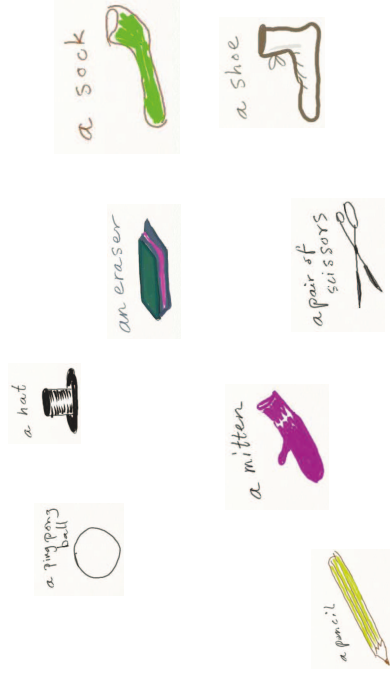
9

Random Sentiment

- Gate Keeper sticks his hand in a bucket, and picks up two peaces of piece of paper, and says:
- It turns out that you, due to this mysterious Outbreak are annoyed by (thing on note), and for some reason think that (thing on note) are really funny.
- (add sentiments amusement and anger to character sheet)

10

Things in the bucket

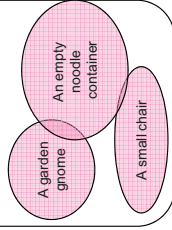


11

Sentiment by choice

12

At night you wake up by an unfamiliar touch. Damp smell. What would be most disturbing to find in your bed?



Depending on what object the player chooses, add sentiment object with a high fear value.

15
14

Gate Keeper directs player to Teresa

- I need some more time to have a look at your personality files. Could you please go to Teresa meanwhile? She is good at explaining this thing with affective actions. You see, since the Outbreak the way we interact with each other also changed. It became really explicit so to say... And if you don't mind, could your bring me a glass of water?

• If player wants to talk more:

- Anyhow, thank god you are here. We really need you. ...look... be careful out there... as i said, some just couldn't handle things when ...all this got out.
- **And even more:**
- Sometimes i think about how it used to be the. Since the outbreak we had to reformulate some vision statements and also expand a bit. Well we DID need to care of our own. You may visit The Clinic for Increased Mental Health later on, but i hope you won't need it.
- **And even more:**
- Could you come back later? I feel a bit tired, and really thirsty too.

15

16

Scenario 2

Meet NPC Teresa

-Affective action

-Sentiment object to character

Sentiment as effect of actions

18

Meet NPC + affective action (single player)

Player to navigate in world, find NPC Teresa

T tells avatar she needs a hug. (give dialog)

Present player with affective action interface

Aa:s are introduced to player in steps.

Player free to use affective actions on T.

Move Marker on Teresa's public Mood sheet so player can see.

Player is helped with moving the marker on the public mood sheet of avatar.

Observe on character sheet: emotional + mood effects of AAs.

After a few interactions (around 5) set sentiment on the highest value of Teresa and of Avatar. (possibly several, possibly spawn of single sentiment objects if maxvalue is reached)

(save sentiments of T and avatar)

Theresa direct player to room
with stuff and watercooler

- I suppose the gate keeper asked you to bring him water. The water cooler is down the corridor... but be careful. There was a filmteam here, and they became a bit unstable. Not sure what happened to them but they left all sorts of stuff down that corridor.

20

Scenario 3

Sentiment object (single player)

- Area where chairs, gnomes and slippers are. Also stuff for the random sentiments. (a corridor with electronic rekvisita left by a mentally unstable film crew).
- Player observe effect when in proximity of scary objects (homing in on avatar making sudden movements).
- (Relief raptor flutters by.)
- Water cooler in the end of the hall. Player gets message that avatar has a glass of water after interaction with water cooler.

Interview 1

Questions about Sentiments

- What do you think will happen next?
- Was it any particular sentiment object that made any impression on you? Why?
- Which was you least favorite sentiment object? Why?
- Which was your favorite sentiment object? Why?
- What did you think about getting random sentiment objects from the Gate Keeper's bucket?
- What did you think about getting sentiment objects as a consequence of an imagined scenario? (When the gatekeeper asked you about dollhouse chairs, garden gnomes and empty noodle containers?)
- What did you think about getting a sentiment toward the NPC Theresa in interaction
- Other Thoughts? Suggestions?

Interview Questions about Mood

- What did you think about the mood feature?
- What did you think about your avatar being represented as it's mood when you interacted with Teresa?
- What did you think about seeing Teresas mood?
- What do you think about the colors that represent the moods?
- What did you think about how the mood of your avatar was affected by the interaction with Teresa?
- Was there any Affective Action that you would wanted to have in any of the stages that was not there? Which? Why?
- (time for break if participant wants)

25

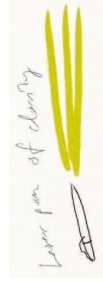
Scenario 4

Mind Magic

26

On the way back

- In proximity to theresa, observe sentiment change.
- Teresa is attacked by a Colossus of Confusion!
- Theresa yells: HELP! HELP!
- (Teresa is afraid and in a bad mood)
- Find Spell: Laser Pen of Clarity.



T5

Thank you so much. I don't know what I hade done without you! You see if an emotion gets so intense one can't contain it! MANIFESTS itself! Im so sad again. Would you mind comforting... Oh NO... here we go again.

I wish I could cry.



T6

I guess that could work as an illustration. What happened was that my sadness overwhelmed me. When I get so sad that I can't be any more sad the sadness kind of climbs out, I couldn't contain it!

Thanks again. How ironic, I was the one who was supposed help YOU, being new and all.

Well, the Gate Keeper is waiting for you.

28

Scenario 5

Getting personality spells

Gate Keeper Dialog 2

- GK: Thank you so much for the water, i was so thirsty!
- or, if no water. Whines: what about my water? (no talking until water is given)
- Oh well. Lets make the best of it. In my opinion we need to dig where we stand. The more we can learn - we need to start with ourselves. Lets see now i have you files here. (shuffles papers). Don't think i don't know what i'm doing, as head of HR i know about psychology. We actually do have an education than kouverymuch. Ok... You are really strong in (strongest facet except NEuro). This would make you really good at 'spell name'. That will help us all.
- And don't you think neuroticism is something entirely bad! How we will understand it in others if we don't have it ourselves? And - forgive me for saying this, but it can actually be used! I see that you will be especially good at (spell name corresponding to highest N-trait). Oh no don't try it on me thankyou. (system gives spells when they are mentioned)

Mapping of Neuro spells & Traits

trait	emo	spell	note
anxiety	fear	+ Cold ripple of fear - Soothing hand	
anger	emo_anger	+ Primal fire of fury - Cooling Cloth	
depression	sadness	+ Wet net of tears - Accommodate sorrow	
self consciousness	shame	+ Veil of humiliation - Spine of Confidence	immoderation - guilt/sh wiping, but the eye one
immoderation	guilt	+ True-sounding accusation - Reason - Forgive	
Vulnerability	Distress/Anguish	+ Song of Pain - Dull pain	

Emotion - Mood M:

	intro	ext	intro	ext
emo_amusement			+	
emo_interest_excitement			+1	
emo_enjoyment_joy			+2	
emo_pleasure			+1.5	+1
emo_satisfaction			+2	
emo_confusion				-1
emo_surprise_shock			+1.5	
emo_distress_anguish			-2	-1
emo_fear_terror				
emo_anger_fury				-
emo_shame_humiliation			-1.5	
emo_sadness			-2	
emo_guilt			-1.5	

Counter Emotion Spells

- Amusement → Bore
- Amusement → Dull
- Joy → Contempt
- Relief → Problemalise
- Satisfaction → diminish
- Surprise → alcohol
- Confusion → Clarity
- Anguish → Sooth
- Terror → Calm, diminish
- Anger → sooth
- Shame → confidence, expla
- Sorrow → cleansing tears
- Guilt → reason, ask forgive

mapping facets and emo

Emotion - Mood Mappin

trait	emotion	spell	emo	extro	intro
Extroversion	amusement	Amusement shower	emo_amusement	+2	
Agreeableness	joy	Joy shower	emo_enjoyment_joy	+2	+1.5
Conscientiousness	satisfaction	Satisfaction shower	emo_satisfaction	+2	
Openness	interest excitement	Excitement shower	emo_interest_excitement	+2	+1.5

Interview 2

Questions

1. What do you think will happen next?
2. How do you think the personality of your avatar affects the other values in the mind?
3. What did you think about getting spells from the Gate Keeper that he claimed were based on the personality of your avatar?
4. What did you think about getting the spell "Laser pen of Clarity"?
5. Did your perception of the representation of mood change during this last scenario? If so how? Why?

34

Questions about personality spells

1. Was there anything in particular you reacted at during this test? How? Why?
2. Was there something in particular you liked? What? Why?
3. Was there something particular you disliked? What? Why?
4. Any other comments? Thoughts? Suggestions?

35

C.8 Questions asked to the participants of the World of Minds play-test

In association to the play-test of the WoM paper prototype, each participant answered survey and interview questions in six steps. For the surveys, the online survey tool SurveyMonkey was used. On each page of the surveys, three questions were asked. Each survey was limited to nine questions. In this appendix the questions of both the interviews and the surveys are presented.

Survey 1 - Demographics and game-play experience

1. Please enter your name.
2. Please enter your email-address
3. Are you male or female?
 - Male
 - Female
4. In the play- testing of World of Minds do you intend to:
 - Play as if you were playing yourself? (self-play)
 - Play a fictional character that you have designed? (role-play)
 - Not sure, might become a mix? (mixed play approach)
 - Please enter a desired name for your PC
5. Do you have experience with playing single-player role-playing games on computer or console?

- No, none.
 - Yes, I have played a few.
 - Yes! I have played them A LOT!
 - Optional comment: My favorite(s) are:
6. Do you have experience with playing Massively Multiplayer Online Games, such as World of Warcraft?
- No
 - I have tried, but I played less than a month.
 - Yes I have played one or two MMOs.
 - Yes, I have played more than two MMOs.
 - If you picked alternative 3 or 4, please specify which MMOs you played and approximately for how long you played them. Also include any MUDs.
7. Do you have experience with playing tabletop role-playing games such as D&D? (E.g. sitting around a table with a bunch of people and a pile of books, from for example White Wolf?)
- No
 - Yes, but I only tried a few times.
 - Yes, I did that for many years.
 - Comment (optional)
8. Do you have experience with Live Action Role Playing? (LARP)

- No
 - Yes, I have tried that.
 - Yes, I did that regularly for several years.
 - Comment (optional)
9. Do you have experience with playing tabletop strategy games? (Examples: Risk, Diplomacy, Carcassonne)
- No
 - Yes. I play irregularly, when opportunity is given.
 - Yes. I play tabletop games regularly with a group of friends.
 - Comment (optional)

Survey 2 - Play-style, Personality, Character Creation and attitude towards personality tests

1. What is the name of your PC? (If you don't remember please enter your real name.)
2. Did you want to self-play, role play, or a mix of both?
 - Self play
 - Role play
 - Mix of both
 - I don't remember

Why did you prefer self/role/mixed?

3. 1. Would it matter to you whether other players knew if you self-played or role played?

- Yes
- No
- Not Sure

Comment

4. What are your thoughts regarding how available the personality data of your PC would be to other players in the game world?

5. In World of Minds an PC can only see his/her own personality traits, unless the player chooses to show them to another PC. What do you think of this?

6. How do you feel about getting to know strengths and weaknesses of other PCs, and others to get to know your PC, so you could use this knowledge to together meet challenges in the game?

7. What did you think about the results of the IPIP NEO test for your PC?

8. What do you think about using personality data for PC creation in a role playing game?

9. For creation of your PC personality, please rate the following approaches in terms of what you would prefer (The choices are not exclusive, you can prefer or dislike them all)

- A test with questions such as the IPIP NEO before you go into the game world.

- A series of interviews with similar questions in several smaller dialogues with automated characters in the game world.
- A series of in game activities where your actions define the personality traits of your PC.

(A rating scale of 1 to 5 or N/A was used.)

10. Do you like taking survey tests that define you in different ways? (Examples: Meyers-Briggs test, if you are ninja or a pirate, and various tests on Facebook such as ‘your criminal personality’.)

- Yes I do it often and I think that is great fun! I also like seeing the results of my friends!
- Yes I find it fun, and I do it sometimes.
- Sometimes it can be fun.
- I’ve done it but it’s not my thing really.
- I dislike those tests.

Comment

Interview 1 - Sentiments, Mood and Affective Actions

The following questions were asked by the test leader in the play-test after the first two scenarios:

1. What do you think will happen next?
2. Was it any particular sentiment object that made any impression on you? Why?

3. Which was you least favorite sentiment object? Why?
4. Which was your favorite sentiment object? Why?
5. What did you think about getting random sentiment objects from the Gate Keepers bucket?
6. What did you think about getting sentiment objects as a consequence of an imagined scenario? (When the gatekeeper asked you about dollhouse chairs, garden gnomes and empty noodle containers?)
7. What did you think about getting a sentiment toward the NPC Theresa in interaction?
8. Other Thoughts? Suggestions? (About the sentiments.)
9. What did you think about the mood feature?
10. What did you think about your PC being represented as its mood when you interacted with Teresa?
11. What did you think about seeing Teresas mood?
12. What do you think about the colors that represent the moods?
13. What did you think about how the mood of your PC was affected by the interaction with Teresa?
14. Was there any Affective Action that you would wanted to have in any of the stages that was not there? Which? Why?

Interview 2 - Personality, Spells, Mood and General Impressions

The following questions were asked by the test leader in the end of the play-test when all scenarios were traversed:

1. What do you think will happen next? (In the VGW.)
2. How do you think the personality of your PC affects the other values in the mind?
3. What did you think about getting spells from the Gate Keeper that he claimed were based on the personality of your PC?
4. What did you think about getting the spell Laser pen of Clarity?
5. Did your perception of the representation of the mood feature change during this last scenario? If so how? Why?
6. Was there anything in particular you reacted at during this test? How? Why?
7. Was there something in particular you liked? What? Why?
8. Was there something particular you disliked? What? Why?
9. Any other comments? Thoughts? Suggestions?

Survey 3 - Sentiments

Immediately after the play-test the participants were instructed to fill in two short surveys. The majority of the participants filled them in within three hours after participating in the test.

1. What is the name of your PC? (If you can't remember, enter your name)
2. Do you remember any of the sentiments your PC got? If so, which ones?
3. In one scenario your PC got sentiment objects in 3 different ways. First the Gate Keeper gave random sentiments from his bucket. Second the Gate Keeper talked you through a scenario where you could choose between three items. Third, by interacting with the character Theresa you got a sentiment toward her that was an effect of your interaction. Please rate on a scale (from 1 to 5 or NA) what you preferred:
 - The random sentiments from the bucket.
 - The sentiment from the interview.
 - The sentiment(s) towards Teresa.
4. What did you think about getting random sentiments from the Gate Keeper's bucket?
5. What did you think about getting sentiment objects as a consequence of an imagined scenario? (When the gatekeeper asked you about dollhouse chairs, garden gnomes and empty noodle containers?)
6. What did you think about getting a sentiment toward the NPC Theresa when you interacted with her through using affective actions via your PC?
7. Which of the sentiments that your PC got made most sense to you? Why?
8. Which of the sentiments your PC made LEAST sense to you? Why?

9. Would you like to play a role playing game with many players that used sentiments so different characters had different inclinations towards entities in the game world?

- No
- Maybe
- Yes
- Absolutely

Comment

10. Other thoughts about the sentiment objects?

Survey 4 — Mood, Spells and general impressions.

1. Please enter the name of your PC. (If you dont remember, enter your name.)
2. How would you describe what the "mood" of an PC is to someone else?
3. What do you think about the colors that were used to represent the mood of a character?
4. Can you think of other ways of representing the mood? Which ones? If so, would you prefer any of the other ways you thought of?
5. Do you remember the spells your PC got to learn? If so, what do you remember about them?
6. What did you think about getting spells that were based on the personality of your PC?

7. Please think about the whole test. Was there anything in particular that you enjoyed? If so, what? Why?
8. Please think about the whole test. Was there anything in particular that you disliked? If so, what? Why?
9. This is the last question. Do you have any other comments regarding the play-prototype or about the experience? Suggestions, opinions, or reactions not covered in these questions?

C.9 Transana Collection Report of Question 2 in Interview 2

Transana Collection Report

Collection: Interview 2 > Q2 Personality

Collection: Interview 2 > Q2 Personality

Clip: Player 1

Time: 0:26:50.1 - 0:38:01.5 (Length: 0:11:11.4)

Clip Keywords:

Emotions : Amusement
Emotions : Anger
Emotions : fear
Interview 2 : Interview2
Interview 2 : Q2- Personality effect on rest of mind
mood : jubilant
Personality : Agreeableness
Personality : Consciouentousness
Personality : Extroversion
Personality : P sup map btw traits and ME and MR
Personality : personality affecting own interaction with NPCs
Personality : Player relates to Agreeableness
Personality : Player relates to Consiouentousness
Personality : Player relates to extroversion
Personality : Player relates to Neuroticism
Personality : Player relating to Openness

Clip: Player 2

Time: 0:36:43.4 - 0:37:52.3 (Length: 0:01:08.9)

Clip Keywords:

Emotions : Anger
Emotions : Sadness
Interview 2 : Interview2
Interview 2 : Q2- Personality effect on rest of mind
mood : bliss
mood : happy
mood : jubilant
Personality : Agreeableness
Personality : Extroversion
Personality : P sup map btw traits and mood
Personality : Player relates to Agreeableness
Personality : Player relates to extroversion

Clip: Player 3

Time: 0:40:56.9 - 0:41:51.8 (Length: 0:00:54.8)

Clip Keywords:

Emotions : Interest/Excitement
Interview 2 : Interview2
Interview 2 : Q2- Personality effect on rest of mind
Personality : Extroversion
Personality : Openness
Personality : P sup map btw traits and effect of AA
Personality : P sup map btw traits and ME and MR
Personality : Player not sure about Openness
Personality : Player relates to extroversion

Clip: Player 4

Time: 0:36:22.9 - 0:36:42.6 (Length: 0:00:19.7)

Clip Keywords:

Emotions : Guilt
Emotions : Sadness
Interview 2 : Interview2

Interview 2 : Q2- Personality effect on rest of mind
Personality : Extroversion
Personality : P sup map btw traits and emotions
Personality : Player relates to extroversion

Clip: Player 5

Time: 0:02:13.6 - 0:03:21.4 (**Length:** 0:01:07.7)

Clip Keywords:

Emotions : Distress/Anguish
Emotions : Interest/Excitement
Interview 2 : Interview2
Interview 2 : Q2- Personality effect on rest of mind
Personality : P sup map btw traits and emotions
Personality : Player relates to extroversion

Clip: Player 6

Time: 0:14:00.2 - 0:14:30.1 (**Length:** 0:00:29.9)

Clip Keywords:

Interview 2 : Interview2
Interview 2 : Q2- Personality effect on rest of mind
Personality : Extroversion
Personality : P sup map btw traits and emotions
Personality : Player relates to extroversion

Clip: Player 7

Time: 0:42:01.3 - 0:44:35.7 (**Length:** 0:02:34.4)

Clip Keywords:

Emotions : Amusement
Emotions : Interest/Excitement
Interview 2 : Interview2
Interview 2 : Q2- Personality effect on rest of mind
Personality : Agreeableness
Personality : Neuroticism
Personality : P sup map btw traits and effect of AA
Personality : P sup map btw traits and emotions
Personality : Player relating to Openness

Clip: Player 8

Time: 0:17:07.8 - 0:18:36.0 (**Length:** 0:01:28.2)

Clip Keywords:

Emotions : Amusement
Emotions : Anger
Emotions : Distress/Anguish
Emotions : humiliation
Emotions : Sadness
Emotions : Shame
Interview 2 : Interview2
Personality : Agreeableness
Personality : Consciouentousness
Personality : Extroversion
Personality : Neuroticism
Personality : Openness
Personality : P sup map btw traits and emotions
Personality : Player not sure about agreeableness
Personality : Player not sure about Consciouentousness
Personality : Player not sure about Openness
Personality : Player relates to extroversion
Personality : Player relates to Neuroticism

Clip: Player 9

Time: 0:49:17.6 - 0:50:23.3 (**Length:** 0:01:05.8)

Clip Keywords:

Personality : Agreeableness
 Personality : personality affecting own interaction with NPCs
 Personality : Player relates to Agreeableness
 Personality : real life personality

Clip: Player 10

Time: 0:13:07.2 - 0:14:41.4 (**Length:** 0:01:34.2)

Clip Keywords:

Interview 2 : Interview2
 Interview 2 : Q2- Personality effect on rest of mind
 Personality : Agreeableness
 Personality : Extroversion
 Personality : P sup map btw traits and effect of AA
 Personality : P unsure of map btw traits and emotions.
 Personality : Player relates to extroversion

Summary

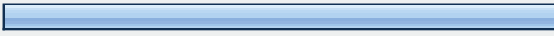
Emotions : Amusement	3
0:15:13.9	
Emotions : Anger	3
0:13:48.5	
Emotions : Distress/Anguish	2
0:02:35.9	
Emotions : Guilt	1
0:00:19.7	
Emotions : Interest/Excitement	3
0:04:37.0	
Emotions : Sadness	3
0:02:56.8	
Emotions : Shame	1
0:01:28.2	
Emotions : fear	1
0:11:11.4	
Emotions : humiliation	1
0:01:28.2	
Interview 2 : Interview2	9
0:20:49.3	
Interview 2 : Q2- Personality effect on rest of mind	8
0:19:21.1	
Personality : Agreeableness	6
0:19:02.8	
Personality : Consciouentousness	2
0:12:39.5	
Personality : Extroversion	7
0:17:07.1	
Personality : Neuroticism	2
0:04:02.6	
Personality : Openness	2
0:02:23.0	
Personality : P sup map btw traits and ME and MR	2
0:12:06.2	
Personality : P sup map btw traits and effect of AA	3
0:05:03.5	
Personality : P sup map btw traits and emotions	5
0:06:00.0	
Personality : P sup map btw traits and mood	1
0:01:08.9	
Personality : P unsure of map btw traits and emotions.	1
0:01:34.2	
Personality : Player not sure about Consciouentousness	1
0:01:28.2	
Personality : Player not sure about Openness	2

0:02:23.0	Personality : Player not sure about agreeableness	1
0:01:28.2	Personality : Player relates to Agreeableness	3
0:13:26.0	Personality : Player relates to Consiouentousness	1
0:11:11.4	Personality : Player relates to Neuroticism	2
0:12:39.5	Personality : Player relates to extroversion	8
0:18:14.9	Personality : Player relating to Openness	2
0:13:45.8	Personality : personality affecting own interaction with NPC	2
0:12:17.1	Personality : real life personality	1
0:01:05.8	mood : bliss	1
0:01:08.9	mood : happy	1
0:01:08.9	mood : jubilant	2
0:12:20.3		
Clips:	10	Total Time:
0:21:55.0		

C.10 Summarising Survey Reports

WoM User Data Prototype Playtest 1

1. This question was added after the survey for the purpose of filtering. Yes designates that the participant completed the whole procedure of the play testing. No indicates that the participant only partially completed the procedure


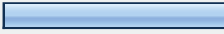
		Response Percent	Response Count
Yes - participated in full procedure		100.0%	10
No - Participated partially		0.0%	0
		<i>answered question</i>	10
		<i>skipped question</i>	0

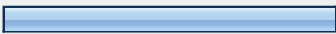


2. Please enter your name

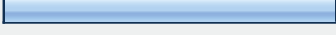
		Response Count
		10
		<i>answered question</i>
		<i>skipped question</i>

3. Please enter your email-adress

		Response Count
		10
		<i>answered question</i>
		<i>skipped question</i>

4. Are you male or female?			
		Response Percent	Response Count
Male		60.0%	6
Female		40.0%	4
<i>answered question</i>			10
<i>skipped question</i>			0

5. In the play- testing of World of Minds do you intend to:			
		Response Percent	Response Count
Play as if you were playing yourself? (self-play)		60.0%	6
Play a fictional character that you have designed? (role-play)		10.0%	1
Not sure, might become a mix? (mixed play approach)		30.0%	3
Please enter a desired name for your avatar			9
<i>answered question</i>			10
<i>skipped question</i>			0

6. Do you have experience with playing single-player role-playing games on computer or console?			
		Response Percent	Response Count
No, none.		10.0%	1
Yes, I have played a few.		30.0%	3
Yes! I have played them A LOT!		60.0%	6
Optional comment: My favorite(s) are:			5
<i>answered question</i>			10
<i>skipped question</i>			0

7. Do you have experience with playing Massively Multiplayer Online Games, such as World of Warcraft?			
		Response Percent	Response Count
No	<input type="checkbox"/>	10.0%	1
I have tried, but I played less than a month.	<input type="checkbox"/>	30.0%	3
Yes I have played one or two MMO's.	<input type="checkbox"/>	20.0%	2
Yes, I have played more than two MMO's.	<input type="checkbox"/>	40.0%	4
If you picked alternative 3 or 4, please specify which MMO's you played and approximately for how long you played them. Also include any MUDs.			4
<i>answered question</i>			10
<i>skipped question</i>			0

8. Do you have experience with playing tabletop role-playing games such as D&D? (E.g. sitting around a table with a bunch of people and a pile of books, from for example White Wolf?)			
		Response Percent	Response Count
No	<input type="checkbox"/>	20.0%	2
Yes, but I only tried a few times.	<input type="checkbox"/>	10.0%	1
Yes, I did that for many years.	<input type="checkbox"/>	70.0%	7
Comment (optional)			3
<i>answered question</i>			10
<i>skipped question</i>			0

9. Do you have experience with Live Action Role Playing? (LARP)			
		Response Percent	Response Count
No	<input type="checkbox"/>	80.0%	8
Yes, I have tried that.	<input type="checkbox"/>	10.0%	1
Yes, I did that regularly for several years.	<input type="checkbox"/>	10.0%	1
Comment (optional)			2
answered question			10
skipped question			0


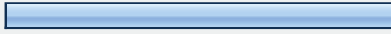
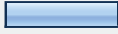
10. Do you have experience with playing tabletop strategy games? (Examples: Risk, Diplomacy, Carcassonne)			
		Response Percent	Response Count
No	<input type="checkbox"/>	20.0%	2
Yes. I play irregularly, when opportunity is given.	<input type="checkbox"/>	50.0%	5
Yes. I play tabletop games regularly with a group of friends.	<input type="checkbox"/>	30.0%	3
Comment (optional)			1
answered question			10
skipped question			0

2. Opinions about using personality traits for Avatar Creation in WoM

1. This question was added after the test for filtering purposes. Yes means that the participant completed the whole procedure in the play test. No signifies that the participant only partially completed the test.			Response Percent	Response Count
Yes - participated in whole procedure		100.0%	10	
No - participated partially		0.0%	0	
			<i>answered question</i>	10
			<i>skipped question</i>	0

2. What is the name of your avatar? (If you don't remember please enter your real name.)		Response Count
		10
		<i>answered question</i>
		<i>skipped question</i>
		10
		0

3. Did you want to self-play, role play, or a mix of both?			Response Percent	Response Count
Self play		60.0%	6	
Role play		0.0%	0	
Mix of both		40.0%	4	
I don't remember		0.0%	0	
Why did you prefer self/role/mixed?				8
			<i>answered question</i>	10
			<i>skipped question</i>	0

4. Would it matter to you whether other players knew if you self-played or role played?			Response Percent	Response Count
Yes			10.0%	1
No			70.0%	7
Not Sure			20.0%	2
			Comment	2
			<i>answered question</i>	10
			<i>skipped question</i>	0

5. What are your thoughts regarding how available the personality data of your avatar would be to other players in the game world?			Response Count
			10
			<i>answered question</i>
			10
			<i>skipped question</i>
			0

6. In World of Minds an avatar can only see his/her own personality traits, unless the player chooses to show them to another player character. What do you think of this?			Response Count
			10
			<i>answered question</i>
			10
			<i>skipped question</i>
			0

7. How do you feel about getting to know strengths and weaknesses of other avatars, and other's to get to know your avatar, so you could use this knowledge to together meet challenges in the game?

		Response Count
		10
	<i>answered question</i>	10
	<i>skipped question</i>	0

8. What did you think about the results of the IPIP NEO test for your avatar?

		Response Count
		10
	<i>answered question</i>	10
	<i>skipped question</i>	0

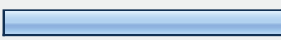
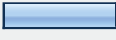
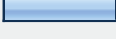

9. What do you think about using personality data for avatar creation in a role playing game?

		Response Count
		10
	<i>answered question</i>	10
	<i>skipped question</i>	0

10. For creation of your avatar personality, please rate the following approaches in terms of what you would prefer (The choices are not exclusive, you can prefer or dislike them all)

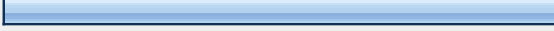
	I would hate it	I would not like it	Ok	I would like that	I would LOVE it!	N/A	Rating Average	Response Count
A test with questions such as the IPIP NEO before you go into the game world.	10.0% (1)	20.0% (2)	60.0% (6)	10.0% (1)	0.0% (0)	0.0% (0)	2.70	10
A series of interviews with similar questions in several smaller dialogs with automated characters in the game world.	0.0% (0)	22.2% (2)	11.1% (1)	55.6% (5)	11.1% (1)	0.0% (0)	3.56	9
A series of in game activities where your actions define the personality traits of your avatar.	0.0% (0)	0.0% (0)	11.1% (1)	22.2% (2)	66.7% (6)	0.0% (0)	4.56	9
Comment								5
answered question								10
skipped question								0

11. Do you like taking survey tests that define you in different ways? (examples: If you are ninja or a pirate, and various tests on Facebook such as "your criminal personality", Meyers-Briggs test)

	Response Percent	Response Count
Yes I do it often and I think that is great fun! I also like seeing the results of my friends!	0.0%	0
Yes i find it fun, and i do it sometimes.		5
Sometimes it can be fun.		2
I've done it but it's not my thing really.		2
I dislike those tests.		1
Comment		3
answered question		10
skipped question		0

3. Sentiment Survey

1. This question was added after the play-test for the purpose of filtering the responses. Yes means that the participant completed the whole procedure. No means that the participant only partially completed the procedure.

		Response Percent	Response Count
Yes - participated in full procedure		100.0%	10
No - partial participation		0.0%	0
	<i>answered question</i>		10
	<i>skipped question</i>		0

2. What is the name of your avatar? (If you can't remember, enter your name)

		Response Count
		10
	<i>answered question</i>	10
	<i>skipped question</i>	0

3. Do you remember any of the sentiments your Avatar got? If so, which ones?

		Response Count
		10
	<i>answered question</i>	10
	<i>skipped question</i>	0

4. In this scenario your avatar got sentiment objects in 3 different ways. First the Gate Keeper gave random sentiments from his bucket. Second the Gate Keeper talked you through a scenario where you could choose between three items. Third, by interacting with the character Theresa you got a sentiment toward her that was an effect of your interaction. Please rate on a scale what you preferred:

	Bad	Not so good	It was ok	Good	Very good	N/A	Rating Average	Response Count
The random sentiments from the bucket	10.0% (1)	0.0% (0)	50.0% (5)	20.0% (2)	20.0% (2)	0.0% (0)	3.40	10
The sentiment from the interview	0.0% (0)	0.0% (0)	10.0% (1)	70.0% (7)	20.0% (2)	0.0% (0)	4.10	10
The sentiment(s) towards Teresa	0.0% (0)	0.0% (0)	20.0% (2)	0.0% (0)	80.0% (8)	0.0% (0)	4.60	10
	<i>answered question</i>							10
	<i>skipped question</i>							0

5. What did you think about getting random sentiments from the Gate Keeper's bucket?

	Response Count
	10
	<i>answered question</i>
	10
	<i>skipped question</i>
	0

6. What did you think about getting sentiment objects as a consequence of an imagined scenario? (When the gatekeeper asked you about dollhouse chairs, garden gnomes and empty noodle containers?)

	Response Count
	9
	<i>answered question</i>
	9
	<i>skipped question</i>
	1

7. What did you think about getting a sentiment toward the NPC Theresa when you interacted with her through using affective actions via your avatar?

		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	1

8. Which of the sentiments that your avatar got made most sense to you? Why?

		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	1

9. Which of the sentiments your avatar made LEAST sense to you? Why?

		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	1

10. Would you like to play a role playing game with many players that used sentiments so different characters had different inclinations towards entities in the game world?

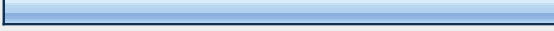
		Response Percent	Response Count
No		0.0%	0
Maybe	<input type="text"/>	33.3%	3
Yes	<input type="text"/>	33.3%	3
Absolutely	<input type="text"/>	33.3%	3
Comment			6
<i>answered question</i>			9
<i>skipped question</i>			1

11. Other thoughts about the sentiment objects?

		Response Count
		8
<i>answered question</i>		8
<i>skipped question</i>		2

4 Wom Survey - Mood, Personality and General

1. This question was added after the play-test for the purpose of filtering the responses. Yes means that the participant completed the whole procedure. No means that the participant only partially completed the procedure.

		Response Percent	Response Count
Yes - participant completed the full procedure		100.0%	9
No - partial participation		0.0%	0
	<i>answered question</i>		9
	<i>skipped question</i>		0

2. Please enter the name of your avatar. (If you don't remember, enter your name.)

		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	0

3. How would you describe what the "mood" of an avatar is to someone else?

		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	0

4. What do you think about the colors that were used to represent the mood of a character?

		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	0

5. Can you think of other ways of representing the mood? Which ones? If so, would you prefer any of the other ways you thought of?		
		Response Count
		8
	<i>answered question</i>	8
	<i>skipped question</i>	1

6. Do you remember the spells your avatar got to learn? If so, what do you remember about them?		
		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	0

7. What did you think about getting spells that were based on the personality of your avatar?		
		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	0

8. Please think about the whole test. Was there anything in particular that you enjoyed? If so, what? Why?		
		Response Count
		9
	<i>answered question</i>	9
	<i>skipped question</i>	0

9. Please think about the whole test. Was there anything in particular that you disliked? If so, what? Why?

		Response Count
		8
	<i>answered question</i>	8
	<i>skipped question</i>	1

10. This is the last question. Do you have any other comments regarding the play-prototype or about the experience? Suggestions, opinions, or reactions not covered in these questions?

		Response Count
		7
	<i>answered question</i>	7
	<i>skipped question</i>	2

C.11 Response Text on Question 6 in Survey 2

2. Opinions about using personality traits for Avatar Creation in WoM

How do you feel about getting to know strengths and weaknesses of other avatars, and other's to get to know your avatar, so you could use this knowledge to together meet challenges in the game?		
		Response Count
		10
	<i>answered question</i>	10
	<i>skipped question</i>	0

Response Text		
1	It sounds different (in a good way) from other games, especially if aspects of personality are made visible to other players. I like it! I think it would make the game feel more real.	Apr 5, 2008 8:00 PM
2	Sounds fun! (man my answers are boring)	Apr 6, 2008 1:59 AM
3	depending on game play, this could be useful.	Apr 6, 2008 11:43 PM
4	This is a good idea. However, if these strengths and weaknesses are based on the personality tests, the act of playing the game in view of another player would provide information about the player.	Apr 7, 2008 8:47 PM
5	It'll take some time and some thought, but thinking only scares people from California.	Apr 8, 2008 12:33 AM
6	Sounds like an interesting social and game mechanic.	Apr 8, 2008 4:36 AM
7	Would make it very easy to play around the game.	Apr 9, 2008 8:41 PM
8	It will make the game easier, I think.	Apr 10, 2008 12:25 AM
9	It depends on the nature of the game. If it's intended as purely cooperative, this makes sense.	Apr 10, 2008 1:02 AM
10	That sounds like a good way to use personality data constructively.	Apr 11, 2008 11:26 PM

C.12 Response Text on Question 2 in Survey 3

3. Sentiment Survey

Do you remember any of the sentiments your Avatar got? If so, which ones?		
		Response Count
		10
<i>answered question</i>		10
<i>skipped question</i>		0

Response Text		
1	Fear of noodles (from question), positive sentiment towards Theresa from interaction. I don't remember the random sentiments.	Aug 19, 2009 10:20 PM
2	Fear of gnomes, happy with shoes, interest with Teresa, and one more which I forget.	Aug 19, 2009 10:20 PM
3	A sock that looked like a crack pipe. A hat. A empty, Chinese noodle container I imagined to be a transparent Tupperware container. A Teresa +interest sentiment.	Aug 19, 2009 10:21 PM
4	Fear of gnomes, amusement of socks, (something) of pencils. Liked the character in the second room in some way.	Aug 19, 2009 10:21 PM
5	Fear of chairs, anger towards erasers, amusement from hats, and interest in Teresa.	Aug 19, 2009 10:21 PM
6	Fear - Gnomes Anger - Mittens Amusement - Socks Interest - Teresa	Aug 19, 2009 10:22 PM
7	angry shoe, amusement sock, satisfaction theresa, fear gnome	Aug 19, 2009 10:22 PM
8	fear - garden gnomes angry - socks amusement - erasers satisfaction x2 - Teresa	Aug 19, 2009 10:23 PM
9	Scissors, pencil, garden gnome	Aug 19, 2009 10:23 PM
10	Angry towards a mitten amusement towards scissors something positive towards teresea fear of garden gnomes	Aug 19, 2009 10:24 PM

C.13 Response Text on Question 3 in Survey 4

4 Wom Survey - Mood, Personality and General

What do you think about the colors that were used to represent the mood of a character?		
		Response Count
		9
<i>answered question</i>		9
<i>skipped question</i>		0

Response Text		
1	on one axis it went from dark to light, which made sense. I wasn't sure what the other axis represented, but the color range suggested that the blueish colors were more negative.	Apr 8, 2008 7:38 PM
2	I liked all of them except the bottom right corner, which seemed too peaceful for the mood it was representing.	Apr 8, 2008 9:35 PM
3	I think some of the "negative" emotions were better suited than the "positive" emotions.	Apr 9, 2008 12:52 AM
4	I thought that was a great idea. The only one that didn't quite make sense was fear. Fear was a "red" emotion so it would you move toward "angry". I think it should be a purple (lilac) emotion, moving you somewhere between depressed and angry.	Apr 9, 2008 2:13 AM
5	It seemed intuitive enough for the gamemaster to know what to do quickly.	Apr 9, 2008 11:10 PM
6	They were okay. Light blue is definitely the colour for bliss due to the fact it represents blue skies and hippies in California. I could see the angry colour being a bit more red.. but I'm willing to accept it as long as the jubilant colour is rosea.	Apr 11, 2008 8:12 PM
7	No opinion. Any set of colors would be fine, so long as they aren't painfully bright or designed to wash out the text.	Apr 12, 2008 8:59 AM
8	As I said in the interview, most of the colors translated well into representations of mood (in my head anyway). Neutral was the only one that was off; it seemed too dark. This seems to be a difficult question as each individual would have a different mood->color mapping in their heads.	Apr 14, 2008 7:53 PM
9	Fine	Apr 14, 2008 7:59 PM

C.14 Response Text on Question 6 in Survey 4

4 Wom Survey - Mood, Personality and General

What did you think about getting spells that were based on the personality of your avatar?		
		Response Count
		9
<i>answered question</i>		9
<i>skipped question</i>		0

Response Text		
1	it wasn't clear how I was supposed to use them	Apr 8, 2008 7:42 PM
2	I really like this. It makes a lot more sense than learning spells from a book, and makes me feel like my avatar's personality really has impact on how I will be playing the game.	Apr 8, 2008 11:38 PM
3	I think that was a good idea, it gives more meaning to what the avatar can do.	Apr 9, 2008 12:08 AM
4	I thought that was really interesting. I am interested to see whether the game world would end up skewed based on specific personality types being drawn to MMOs.	Apr 9, 2008 2:17 AM
5	It will ultimately make my roleplaying more consistent.	Apr 9, 2008 11:14 PM
6	Great! As long as nobody else has a disadvantage or advantage over me I'm okay with it - it's just another layer to the RP process.	Apr 11, 2008 8:14 PM
7	I would prefer to choose them directly myself rather than have them assigned.	Apr 12, 2008 9:02 AM
8	I think it is a cool way to personalize your avatar's abilities. This may not go over well with some gamers who like to have as much control as possible over their character growth. Getting spells from personality is a different method of choosing how your avatar interacts with the world (like a class). Not having direct control over your class may be a difficult pill to swallow.	Apr 14, 2008 7:59 PM
9	Great. Would have liked to play more to use them :)	Apr 14, 2008 8:00 PM

**CHARACTERISING ACTION POTENTIAL
IN VIRTUAL GAME WORLDS
APPLIED WITH THE MIND MODULE**

Volume 3

MIRJAM PALOSAARI ELADHARI

A thesis submitted in partial fulfilment of the
requirements of the University of Teesside
for the degree of Doctor of Philosophy

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Appendix D

Publications

D.1 Eladhari 2003

Publication in the internet-based Game Research in May 2003. It is available at the URL <http://game-research.com/index.php/articles/trends-in-mmog-development/>.

NAVIGATION  [SUBSCRIBE TO OUR NEWSLETTER](#)

- Home
- News
- History and genres
 - Action games
 - Adventure games
 - Strategy games
 - Simulation games
- Form and aesthetics
 - Perspective
- Online gaming
- Wireless gaming
- Business
- Statistics
- Education
- Health hazards
- Reports
- Articles
 - Write an article
- Dictionary
- Discussion Forum
- Consulting

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- [Game Culture](#)
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- [Ludology.org](#)
Academic game site
- [Killer List of Arcade Games](#)

Trends in MMOG development

by **Mirjam Eladhari, researcher at Zero-Game Studio, Interactive Institute, Sweden.**

Currently, in April 2003, there are 51 MMOGs (Massively Multiplayer Online Games) available and about 120 MMOGs are in development. This article is based on a survey of these games and addresses the questions of what trends there are in type of gameplay and fictional world themes. We will also have a look at how the MMORPG genre (Massively Multiplayer Online Role Playing Games) is evolving by identifying what new features are being developed.

The standard MMOG

In order to see what is new, we need to compare with existing standard features. The first MMORPGs that reached a wide audience were released in the late nineties, (Meridian 59 September 1996, Ultima Online September 1997, EverQuest March 1999, Asheron's Call November 1999) and features in these games are more or less standard components in most MMORPGs:

- Thousands of simultaneous players.
- A very big 3D environment with several cities and vast areas between them.
- Character classes of varied complexity.
- A set of skills for the player to choose from and develop for the character during the game by usage and by assigning experience points.
- Combat system, in game mostly used for fighting NPC (Non-player characters) foes like monsters, but optionally to combat other players.
- Magic system that ties into combat system and skill system.
- Items in game world that can be used by players as equipment or modified and used by using acquired skills.
- In game trading between players, which often extends to out of game trading with real money.
- Homes, areas in the game that a single or several players have ownership over and can

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It is said...

'Videogames are not going to go away. You can't hide under the stairs. Resistance is futile.'

- [STEVEN POOLE]

Remember?

Historical
information on
arcade games

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Academic journal

modify by placing and storing items in them.

- Quests for players to perform, either in the form of items or NPCs in the game world leading or motivating players to perform a certain series of actions, or events initiated by a game master or implemented by a live team.
- Evolving story line, i.e. the history of the game world.
- Social systems allowing players to form permanent or temporary groupings.
- NPCs of several types, usually including monsters, humanoid NPCs that trade items and humanoid NPCs that deliver quests.

Feature trends in MMOG development

Most of the MMOG games under development follow the state of the art when it comes to the basic game play features listed above, adding new features to the list or slanting existing features in new directions. Some development teams (about 15%) are restricting themselves to standard features.

However, some prominent trends that can be observed from the features of the 114 games under development are the notions of player freedom and virtual life. Game developers are striving to create worlds that provide an alternative to the real world but with similar perceived levels of complexity. This in-game complexity is born when developers are able to make systems that are so dynamic that a massive number of players can use in-game features to create systemic complexity by interacting according to different varieties of frameworks for social structure, politics and economics. Frequent words in the most ambitious outlines for games are "freedom", "virtual life", and "dynamic". (e.g. Athanasia, Boundless Adventures and EverQuest II). This might be seen as a heritage from the precursors of the MMOGs, the shared virtual worlds (e.g. Active Worlds, WorldsAway and Online Traveler), where the idea and praxis of a virtual life parallel to the real life was promoted to the users.

Another observable trend is to make it possible for the player to create objects within the game, and to shape and affect parts of the game world, depending on the circumstances, as an individual or as part of a group, players and their actions then actively forming large parts of the geography of the world (e.g. Atriarch, Dawn).

Also the idea of deeper characterization is something that developers are focusing on

more strongly, and this is especially common in games that are in their second iteration (sequels). The idea of deeper, or better, characterization is in most cases realized, not by remaking the commonly used system of character classes into something else, but by focusing on making more advanced systems with a greater variety of character classes and greater freedom to combine the different features of the classes and associated character skills (e.g. Atriarch, EverQuest II).

The idea of having more dynamic systems for quest assignments and for players to experience and evolve stories that affect the world and the history of the world is common. Usually this involves having a storytelling system that allows the player to take part in the formation of the history of the world on different levels – large-scale world history, the individual story of the player character and of the group (e.g. Atriarch, StarWars Galaxies).

It also appears that many game developers are making a strong effort to build features facilitating group dynamics with emergent political and economic systems. This involves the possibility of forming social groupings, both on small and large scales, being a part of a smaller, tighter social group, but also being part of a bigger, more loosely connected group, a society, culture or subculture. (eg. Horizons, Entropia, PlaneShift, Ryzom). The game that currently stands out among available titles in this area is Asheron's Call, and this feature is also a strong factor in the game's success.

Most games in production are striving for the development of more advanced non-player characters that behave in more dynamic ways than in current games.

Another trend in MMOG sequels is to make it possible for players to develop their characters in non-confrontational ways (e.g. EverQuest II).

Last but not least we have the trend of building game worlds that have both autonomy and are affected by players in the game, embodying principles of an eco system.

MMOG genre trends

Before making this survey I had a few preconceptions about the results that proved to be false. I thought that there would be an increasing number of games that combine different game play genres, such as real-time strategy or first person shooter combined with role-playing. I also thought that there would be a change in the choice of fictional themes for game worlds, going away from the two

prominent themes of sci-fi/post-apocalypse/space and fantasy towards a larger number of game worlds having unique themes. This all proved to be wrong. Looking at the percentages below we see that the quantitative division between game play genres and world theme genres for games in development is about the same as for existing games. The only significant change is fewer MMOGs in development having real time strategy elements of game play. Another observable trend that is not clear from the percentages below is an increase of world themes inspired by either comics or movies.

Game world themes in current MMOGs and in MMOGs in development

In April 2003 there are 51 MMOGs available for game players worldwide. The fantasy genre dominates the world themes of these games - 14 of them have a fantasy theme. In second place come 9 game worlds having a science fiction or post apocalypse setting.

A survey of the 51 available titles shows the following balance among themes for game worlds:

- 2 games with historic themes (6%)
- 11 games with science fiction or post apocalypse world themes (32%)
- 14 games with fantasy world themes (41%)
- 5 games with unique world themes (15 %)
- 2 games with oriental or anime style (6%)

Remaining games: genre not of interest in context (vehicle games for example); hence the percentages above are counted on a sum of 34.

By comparison, for MMOGs that currently are under development the themes are:

- 4 games with historic world themes (5%)
- 24 worlds with a science fiction or post apocalyptic themes (36%)
- 26 worlds with a general fantasy themes (38%)
- 9 games with unique worlds (14%)
- 5 worlds inspired by comics or anime (7%)

Remaining games fall within world themes not of interest in this context (eg. vehicle games). The percentages above are counted on the sum of the categorized games, 68. Total number of surveyed MMOGs under development is 114.

Type of gameplay in current MMOGs and in MMOGs under development

When it comes to genres for world themes, the percentage of titles under production in each genre is roughly the same as the percentage of titles already available in those genres. This suggests that the development of MMOGs

follows the same pattern as traditional game production in rigidly following established genres and avoiding market risk.

This pattern is possible to observe when it comes to genres for game play (as opposed to world theme genres). My survey shows the following balance in available MMOG titles:

28 games with role-playing elements (54 %)
11 games with real time strategy game play (26%)
6 games where game play is focused on driving a vehicle (12%)
5 games that are mainly focused on battle (10%)
2 games combine role playing elements and real time strategy (4%)

The percentages above are counted on 51 games, but note that some of them are categorized in more than one category, or are not possible to categorize at all.

Except for a decrease in the number of real time strategy MMOGs, the balance between game play genres is very similar for the MMOGs under development:

53 games with role-playing elements (56 %)
13 games with real time strategy game play (14%)
10 games where game play is focused on driving a vehicle (11 %)
12 games that are mainly focused on battle (13 %)
4 games combine role playing elements and real time strategy (4%)

These percentages are based upon 94 games; all 114 games in production minus 20 for which there is insufficient information (too early in production). (Note that the sum of 92 listed games is not a figure for the actual total number of games since some of them are represented in more categories than one and some not at all.

About the survey

The background work of this survey consisted of reading descriptions of the 51 available MMOGs; the 114 MMOGs under development and 26 cancelled or suspended MMOG productions. From the basis of this material, I classified the games according to type of game play and theme of fiction in the game world, while I paid special attention to non-standard features in games under development. Due to time constraints, I played only a few of the games that are currently in their beta stage. Besides information about each individual game I found the website Stratics Cental

(<http://www.stratics.com/>) very useful. The genre categorization (21 pages) is available on request

(mirjam.eladhari@interactiveinstitute.se).

Links

Stratics Central – **Available MMOG titles**

Stratics Central – **MMOGs in development**

Document with descriptions of MMOGs available in March/April 2003

[Last update: May 2, 2003]

WEB@GAME-RESEARCH.COM

D.2 Lindley and Eladhari 2003

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“Causal Normalisation: A Methodology for Coherent Story Logic Design in Computer Role-Playing Games”¹

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Abstract. A common experience in playing computer role-playing games, adventure games, and action games, is to move through a complex environment only to discover that a quest cannot be completed, a barrier cannot be passed, or a goal cannot be achieved without reloading an earlier game state and trying different paths through the story. This is typically an unanticipated side effect caused by the player having moved through a sequence of actions or a pathway different from that anticipated by the game designers. Analogous side effects can be observed in traditional software engineering, referred to as data coupling and control coupling, in database design, in terms of unnormalised relations, and in knowledge base design, in terms of unnormalised truth-functional dependencies between declarative rules. In all cases, good design is a matter of minimising functional dependencies, and therefore coupling relationships, between different parts of the system structures, and deriving system design from the minimised dependency relationships. We propose a story logic design methodology, referred to as causal normalisation, that minimises some forms of causal functional dependency within story logics and therefore eliminates some unintended forms of causal coupling. This can reduce the kind of unexpected dead ends in gameplay that lead to player perceptions of poor game design. Normalisation may not be enough, however. Extending the principle of minimal coupling, we propose an object-oriented approach to story logic, and relate this to principles of normalisation and game architecture.

Introduction

The study of games and gameplay has historically been concerned with the study of competitive systems, associated with economic theory more strongly than with play. Traditional board games and puzzle games typically model competitive situations in a very abstract way, involving little or no story context, game world, or characterization. It is only with the advent of computer games that the distinctions between games/gameplay and narrative have become unclear, and the study of games

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has shifted focus more strongly towards games as a type of fiction. Computer games span a range of forms, varying from the highly narrative, to the highly non-narrative. This range of perspectives, from the ludological to the narratological, is depicted on Figure 1. At the ludological extreme are computer implementations of traditional board games, and abstract game forms that rely upon the active dynamics of a computer implementation, but have little or no function in terms of representing a fictional world. At the narratological extreme are highly story-oriented productions, from multipath movies to hypertext stories and adventures.

The more dominant computer game forms lie in a continuum between these extremes, using different approaches for the integration of narrative and patterned gameplay. This may lead to a perceived tension between gameplay and story in computer role-playing games (see, for example, Aarseth, 1997), although this ultimately amounts to a matter of style and taste; players will gravitate to the games that satisfy their preferences in terms of narrative framing and its relation to the core gameplay experience (or the *gameplay gestalt*, as an essentially non-narrative interaction pattern, Lindley 2002). There are game forms more concerned with simulation, or realising multi-user, on-line avatar worlds, that strain the definition of games, although similar tensions between game play and story also occur in these systems.

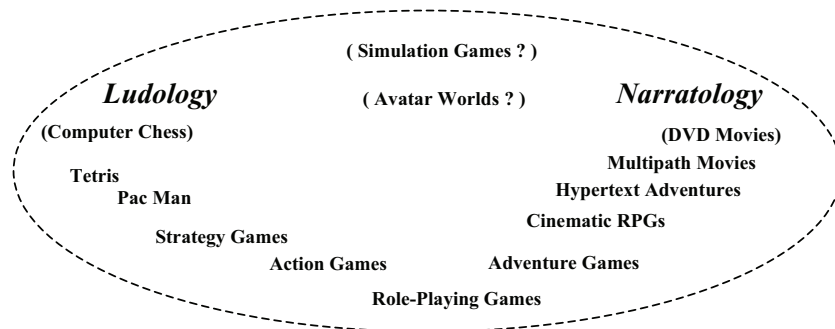


Fig. 1. Games fall within a continuum from the ludological to the narratological

More consistently frustrating for players than the gameplay/narrative tension is the experience of moving through a rich game world, completing the tasks, meeting the challenges, completing the quests, etc., only to come to a point that is unpassable since some unknown critical action has not been performed at a previous point in the game. This may result in the player needing to experiment with reloading past game states in order to try to discover the “correct” sequence that needed to be completed, restarting the game, or floundering around with no idea of what went wrong or how to move forward. If the frustration level is too high, the player will stop playing the game, leaving her with the impression that it was too hard, impossible to understand, too tedious to resolve, and/or badly designed. This is a problem of story logic. Story logic becomes more explicit in the movement from the ludological pole towards the narratological pole of Figure 1. However, story logic problems are most prevalent in the intermediate zones, where story design is obscured by gameplay and simulation.

In this paper we consider the extent to which problems in story logic can be attributed to design characteristics that can be analysed in software engineering terms, ie. in terms of dependency relationships among story elements. We present a simple example of a stereotypical game quest, together with two undesirable outcomes that have actually been experienced by the authors in real game play. We present a semi-formalised representation of the causal relationships involved in the quest and the problematic situations. We then review the concepts of coupling, functional dependency, and normalisation theory as they have been used in the history of software engineering methodologies, and explore the applicability of these concepts to story logics. A number of principles for normal forms for story logics are presented. We also consider the applicability of object-oriented concepts to storytelling, and what this means in terms of system architectures for games.

The Dead End – Errors in Game Logic

The forms of games in which stories dominate the player experience are branching narratives based upon a hypertext model (eg. multi-path movies, <http://www.brilliantdigital.com/solutions/movies/>); at the other extreme, strong gameplay can be experienced in very abstract games having no story at all, such as traditional board and puzzle games. Problems in game logic of the kind discussed here lie in intermediate forms, where game designers wish to impose a specific series of plot points in order to create particular story structures, but game players are given high levels of freedom in interaction, especially in relation to the exploration of the landscapes and architectures of a game world.

A common strategy for imposing a specific story sequence within a highly interactive game is to make progress in the game conditional upon completing a specific sequence of actions or plot points. This is where design problems may arise. Consider, for example, the following clichéd scenario. The player plays the part of a fantasy protagonist (the player character, or PC) moving through a medieval world inhabited by various helpful or enemy non-player characters (NPCs). The designers have created a quest: an ailing wizard will give the player a key to an underground cave system in return for killing an old enemy dragon that the wizard has failed to destroy in time before his own death, and which therefore now threatens the local town. This is programmed into the game. However, as a function of the virtual geography of the game, the player's interactive possibilities for traversing this geography, and the way the quest is imposed upon the player, several story outcomes are possible. First, the outcome intended by the designers:

1. the player meets the wizard and is given the quest. The player follows the wizard's instructions, finds, battles and defeats the dragon, returns its head to the wizard, and is rewarded with the key. The player can now continue in the game by seeking and entering the underground cave system to further her higher level quest.

As a simple example of a design problem, however, we consider the case when the player has enough freedom in the environment to go to the dragon's lair before going to the wizard's lair. This occurs in part due to the game designers attempts to simulate a world, since one solution for the dependency problem (generally undesirable for players) is to restrict freedom of movement in the world to enforce the required sequence of events. One design solution for imposing the intended story without restricting freedom of movement is to not instantiate the dragon until the wizard has been encountered. This leads to the following possible outcome:

2. the player goes into an empty lair (no dragon yet). The player goes on to receive the wizard's instructions. The player is now looking for a dragon in a lair, but does not go back to the lair because it was previously found to be empty. The player searches through all reachable but previously unexplored parts of the terrain. No dragon is found. Either the player must revisit all previously visited areas of the map just in case one of them was the lair which is now by chance inhabited, or will give up, having no options to go anywhere new, and not understanding why the dragon is not to be found.

To avoid this, designers allow the dragon to be in its lair before the player character visits the wizard, leading to another possible outcome:

3. the player goes into the dragon's lair, battles and defeats the dragon. The player then goes on to meet the wizard and is given the quest. However, the quest cannot be completed, because the dragon no longer exists. The player must reload a game state prior to the point of defeating the dragon, and go through the battle again, this time after visiting the wizard. If no suitable state has been saved, the player must restart the game, or stop playing.

Of course, there are solutions that avoid these outcomes. For example, to avoid outcome 2, the wizard can explain where the lair is, and the designers can hope that this can be related to the player's memory of the lair if it has already been visited. This can however detract from the fun element of finding the lair as part of the quest, and also raises the question of why the player didn't run into the dragon along the long and winding route from the lair to the wizard. The solution violates the expected existential logic of the world for the sake of a specific story sequence. Outcome 3 can be avoided by having the wizard reward the player's action of killing the dragon even though the action was performed before the player was instructed to do it, so it is no longer necessarily a quest. This is a matter of weakening the imposition of the designer's desired story sequence, for the sake of a more plausible simulation of a world.

While these solutions are possible, they and the situation leading to them raise the question of whether there is a more general and coherent method for understanding and resolving this kind of problem in story logic. Here we propose two methods; firstly, we consider the analysis of causal dependencies in the game logic, including the notion of *causal coupling*, and a design methodology based upon the minimisation

of causal coupling by *causal normalisation*. This approach is appropriate when specific story structures (such as quests) are desired as an intrinsic part of the game form. The second approach, that of object oriented storytelling, is desirable when the world is to function more as a simulation, in which stories are an emergent and retrospective phenomenon.

Causal Modelling for Game Logics

The story example above can be represented in the following way. We use the notation:

E1(P meets W and receives Q) -> E2(P goes to L)

to represent a causal relationship, where:

E1 and E2 denote events 1 and 2, respectively

P refers to the player

W refers to the wizard

Q refers to the quest instruction

L refers to the dragon's lair

-> is a causal relationship, where the event(s) on the left hand side of the arrow causes the event on the right hand side of the arrow.

We have not completely formalised this notation, nor adopted an existing causal logic, but find this level of formalisation sufficient for the analysis presented here, ie. as a tool for the analysis of patterns of causal dependency.

Using this notation, we present outcome 1 above in terms of the following sequence of causal dependencies desired by the game designers.

Sequence 1:

E1(P meets W and receives Q)
-> E2(P goes to L) where L denotes the dragon's lair
-> E3(P meets D) where D denotes the dragon
-> E4(P defeats D)
-> E5(P returns victoriously to W)
-> E6(P receives R) where R denotes the reward

A crucial issue in game design is whether or not to impose these kinds of causal relationships as rules that the player must obey. This becomes very complex, since a decision to impose causal rules raises the need for desirable formal properties, such as soundness, completeness, decidability and consistency (see Frost, 1986). The undesirable outcomes 2 and 3 above result from the lack of these properties for the causal system expressed in Sequence 1. For instance, the system is incomplete in the sense that E2 can be true without being derived from (or caused by) E1. The presence

of the player as an active causal agent in the game world, and the function of that world as a simulation, make it impossible to formalise all possible simulated causal relationships in that world, so a formal approach to proving desirable behaviour is generally not feasible.

Examining outcome 2 above, in which the user encounters the lair without the dragon prior to encountering the wizard, we find the causal sequence:

Sequence 2:
E2
- > E1
- > confusion!

Outcome 3 involves the sequence:

Sequence 3:
E2
- > E3
- > E4
- > E1
- > E2
- > E5
- > dead end!

Since these problems arise from undesirable patterns of causal dependency, it may be feasible to apply systematic methods from software engineering practice, based upon dependency analysis, as an aid to story logic design.

Coupling, Dependency, and Normalisation in Software Engineering

The analysis of dependencies underlies methodologies for system development within a variety of programming and development paradigms. This includes structured development (analysis and design) for procedural software systems (Yourdon and Constantine, 1979), normalisation of relational database systems (Codd 1970, 1971, 1972; Date 1981), and normalisation of rule-based knowledge systems (Debenham, 1989, 1998). Structured development for software systems is based upon an analysis of the data flow relationships within an application, as captured by hierarchical data flow diagrams (DFDs; see De Marco 1978, Gane and Sarson 1979). A data flow diagram is a representation of the data within a system, and how data flows between different transforming processes. Structured software development methodology has traditionally used DFDs to represent data flow as part of the analysis of a system, and the resulting DFDs have then been used as a basis for hierarchically defining program modules. In developing this approach, Yourdon and Constantine (1979) articulate the concept of *coupling*, as the degree to which one functional module of a system must know about another, which then amounts to the likelihood that modifications to one

module will effect the operation of another in some way. Coupling can be further classified into *data* coupling and *control* coupling, where data coupling involves a data dependency between modules (modifying a data value in one module changes the data outputs of another), and control coupling involves a control dependency (the behaviour of one module influences the control sequencing of another). A good structured design amounts to creating system with a minimum of coupling between modules, so that future modifications to a module will have a minimum impact upon the operation of the rest of the system. Structured analysis and design techniques focus on data flow relationships, and seek to minimise data functional dependencies between modules by defining systems having a structure that reflects data dependency.

Database normalisation involves constructing relations for relational databases that reflect the functional dependencies within the data domains. A functional relation from a domain A to a domain B means that a value within domain A uniquely determines a value within domain B; values within domain B can have more than one determinant in A, but each value in A has only one dependent value in B. Database normalisation is a process of eliminating redundancy and inconsistent dependencies within relational database designs by following the patterns of functional dependency within the data domains (see Date, 1981). This can be seen to be a very similar process to the minimisation of coupling in structured analysis and design (or identical at an abstract level), the difference being that in pure database systems, values are explicitly represented rather than being calculated dynamically.

Normalisation theory is extended into rule base systems by Debenham (1989, 1998), in this case dealing with the same or similar kinds of functional dependencies, but expressed in terms of abstract declarative relations, instead of database tuples. These dependencies are truth-functional dependencies, and normalisation amounts to the minimisation of truth-functional coupling. A simple example is the separation of repetitive premise subsets into distinct rules, analogous to Codd's first normal form for database systems. For example, consider the simple propositional rules:

Rule 1:
A, B, C, D, E :- F

Rule 2:
G, H, C, D, E :- I

where capitalised letters represent simple propositions, and :- represents logical implication. The occurrence of the subset of premises {C, D, E} in both rules suggests an interdependency between the propositions within the subset. This creates an update hazard, since any change to this interdependent set must be reflected everywhere that it occurs. Rules 1 and 2 are therefore truth-functionally coupled in the sense that the {C, D, E} subset represents a common meaning, which becomes ambiguous if the expression of that meaning becomes inconsistent in different rules. To avoid this, the rules can be normalized by extracting the subset as a new rule, and replacing the subset by the head of the new rule in rules 1 and 2, giving the new rule set:

Rule 1:
A, B, J :- F

Rule 2:
G, H, J :- I

Rule 3:
C, D, E :- J

The meaning of the {C, D, E} subset is now encapsulated within Rule 3, and changes to the subset only have to be made in one place. As with structured software design and database normalization, the representation structures reflect the functional dependencies within the system.

Object-oriented software development methodologies (see Booch, 1994) have superseded many of the earlier methodologies, as a more coherent and universal method of addressing the standing issues of minimizing modular coupling and providing a principled approach to system development. Object-based approaches provide a consistent methodology through all phases of software development, since objects identified during analysis may provide the foundation for objects in the design and implementation of systems. An object encapsulates both data and control, and provides what should be well-defined interfaces through which other modules can use their functionality. Object-based systems typically also use the concept of inheritance, allowing system constructs to be defined as classes at various levels of abstraction, with lower level constructs inheriting features, data, and/or functions (methods) from higher abstraction levels. An object is then an instance of a class, having its own internal data (state information), and interfaces defined as methods by which other objects can interact with it. Ideally, a system composed of a set of interacting objects has minimal control and data coupling between its elements.

In the next section we examine the meaning of principles of dependency analysis for story logics. The issue of object-orientation in story structure is examined in the section after that.

Causal Normalisation For Games

Examination of sequence 1 together with outcome sequences 2 and 3 shows that these outcomes result from dependent and independent relationships that are not clearly represented in Sequence 1. In particular, outcome 2 results from a dependency between E1 and E3. That is, the player can only meet the dragon if she has first encountered the wizard. Outcome 3 results from a dependency between E4, E5 and E1; the player can only return to the wizard after killing the dragon and receive a

reward if the wizard has been visited before the dragon was killed. In both cases, the ability to enter the sequence at E2 undermines the intended story logic.

This kind of causal influence resembles control and data coupling phenomena in software engineering, and unnormalised relationships in databases and rule base systems. In all cases, there are dependencies that cut across the intended, explicit, or modelled dependencies of the system. For story logics we can refer to this as *causal coupling*, informally understood as a causal relationship that is excluded from a high level causal model of the story logic. If causal coupling is ignored, sequence 1 could be represented by a sequence of separate causal steps, as follows.

Sequence 4:

E1(P meets W and receives Q)	->	E2(P goes to L)
E2(P goes to L)	->	E3(P meets D)
E3(P meets D)	->	E4(P defeats D)
E4(P defeats D)	->	E5(P returns victoriously to W)
E5(P returns victoriously to W)	->	E6(P receives R)

If each step is treated as a causal rule within the system, then the occurrence of a cause event must be followed by the occurrence of an effect event. This allows sequence 1 to be sidestepped to different degrees, due to the nature of the game world as a simulation in which the traversal of the world by the player character, or the player character's affect within the world (eg. via magic), is not constrained in terms of this causal rule set. For instance, the player might remotely defeat the dragon by magical or other indirect means, without ever having met either the wizard or the dragon. Then E4 is satisfied, and by the steps E4 -> E5 and E5 -> E6, the player receives the reward from the wizard.

If the designers wish to impose the strategies that lead to outcomes 2 and 3, we can explicitly represent what were the hidden dependencies between E1, E3, and E5 in sequence 1 by modifying the causal steps of sequence 4 as follows :

Sequence 5:

E1(P meets W and receives Q)	->	E2(P goes to L)
E1(P meets W and receives Q) and E2(P goes to L)	->	E3(P meets D)
E3(P meets D)	->	E4(P defeats D)
E1(P meets W and receives Q) and E4(P defeats D)	->	E5(P returns victoriously to W)
E5(P returns victoriously to W)	->	E6(P receives R)

Now it is possible to see that the causal relations expressed within the second rule include a hidden relation within the causes analogous to that addressed by Boyce-Codd Normal Form (BCNF) in database theory (see Date, 1981). This is because E3 is caused by E1 and E2, while E2 is an effect of E1. The hidden dependency creates precisely the kind of anomaly observed in outcome 2, that if E2 occurs without E1, there is no specified outcome. Similarly in rule 4, if E4 occurs without E1, there is no specified outcome, although in this case there are no dependencies between E1 and E4.

Modelling the previously hidden dependencies clarifies the existence of undesirable game states. It can also be asked if there is a methodology analogous to normalisation that can be applied to causal models of this kind that might prevent or help to prevent these anomalies from occurring. Applying the principle of BCNF to the second causal step of sequence 2, we could break it down into the first two separate steps of sequence 4:

E1(P meets W and receives Q)	->	E2(P goes to L)
E2(P goes to L)	->	E3(P meets D)

These relationships are normalised in a form analogous to BCNF, eliminating interdependencies between the causes within a single relationship. Now we are back in the situation of no longer imposing the logic that leads to our earlier outcome 2. It appears that the imposition of a desired story sequence creates the unnormalised story structure responsible for the undesirable outcome.

This analysis suggests that it may be possible to define a general set of normal forms for the causal relationships in story logics. Assuming a representation of causal relationships that links a set of causes to a specific effect, such normal forms for story logics should at least:

- extract recurrent subsets of causes representing independent events as separate cause-event relations (an analog of Codd’s first normal form for relational databases)
- eliminate irrelevant causes from cause sets (an analog of Codd’s second normal form)
- separate multiple effects of a common set of causes into multiple relations, one for each effect (an analog of Codd’s fourth and fifth normal forms)
- eliminate interdependencies between causes within any single relation (an analog of BCNF)

Developing these ideas into a more precise, extensive, and formalised list of normal forms for causal relations is beyond the scope of this paper. Such a task will depend upon settling upon a specific representation for story logics. This should be able to be done for any explicit representation of causal dependencies in stories, and applying the above normal forms to the analysis of those dependencies. Using causal normalisation, it should be possible to eliminate story logic anomalies for games in which the story logic covers all possible traversals of the game world. These are the games close to the narratological pole of Figure 1.

Normalisation Methodology and System Architecture

Database normalisation theory derives from the relational formalisation of database functionality. Relational databases are designed in accordance with this model, so the abstract methodology has a deep relationship to the operational semantics of a

relational database. Applying a normalisation method to the story logic of a computer game requires a similar mapping from a representation that is convenient to normalise, to the semantics of that representation in terms of the simulated events and player experiences of the game world. What is required, therefore, is a mapping between different levels of interpretation of “the game”. For a story-driven computer game there are three levels that internally form text layers and structures:

1. The *code level*, consisting of engines, a game framework and game programming. These together define the mechanics, the virtual geographical structure of the game world, and the conditions for the overall story and its deep structure.
2. The *narrative level*, consisting of the overall story, deep structure and the specific story carrying objects, which in turn can manifest the story, possible side quests and internally independent stories.
3. The *discourse level*, consisting of the sequential order that is created between the parts of the narrative simultaneously with the players movement through the game. It is at this level that the surface structure of a game text can be monitored.

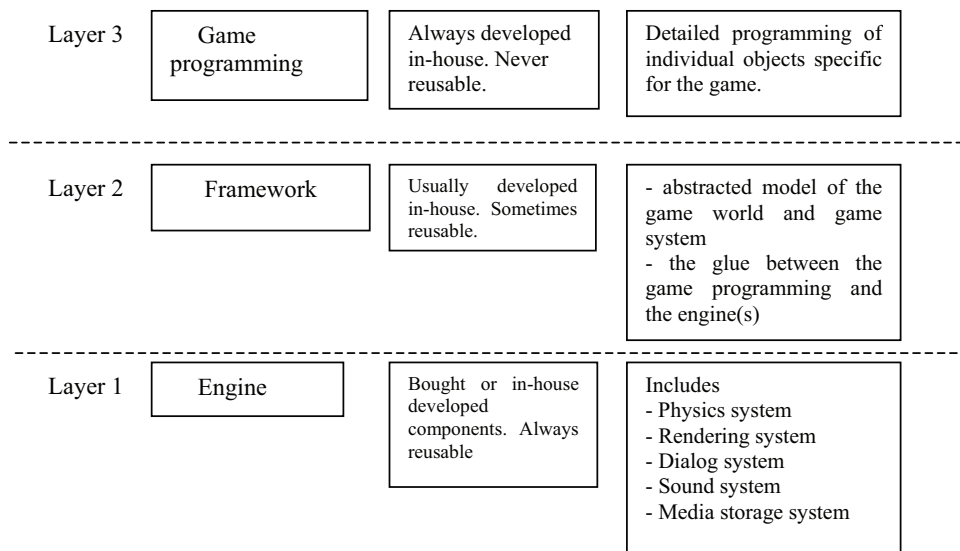


Fig. 2. Layers of text in the code level in computer games.

In these terms, given a game engine constituting the code level, the narrative level may be a primary concern for the game designer (who might implement the level as data to be inserted within the code level). The discourse level is the game play experience and the experience of the game as a story on the part of a player. Causal normalisation is a narrative level methodology to help to ensure that the data entering the code level creates a coherent story experience at the discourse level. Effective normalization must be treated as an issue of defining a coherent and useable narrative level methodology together with a clear migration path to the semantics of narrative

representation within the code level, just as a normalized logical relational database model has a clear mapping to table structures within a relational database (notwithstanding pragmatic variations in implementation). Before this is possible, it is necessary to devise clear representations for the narrative level and its semantics.

In general, what we have referred to here as the code level of a game can itself be subdivided into three levels, as shown in Figure 2. The lowest layer of the code level is the engine, consisting of very general functions, such as the rendering system interface, animation interfaces, collision detection, terrain or portal management, a dialog system, and media storage and access. Above this is the framework for the game, which is the level of abstract representations of game structures, such as game agent classes, behaviour controller classes, an event management system, and a communication (ie. message passing) system. The engine may be general across many game genres, while the framework may be more genre-specific. On top of these levels is the specific game programming, consisting mostly of data and instance definitions for realizing a specific game. These layers together present the media that to the player is the game.

How this architecture is built and where the borders are between the layers is different from game to game, from developer to developer, and from genre to genre; it also depends upon the technical platforms and environments of the game.

Object-Oriented Storytelling and the Minimisation of Causal Coupling

For story logics within highly interactive game worlds, where issues of story do not totally dominate the world simulation functions of a game, the concept of normalisation is not as clear as, for example, the case of database systems. Within these worlds, story logics are generally not complex enough to justify a full causal logic, and story structures are often sparse in relation to the size of a game world and the overall cognitive density of the gameplay experience. It is in this kind of world that cases like that of rule 4 of sequence 5 above cause a problem beyond the scope of normalisation. In this case, there is a straightforward stipulation that the player cannot receive the reward without visiting the wizard *before* killing the dragon. This may be the designer's interpretation of the personality of the wizard; the player must act as desired, or miss out on the prize that will unlock unexplored areas of the game world. In general this would be a perverse and undesirable discovery for the player, and we need a better method for reducing such chains of dependency for more flexible game play. This can be accomplished by pursuing object-oriented storytelling, as a strategy for designing game entities in terms of story potential, rather than imposing causal dependencies.

Object oriented storytelling

Object oriented storytelling is an approach in which all objects in the world have integrity and contain their own stories, functions, possible developments, and possible responses to actions conducted by other objects that influence them. That an object has integrity means that the information available in the object is only available through the object, and all information retrieval or data access is implemented by objects. For object oriented storytelling, this may function as follows.

If a player object, controlled by the player, comes close to a non player character (NPC) object in the game, communication between the player and the NPC is partly defined by the characteristics of the player object, and partly by the characteristics of the NPC object. Depending upon what it has been through earlier in the game, the player object can ask questions governed by the events that have become the history (recorded past) of the player object. The information that the NPC object in its current state can give is dependent on its own history, the location in which the player object encounters it, the time of day it is in the game, etc.. Thus the content of the dialogue and amount of information transferred from the NPC is dependent on a combination of conditions emerging from the meeting between the two objects. By maintaining the integrity of the object, false or confusing causalities need not occur. Actions of the NPC that may be undesirable from an overall story perspective can be avoided by encapsulating knowledge within appropriate objects. For instance, the existence or not of a dragon does not need to be conditioned upon remote interactions that have nothing directly to do with the dragon. An isolated action or state variable that the player object carries can directly correspond with an opportunity to activate a specific response.

This situation corresponds exactly to that discussed in the case of sequence 4 above, and requires the designers to abandon the imposition of prespecified sequences; if the player character goes to the wizard after killing the dragon and without having received the quest, she is nevertheless entitled to the reward. This follows from the simulated intent of the wizard to reward the act of killing the dragon with a key, without making knowledge of this intent a cause within the game world.

This kind of object oriented approach means that it is unnecessary to create an overall story structure having a large number of conditions for which the internal relations must be correct in order to activate the specific response. The system governing the story logic will be more immune to the kind of causal logic problems discussed above. The advantage of this from a story perspective is that it is possible to construct an NPC and define exactly how it should behave according to its characteristics, the operations that can be performed on it, and the internal conditions set for releasing information to a player character. The advantage from a gameplay perspective is that this NPC and other objects will seem more natural and intelligent, since there are no false casual relations conditioning their behaviour.

Mixed Forms: Object-Oriented Storytelling and the Imposed Quest

In a highly simulation based game, built according to principles of object-oriented storytelling, a quest or a story becomes a history of interaction, as suggested by Oliver (2001). Rimmon-Kenan (1998) derives a definition of story from Genett's (1983) concept of *histoire*, but stresses the chronological aspect of the term: "‘Story’ designates the narrated events, abstracted from their disposition in the text and reconstructed in their chronological order, together with the participants in these events." In a story-driven computer game in the genre of the adventure game, and within the high level structure of other genres such as role playing and action games, there is a chronological order in which the events occur within a particular player's experience. This order depends, however, on the nature and implementation of the story generating structures at the code level, which are usually not strictly linear and contain more or less possible chronological variations in what Anna Gunder (1999) would call the omnistory. The omnistory in turn contains all possible real stories, that is, all possible chronologically ordered sequences of events. This must be regarded as a combination of possible variations both in the chronological ordering of events, and in the necessity or contingency of occurrence of events.

In a simulation based game, the omnistory is vast and effectively unknowable. Massively multiplayer on-line roleplaying games (MMORPGs), for example, contain unlimited story potential. However, a role for a player character is still typically understood in narrative terms, providing purposes for the character in the game world, generally in the form of quests. A picture of the events that can occur and their possible causal order in a story between a start and an ending might look like the directed network structure shown in Figure 3:

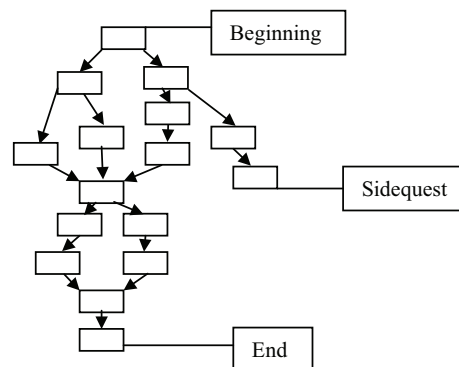


Fig. 3. A network structure depicting casual relations between events.

Each square in Figure 3 represents an event. The arrows may represent casual relations between events. In order for an event to happen, the events that are represented by the boxes that have an immediate above connection must have

happened. In a model like this, all existing casual relations are important. Thus there are only three existing hierarchical levels:

- 1) cogent relations leading to the end of the story,
- 2) relations that are only cogent for experiencing a sidequest, and
- 3) events that are not cogent at all and thus not represented in the model.

In these terms, the player's freedom to move their character beyond the structures of the predefined narrative reflect the simulation functions of the game and game world, representing a realm of non-cogent events from the perspective of the designed narrative patterns. Causal normalization is applicable to the narrative model, irrespectively of the non-cogent events. But to such a simple causal map must be added the complexity of the contingency or necessity of causal relations, and relations of joint sufficiency and joint necessity. Only then can a causal map represent possible variations both in the need for and order of occurrence of causally related events. This greatly complicates both the design process of narrative structures, and the processes of story normalization, suggesting that for simulation based worlds, object-oriented storytelling methods are much easier to handle.

In a game that uses object oriented storytelling, a high level narrative model could be interesting as tool for planning possible story experiences (or as a tool for analyzing the game). But any such plan should only be regarded as a picture of a subset of story experiences possible within the game world; it should not be imposed upon the player or specified as an *a priori* set of dependencies between game objects.

Conclusion

Problems of story logic encountered in computer game play are a consequence of a lack of coherent game development methodologies. As discussed in this paper, the problem of defining a coherent game development methodology can draw from principles of software engineering. However, developing complete solutions must involve the development of production environments in which clear methodological principles have a coherent translation into designs and implementations that preserve the qualities of good designs. For games with highly constrained narrative possibilities, causal (or story logic) normalization provides a methodology for avoiding dead ends or confusing situations in stories. For highly interactive, simulation-based game worlds, however, it appears that the idea of imposing predefined story sequences, even branching sequences, must be largely, if not entirely, abandoned. Instead, we require object-oriented methods for encapsulating interesting behaviour and states of game entities constituting a deep and nonsequential structure of story semantics.

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Player Character Design Facilitating Emotional Depth in MMORPGs

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ABSTRACT

How can we create computer games facilitating emotional depth in the playing experience?

When entering into a persistent virtual game world the player leaves the body behind. It is up to the game designer to create a virtual body with skills, needs and drives necessary for survival and pleasure in the game world. Would it be sensible also to create a virtual mind for the player to possess and evolve? Can models like Maslow's hierarchy of needs and 'being-values', or the personality trait model popularly called 'the big five' be used for character design in a way that suits massive multi-player game form?

Based upon a view of the player character as the concentrated mirror of the functionality of an RPG game and adding features inspired from psychology, cognitive science and behavior science, this paper presents the high-level system design of a virtual mind for the player to possess in a MMORPG. The mind model is being implemented in a research demonstration game in which game play emphasizes emotional engagement and dramatic interaction. This research is conducted in the Zero-Game Studio within the frame of the open research MMORPG Ouroboros.

Keywords

Emotive game play, player character, mind modeling, MMORPG, emergence, Massively Multiplayer, characterization.

INTRODUCTION

When you enter an Role Playing Game (RPG) you step into character and you leave your physical body behind. If it is also a Massively Multiplayer Online Game (MMOG) you meet other player characters. The world never sleeps – its persistently there all the time, with its environment, its history, its challenges and its inhabitants.

It is up to the game developers to decide upon what type of body you can have and how you can develop it in the game. The skills that you can acquire are those which are of use in the game world. The constitution of the world usually is the basis for the types of qualities the player characters can have in the game – there is no need for skills that are not useful in the game. What is useful is defined by the rule set. The player character itself is for the player the focal point that looks out on the world, not just by perceiving it visually from the screen, but also being the center point for all future actions and how these can be performed. From the developers point of view the player character is the entity to which all functionality is aimed.

Most character generation systems in one way or another derive from the D&D™ system from 1974 [11]. Its hard statistics describing agility, speed, strength, hit points etc. These are the features of the bodies we enter into in most RPG like games. When games are on their second or third generation the character generation systems usually become more complex; there are more character classes and customizing skills and other properties become more flexible.

After having entered into these bodies we modify and refine them in a way that gives us the satisfaction of development. We put our minds into these bodies, which in turn are placed in a world with its own rule sets. The rule sets define the needs of these bodies, and the rule set of the game world and its history gives us goals for what to do while performing through those bodies.

Within this model however we recognize a missing part in current games:

Immersion in a deeply emotional sense in digital games that have a high degree of simulation.

This paper describes an ongoing research project to develop a virtual mind for the virtual body of the player character in a massively multiplayer environment, with associated game rules for creating a deeper emotional experience within game play. Based upon the observation that emotive and dramatic interaction must be at the core of game play in order to deepen the narrative experience of the game [17], the virtual mind is integrated with the central mechanics of the game rules.

DEEP CHARACTERISATION IN COMPUTER GAMES

Deep characterization in a single player environment is a product of authorship. One successful example is *Final Fantasy VII*, where characterization is developed in ways similar to novels and movies [5]. On the non-digital multiplayer side, designers of Live Action Role Playing (LARP) events provide a model for role playing leading to intense emotional involvement and dramatic interplayer interaction. LARP events create deep characterization using rule sets, physical environments, game masters and the performative potential of the players.

This leads to the question: is it possible to take “deep characterization” from LARPing and integrate these within a digital game world? These are very different approaches to the creation of game experiences. It is not a trivial thing to integrate different and defining methods from different genres. LARPing tends to use relatively small castes of players, frequently with each character being carefully designed by an author. In massively multiplayer games there is a practical reason for having generic character classes and static quests that all players can perform – it would be an impossible task to individually author unique characters with unique interwoven stories for very large numbers (eg. thousands) of simultaneous players. Combat based games with characters having simple statistical characterizations, enhanced by mechanistic techniques for recombining elements of visual representation, support a very large combinatorial space of possible characters. This method of characterization lends itself to personalization for large numbers of players within the scope of combat oriented descriptions. Analogous combinatorial principles for emotive and deep characters of the kinds performed in LARPs are not yet understood. We also need to address the question of how to create compelling stories in a structure that functions for thousands of simultaneous players. Not only are there many players, but play schedules vary widely, and methods for collaborative drama must be able to deal with this variability.

THE PURGATORY ENGINE AND THE OUROBOROS ITERATIONS

These are complex issues that do not have simple answers, requiring active research to develop new principles of game design and implementation. In the Zero Game Studio of the Interactive Institute we are developing a set of components constituting the open source Purgatory engine for conducting research in this area. Our motivation is to create game play experiences that achieve more varied, subtle, and deeper emotional experiences for players than typical contemporary computer games, and to explore more diverse themes. The Purgatory Engine is especially designed to support experiences of deep characterization and narrative engagement in character in a massively multiplayer virtual world environment.

The Ouroboros project (<http://zerogame.tii.se/ouroboros>) is an experimental game production based upon the Purgatory Engine. The project involves producing specific game implementations in a series of alpha iterations. Each iteration is developed over one to three months to explore specific research themes. Currently the following research components of the Purgatory Engine are either in their planning or their implementation phase:

- Contextual Gesture System; based upon the state of the mind of the character, other characters in the context, and various aspects of the state of the world, a particular subset of dramatic and emotive character gestures are made available to the player
- Story Daemon System; a method for orchestrating narrative experiences by setting and resetting character and world states and goals, and monitoring states to determine critical plot points at which states and goals will be changed to advance a plot; all of this information for a specific narrative matrix is stored within a story daemon, which is a story-management object that can be virally transmitted between and/or inhabit game objects and characters
- Metaphysics System; this is the world-level equivalent of the mind model for a character, representing thematic states of the total game world, and both influencing and being influenced by character and world actions and events
- Language Characterization System; a character-specific adaptive discourse system, replacing free inter-player chat with constrained inter- and in-character chat
- Social Grouping and Influence System; consisting of game rules that encourage group actions (eg. allowing group magical rituals)
- Mind System; a model of a player (or non-player) character's mind that influences what a character can and cannot do, affects other characters within intersecting zones of presence and reception, and provides goals and a prosthetic psyche for the player within the game world

A major point of the Purgatory Engine is to support development and experimentation with multiple and alternate character psyche models, even within a single game world. In Ouroboros, relationships between psychic elements and between these elements and emanations of a world soul provide a system of influences and interactions implementing personalities, and interactions between personalities and the world soul as a system of universal karma; every action has in-game consequences. Consequences are manifested not just in physical terms, but also in emotional, dramatic and metaphysical terms (as a game, not a philosophy). Since this is a model of the associative patterns of the mind and world themes it requires specifying how the associations work in general, together with a tabulation of particular associative relationships. Players of the Ouroboros game do not see any of these mechanics directly. Instead they are manifested in how their player character develops, how the

world develops, what grows and lives in the world, how things happen, what happens and with what difficulty, what works and how well.

The design of a virtual mind for the player to possess is one piece of the Purgatory puzzle where we aim to facilitate emotional depth in MMOG gameplay.

The second self or prosthetic consciousness

“When one starts discussing emotion one is starting to discuss having a self – a perceived and felt self. Emotions are in terms of and help define that ‘self’. The purpose, we propose of this self is to integrate experiences in a meaningful way into a self. Specifically a self is a continuously maintained and global construction that speaks for the organism’s reasoning and assessments on a global level.” [6, p 160]

Observing one’s emotional reactions can be a way of getting to define ‘myself’. For the question of characterization this is important. Film and literature generally provide a multiplicity of sites of identification. First-person narratives imply strong identification with the narrator, and traditional three-act restorative film structures [see 12] imply an audience identification with the central hero, although the act of reading/viewing leaves open many different levels and degrees of identification with numerous characters within the text.

In games, however, control of a (player) character creates a different sense of identification. An avatar in the most general sense is intended to represent the self. Hence in this context we want to achieve a deeper experience of the player character’s prosthetic self.

Bellman recognizes the self as the ultimate integration mechanism in a biological sense, and proposes to implement the self in autonomous agents; our objective, however, is to create a semi-autonomous agent as a vehicle for the performance of a character by a player. We need to find the balance between the autonomy of the player character and the players control of the same. Never the less the approach to autonomy vis-à-vis the rest of the system is just as relevant for us: “Autonomy implies some knowledge of the current state of the system – including its goals”. This is the same standpoint which we think is necessary for the possibility of creating functioning story constructions for games with thousands of players [7, chapter 5].

IN-GAME PLAYER CHARACTER DEVELOPEMENT

Levelling in an RPG type game is a traditional and well functioning effect of, and reward for, successful playing, providing a strong driving force for the player. Sometimes players perform an exaggerated behavior, normally referred to in MMORP contexts as *power levelling*, meaning that a player uses all possible ways within the rule system to level the player character up as fast as possible. The levels are usually represented by a numerical value, so for example a 44 level player character has a much more powerful attack and a larger set of skills than a character of level 7. It is not implausible to compare RPG game world levels to real world hierarchical structures in societies, where the richest, the fittest and the ones higher up in organizational structures in general have more freedom of choice in their actions. This lays deep in the structures around us in our everyday lives, even the title of this conference refers to levelling.

Is this something that we want to mirror in a game world? A numerical model of progress represents an extremely crude model of narrative development, and thematic explorations in general need have nothing at all to do with such concepts of advancement within a systematic hierarchy. Concepts of progress may be supported in ways that do not require in-game or system level representation, ie. as an emergent phenomenon of player communities and/or experiences of personal/emotional

transformation through the performance of characters. For many themes, progress is not a relevant concept at all.

For player character development in Ouroboros there will not be any traditional system of levels represented by numerical values. The driving force of the player for developing the player character will instead be channeled into pursuing values similar to Malow's being-values. The issue of goals for the player characters is tightly interconnected with the core gameplay. The core gameplay is focused around three major game play driving forces: 1) Balancing and evolving the player character, including reaching "being-values" inspired by Maslow and described later in this paper, 2) Performing story deamons – playing parts in the interweaving narratives of the game world, 3) group dynamic emergence and influence.

THE MIND MODULE

"Mind is not a thing but a process – the process of cognition which is identified with the process of life. The brain is a specific structure through which this process operates." [13, p 174]

In this context of the mind of the human player in character, the process of cognition of the player character arises from a prosthetic brain which when instantiated provides the player with a virtual mind to relate through, or to use an expression by Fenncott, a prosthetic consciousness. [18]

The role of the mind module is to provide the system with emotional output from the individual player character. The mind module performs computational operations (of a kind described below) on the input values, which come from virtual sensors, and outputs in the form of emotional reactions and/or potential emotional reactions that in turn become inputs to the sensors of the mind modules of surrounding entities, or entities that in some other way are receptive (eg. if they belong to the same social grouping) to the specific player character.

The system itself consists of a variety of nodes of different types (image 1). After a presentation of the high level design of the mind module, we will have a look at how a specific player character can be implemented in a specific game scenario.

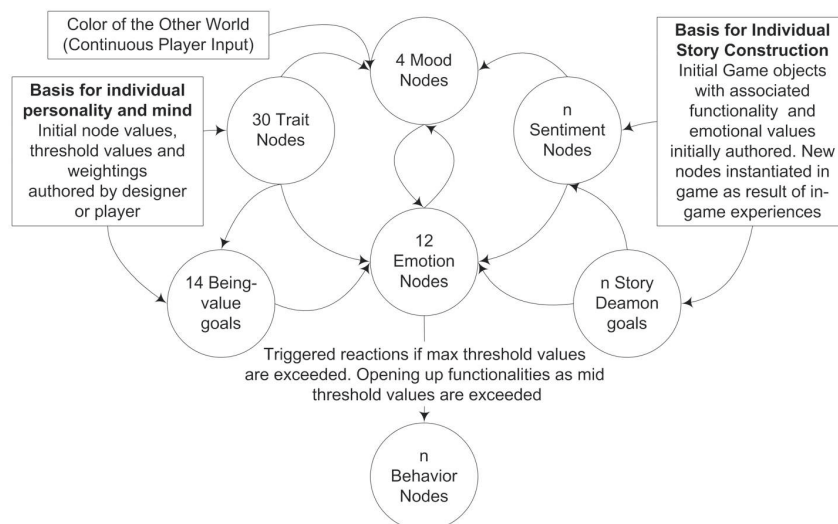


Image 1: Interconnected node types in the Mind Module

Psychic affects

By *personality* we mean the distinctive and characteristic patterns of thought, emotion, and behavior that define an individual's style and influence on his or her interactions with the environment. Moffat [9] suggests that emotion can be regarded as a brief and focused (ie. directed at an intentional object) disposition, while sentiment can be distinguished as a permanent and focused disposition. Mood can be regarded as a brief and global disposition, while personality can be regarded as a global and permanent disposition. Hence emotion, mood, sentiment and personality are regions of a two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other.

	Time: Slow change	Time: Quick change
Not object dependent	Personality trait	Mood
Object dependent	Sentiment	Emotion

Image 2: Psychic affects

Collectively we refer to these four elements as psychic affects, where an *affect* is understood as a feeling or emotion, especially as manifested by facial expression or body language (from *The American Heritage® Dictionary of the English Language*, Fourth Edition, 2000, Houghton Mifflin Company). This is especially pertinent since body language and facial expressions are the primary modes of expression of affect states within the game world. We add the further affect of a psychic or mental *behavior* to represent complex influences, interrelationships and patterns among and between affects, sensory inputs and behavioral outputs.

Personality

The mind model is based upon a view of personality that builds upon three different ways of interpreting the human mind. Biographical (psychodynamic) psychology is concerned with the personal psychic structure of an individual in the context of their life experiences. The five factor trait model is a commonly used model for classifying personalities. The phenomenological model is concerned with life purposes. In a sense these three models look at the past (psychodynamics), the present (trait descriptions) and future (phenomenology) of an individual from a psychic perspective. These models are summarized briefly here, since their detailed elements and interrelationships provide a backdrop to detailed design of the game system.

The personality system is an API consisting of several classes and interfaces for instantiation of the player character. In this system the "mood" is a state which is dependent on both in-game states and the current mood of the player him/herself (color of the other world) and which is taken into account in the body language output.

Personality is modeled using a 5 factor trait model to describe behavioral disposition, with Maslow's [10] model used to describe character purpose and meaning. This integrates with a behavior network to arbitrate interrelationships of these components with activation and deactivation of animated gesture options for the player (automatically triggered gesture responses are also possible), and also within an overall psychodynamic model of emotional structures and substructures of the mind.

Psychodynamic inspiration

Psychodynamic models of the mind are based upon the Freudian distinctions between:

- the *id*, which is a basic and biologically based level of drives and needs
- the *ego*, which modifies desires arising from the id and directives from the superego in the light of the current situation for the sake of self-preservation
- the *superego*, which is a set of internalised goals, directives, values and behavioral rules that have been learned from authority figures such as parents

The psychodynamic model functions as an inspiration for player character mind modeling; the id, the ego and the superego are not explicitly modeled as components in themselves. As Bellman says, there is a danger of postulating a homunculus inside each brain as if there is a "little seat of self" sitting there and controlling all the rest. [4, p 169]. The instantiated mind, as well as our biological minds, operates with so many parallel processes that a centralized view of the ego not is applicable. It can be added that a homunculus provides no explanatory utility for the mind, since it recursively suggests a homuncular account of the mind of the homunculus itself (to infinity).

Nevertheless, the Freudian model is conceptually useful for distinguishing player character goals, drives and social norms guiding behavior into layers, and also for showing what we leave out.

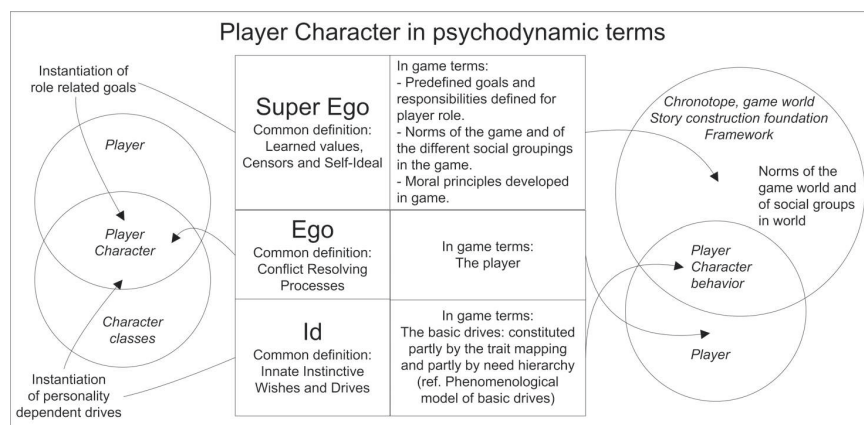


Image 3: Player character in psychodynamic terms

In the first iteration we will not include a layer of basic drives such as hunger or need for sleep which traditionally would be a part of the id-layer (which would result in game-play requiring the player to satisfy the player character's need for sleep, food, mating etc.). The decision to not implement this depends on the rule set of the game world. Ouroboros at this stage will not have rules referring to basic needs or drives. The ego layer will, on the other hand, mostly be provided by the player, being the core of the game-play experience. Ego functions are also directed automatically within the player character by contextual switching of behavioral options presented to the player. Superego functions will be emergent phenomena within the MMORPG, and may also include predefined high level character goals.

From this perspective, in the Purgatory engine game rules and specific mind models embody the psychodynamics of a character, or what Grof refers to as COEX structures, or constellations of condensed experience [19]. COEX structures are patterns of emotive and affective response to people, objects, events and situations, developed as the individual's ego defence mechanisms for resolving and managing conflicts within and between the id and the superego.

Inspiration from phenomenological psychology

Based upon Maslow's principles, the phenomenological/teleological model presents a hierarchy of needs representing a system of purpose for the individual [10]. These are general, where the character, their setting within the game, and ongoing experiences provide more specific manifestations of these purposes. There are also being-values, and these are the ones that we find more interesting. A particular character may have a certain set of being-values to pursue in order to achieve purpose and meaning. The being-values Maslow writes about include: wholeness, perfection, completion, justice, aliveness, richness, simplicity, beauty, goodness, uniqueness, effortlessness, playfulness, truth and self-sufficiency.

Components for these being values will probably be added to the module in parallel with the development of the story daemon system which is concerned with creating a framework for building compelling and dramatic narratives. This system will also involve goal-driven gameplay, and have affects upon how being-value nodes function in the Purgatory Engine.

The big five

In the five factor personality trait model, each factor is further divided into six facets, resulting in thirty descriptive categories.

Factor:	Facet
Extraversion	Friendliness, Gregariousness, Assertiveness, Activity Level, Excitement-Seeking, Cheerfulness
Agreeableness	Trust, Morality, Altruism, Cooperation, Modesty, Sympathy
Conscientiousness	Self-Efficacy, Orderliness, Dutifulness, Achievement-Striving, Self-Discipline Cautiousness
Neuroticism	Anxiety, Anger, Depression, Self-Consciousness, Immoderation, Vulnerability
Openness	Imagination, Artistic Interests, Emotionality, Adventurousness, Intellect, Liberalism

Image 4: Personality traits

In psychology there are tests to classify the personality of an individual based upon this trait scheme. Tests consist of answering a set of questions, where positive or negative answers to a given question are correlated (positively or negatively) with (facets of) one of the five personality traits.

In the mind module each trait will be a node in the weighted network, but as compared to mood nodes, sentiment nodes and emotion nodes the change rate of their values is very slow.

The traits listed here represent part of a (fictional) ontology of mind. Depending on the type of character that a game mythos requires, it is necessary to recognize this as both a starting point and a fictional construction; it doesn't need to have any known or obvious relationship to the structure of real minds. The criteria for the success of such models is the impact on the game play experience. As Sloman points out "Different architectures will support different collections of states and processes: different mental ontologies. Using this design stance we can then define different sorts of emotions, different kinds of awareness, different kind of learning, different kinds of intentionality, and so forth in the context of the architectures that produce them." [4, p 40]

Emotions

The emotions that we have chosen to implement as nodes in this iteration are the ones that according to Ekman have the characteristics of automatic appraisal, commonalities in antecedent events, presence in other primates, quick onset, brief duration, unbidden occurrence, and distinctive physiology. [3, p 18] They are as follows: Amusement, Anger, Fear, Guilt, Interest, Pride in achievement, Relief, Sadness, Satisfaction, Sensory pleasure and Shame. In order to achieve the game play mechanics we need in Ouroboros we have also added "pain", since it cannot, under all circumstances, be seen as an opposite of "sensory pleasure".

Moods and Color of the Other world

The immediate visual outputs of moods on the player character are posture, gesture and expression changes depending on the mood state. In gameplay, different tasks must be done differently, if they can be done at all, depending on the mood.

Moods are modeled by four scales: Harmonic ranging to happy (HH), Gloomy ranging to depressed (GD), Cheerful and friendly (CF) and Annoyed ranging to angry (AA). Moods are not always combinable. A player character cannot be in a HH mood at the same time as GD, but it can be either CF or AA, even though CF is more likely. The mood affects the weights on emotion nodes, making the threshold values more or less likely to be reached depending on the context.

Mood in-game is both a result of the in-game experiences and basic personality settings of the player character, and the player bringing his or her real mind into the game world. As an attempt to bring in the emotional setting of the real player into the multiplayer game experience we introduce the *Color of the Other World*. The Other World here being the 'real world' as opposed to the game world that the player currently is a part of. The first idea was to have the player character mood totally controlled by the player, but the downside of this is that it might encourage the player to set a mood which does not reflect their real mood but instead is used as an instrument to enhance the properties of the player character to make it more successful in game play. Therefore it is crucial to have a feature that has an impact on game-play, but at the same time does not overwhelmingly support the success of the player character in accomplishing tasks or goals within the game. It would also be a signal to other players that might explain some reactions of the player, and a signal for what kind of gameplay and interaction the player at the moment would be interested in. This is a first approach to

be refined by experience. It may also be that having no direct player control of mood results in a different and perhaps deeper engagement with the player character.

Sentiments

In the mind module a sentiment node is tied to an emotion and either a certain individual object or to a certain type of objects. A player character can for example have the emotion Fear tied to an object of the type “wolf” or towards another player character. When the player character who owns the sentiment gets a sensory input of either of these objects in perceptual/influential range, there is an immediate change in the value of the emotive node fear. If the value exceeds a pre-specified threshold, an emotional reaction is triggered.

Time and Behaviour

In our system we need to define the persistence of affective states, and we base the implementation on Frijdas research. Emotional events, he writes, lead to emotional episodes that typically last for one hour or more. In our implementation a high threshold value for an emotional node leads to an immediate emotional reaction expressible by gestural language, but the emotive state and the mood are affected for a longer time span. “Emotions, it is said, tend to be of short duration; moods may persist for a day or even more. [...] More important, the duration of an affective state is uncorrelated with whether the state is an intentional or non-intentional state, that is, whether or not it relates to an object.” [1 p. 61]

For us, the use of threshold values reaching critical values initiating immediate emotional reactions is comparable to Lazarus’ notion of acute emotions : “Acute emotions refer to the immediate adaptational business in an encounter with the environment, the fate of a specific and narrow goal that confronts a beneficial or harmful (or threatening) environmental condition.” [2, p. 84].

The Player Character Mind as a Semantic Network

We have described how the player character’s mind is modeled in terms of personality traits, moods, sentiments, emotions, being values and behaviors. These categories are realized as nodes within a semantic network, generally functioning as a weighted activation net, but with other computation models available. Links between the nodes show how the different components interrelate, which may be as direct influences or as influences effecting more complex behaviors modeled as networks of behavior nodes. Behaviors include both complex and primitive behaviors. Primitive behaviors include the execution of animation sequences or other media primitives, computations, database operations, perception input and processing, activation or deactivation of lexical subsets, and inter-game-object message processing. Complex behaviors are those that can be decomposed into hierarchies and patterns of primitive behaviors, such as go-to-place-X, find-character-Y, seek-an-ally, and maximize-your-number-of-worshippers. Complex behaviors can also represent particular kinds of psychic structures, such as obsessions or neuroses.

The implementation of this model is rather generic, using psychic component classes that may contain a range of different computation types that act upon a variety of different types of data objects. Psychic components may then intermap by relationships of:

- positive or negative levels of activation
- elements that can send (data, symbolic, and/or complex) objects to other elements
- elements that can switch other elements on or off

Links between elements are message (or signal) paths having signals that may carry:

- single message events
- repetitive patterns of messages
- continuous messages/signals

Links can simply connect one element to another, or may have a prioritised relationship to links between other elements [20, eg. allowing them to suppress or inhibit the influences of other elements, in the style of a subsumption architecture].

Elements may then react to an input message in the following ways:

- as an Augmented Finite State Machine (AFSM), change state
- perform a neural network or weighted activation network computation operation on the input value
- perform an arbitrary computation on the input value

The details of a particular character mind are represented in a data (XML) file that is read and used to instantiate an actual mental structure consisting of instances of the generic mental classes interconnected in a network of links. Updating the state of a mind is then a matter of taking all of the inputs to each node from the previous execution cycle and computing the node outputs for this cycle based upon those node inputs and local node computations. The node outputs, together with virtual perceptions, form inputs for the next computation cycle.

A specific mind

The pre-authored player character Greyhowl in Ouroboros is known as a hedonist of epic proportions and his ballroom parties are legendary. Greyhowl is found at the centre of debauchery, always with a pained look on his bored face. He plays his games of sedition and seduction listlessly, ever hoping for something that will touch his cold soul. Greyhowl is of the undead Bysen breed. These are shadowy figures crying in fear and hate in the midwinter night. In the old days they haunted and hurt humans, feeding on their fear of the unknown. Bysing are beings present in the Gotlandic mythos of the Ouroboros project.

Greyhowl has the following values set in his trait nodes (span -50 to 50):

friendliness= -30.0 gregariousness= -20.0 assertiveness=10.0 activity level=10.0 excitement seeking= -25.0, cheerfulness= -45.0, trust= -30.0 morality= -40.0, altruism= -30.0, cooperation= -10.0, modesty= -10.0, sympathy= -30.0, self efficacy=10.0, orderliness="-10.0" dutifulness=0.0, achievement striving= -20.0, self discipline=0.0 cautiousness=10.0 anxiety=35.0, anger=10.0, depression= 35.0, self consciousness=30.0, immoderation=30.0, vulnerability = 40.0, imagination= 10.0 artistic interests= 15.0, emotionality= -25.0, adventurousness= -20.0 intellect= 25.0 liberalism= 20.0

The single being-value Greyhowl strives for is Aliveness. This is uncommon, but depends upon his undead nature.

A long term story deamon holds the story premise and plot point knowledge for the scenario in which Greyhowl's love for Jorme, his servant, could make it possible for Greyhowl to stop being undead.

Initially one sentiment is instantiated: the player character Jorme is associated with the emotion Satisfaction.

If the PC Jorme is in the range of Greyhowl, the emotion node Satisfaction will increase its value. The weight of how much the value will increase depends on the current mood. In the next cycle the mood is affected by the Satisfaction node. This in

turn might change the body posture of Greyhowl and free up the possibility of performing certain gestures or actions.

A possible threat to any character is to be cursed by, for example, an obsession or a personality disorder. A personality disorder in the mind module can consist of one or several trait nodes being set to abnormal values, which in turn would have a heavy impact on the autonomous part of the player character's overall behavior. An obsession is a sentiment node where the emotional weighting towards some specific object/s is/are set to an abnormal value. Also this will have a heavy impact on the autonomous behavior of the character, especially noticeable when the object of obsession is perceived by the player character. A story daemon or another character could be the origin of the curse, and therefore also being the key to how the cursed player character can get rid of the curse.



Image 5: Greyhowl

CONCLUSION

This paper has described ongoing research to develop emotive and dramatic forms of game play by developing game rules that use mind models for the player characters in massively multiplayer games. The nature of the player character in MMOGs calls for other characterization methods than the ones used in traditional linear narrative media. Here we have outlined a system that provides the player character with a prosthetic mind and makes the player character into a semi-autonomous agent. The autonomous part of this agent helps to define and characterize the player character by affect states and emotional reactions that are interconnected with the game world and its inhabitants. The game rule and mind model processing system is implemented in an AI engine called the Purgatory Engine. The project is developing a research MMORPG based upon the engine, called Ouroboros, a dramatic role playing game set in the Nordic mythological milieu of Gotland. This is an ongoing project following an iterative methodology for exploring new game rule sets and game play models, together with an incrementally

expanding game world. The overall goal is to develop games that focus on emotive game play and dramatic interaction.

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D.4 Eladhari and Lindley 2004

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Story Construction and Expressive Agents in Virtual Game Worlds

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ABSTRACT

The narrative structure of virtual game worlds involves a division of narrative elements into unique levels of text and meaning, coherent with game world system architectures. These levels of text and meaning create different levels of narrative authorship, variously integrating both game designers and players as authors at different levels. Both game design and game play therefore involve the creation of narrative potential, while specific narratives as told stories relate histories of play within game worlds.

Author Keywords

Story construction, MMORPG, virtual game worlds, expressive AI, agents, narrative structure.

INTRODUCTION

The aim of this paper is to discuss structures in massively multi player role-playing games (MMORPGs) that makes the emergence of narrative possible. These games are played in virtual worlds, i.e. virtual game worlds (VGWs). The first virtual game world, MUD, was text based and was built by Richard Bartle and Roy Trubshaw (1978). The VGWs started to reach a larger audience at the end of the nineties when they were implemented with three-dimensional graphics (Meridian 59 September 1996, Ultima Online September

1997, EverQuest Mars 1999, Asheron's Call November 1999). Virtual game worlds are realised by networked computers that simulate environments. In these worlds players have graphical representations, avatars that represent them in the world. All interaction with the world and with other players is done through the avatar. The interaction in the world is in real time, and the world is persistent, that is, the world is still there even though a particular player/avatar is not active in the world.

Virtual game worlds have as a genre a set of more or less general features that control what type of game activities are available. Eladhari (2003) describes these features based on a study of 172 game worlds. Note that this is based upon worlds where game play is the focus as opposed to virtual social worlds (VSWs) that are more oriented towards social interaction as the main activity. There are a few things that are striking with virtual game worlds, that makes them unique and different from other forms of art. One of those aspects are how the openness of the narrative structures inherent in the form makes it possible for players to add their own goals to the game worlds, which in turn results in added narrative potential in the world.

A lot has been written about narrative in interactive media. In the area of games, there



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have been classification spaces offered, comparisons presenting similarities to other media, and differences have been pointed out (eg. analyses of interactive from a cultural studies perspective including Aarseth, 1997, Murray, 1997, Juul, 1999, and Ryan, 2001). Publications by authors with backgrounds in screenwriting and filmmaking usually refer to the Hero's Journey (Campbell, 1949, Vogler, 1992) and the restorative three-act structure of drama (described by Danzyger and Rush, 1995); papers and books published by game designers usually refer to the Koster-Vogel Cube (Koster and Vogel, 2002), while publications in more technical venues on the issue of narrative often refer to The Oz Project¹. Prominent traditions of narrative analysis include the structuralist perspective beginning with Propp's morphology of the folk tale (Propp 1968) and including Greimas' actant theory (Greimas 1966), as well as the tradition of hypertext theory (Bolter 1991, Landow 1992), i.e. systems for causal (interactive) relationships between story elements in multi linear stories.

In the light of these different traditions that have had impact on the discussion about interactive narrative, Richard Bartle (2003) makes the refreshing statement that:

Virtual worlds are places, not stories. You can have a story about New York, or a story set in New York, and New York can have a history, but New York is not itself a story. [...] Trying to impose a story on the inhabitants of New York is as sensible as trying to impose a story on the inhabitants of

New York. You can impose events, but not stories; people make their own stories. (p. 661)

Virtual worlds are places, and narrative elements are part of those places. On the scale of the single vs. shared authorship author we have whole spectrum coexisting in these worlds, from pre-scripted story lines to narrative arcs that are totally created by players, more or less despite the world mythos and the original intentions of the world creators. When Lisbeth Klastrup (2003) in her paper "A Poetics of Virtual Worlds" presents a possible poetics of virtual worlds, she introduces the concept of "worldness" as a metric of the particular traits that constitute the experience of a virtual world. In these worlds a more pressing issue than "who is the author here?" is *who owns the world*. (Bartle 2003:51, Reynolds 2002) Who has the right to create content, and how persistent is this created content? Does it become a part of the world history? The world history is in some cases created out of game, for example by guild leaders who document the story of their guild on websites. Another intriguing question is that of the role of the player: is the player a part of the world, designed into it, becoming a part of the creation of the game design teams, or should the player be viewed as an artist within the artwork, expressing him or herself through the tools given by the designers?

It is tempting to take a relativistic stance in this, to say that since these worlds are so intrinsically different from each other, and also very different depending on the cultures and norms the individual player bases have developed, that it is not possible to make any generalizations. We also have the complication that a single researcher cannot participate in a large set of virtual game worlds in order to gather data from a bigger sample set since this would be so time consuming. Yet we do know that many worlds share a lot of features. Bartle

¹An overview of the Oz project and publications is available at: <http://www-2.cs.cmu.edu/afs/cs.cmu.edu/project/oz/web/>

(2003) writes about common paradigms, such as levelling systems, and also about the impact that different code bases for virtual worlds have on, for example, authorial ownership in worlds and their orientation to more or less combat or adventuring as activities that can lead to levelling up. Virtual social worlds like *There* and *Second Life* are exceptions to this though, while not being strongly focused around these types of achievements. For some data we can, instead of playing all the games thoroughly, lean on surveys among the player bases, for example the long-term survey work conducted by Nicholas Yee.² This work can give us hints about player experiences in different virtual worlds.

What is it that we measure in these worlds? A very obvious and striking aspect is that we have big virtual communities here that are perfect test spaces for monitoring human behaviour in environments where we can control many of the conditions. Or at least, we have knowledge of many of the conditions, if not control (significantly, however, we generally have little knowledge of and control over the *extra-game* circumstances of players and their play). Bartle (2003:chapter 6) presents an overview of different disciplines that have found these worlds enticing, accounting for the most common lines of research performed in these disciplines in VWs; virtual worlds are becoming a melting pot for many forms of research.

Within this spectrum, the purpose of this paper is to focus on story construction in virtual game worlds.

DEFINITIONS

When we talk about story, we mean a fixed temporal sequence of events and the actors

that take part in these, that is, the content that a narrative is about. The events are not necessarily told about in the order in which they have happened. In multi linear narratives the reader/player can often chose when to be told about a certain event, but the order in the sequence of events as such does not change – only the sequence of experiencing them/being told about them. A narrative is a story *the way it is told*. Narration, or the art of story telling, is about *how to tell* a story. (These statements are based on work by Genette 1983:27, and Rimmon-Kenan 1993:3.) In multiuser virtual game worlds, being places, there is generally little to no story telling in the design of the world in the traditional sense³. Instead there are elements in the world that have narrative potential (the term narrative potential is used by Ryan, 2001). Players do one thing after another in the world, and the sequence that emerges from the now of the playing is the player's individual story discourse. (This definition is derived from Chatman's definition of discourse, and from Gunder's definitions of omni-discourse and real-discourse, Chatman 1978, Gunder 1999.) The act of creating narrative potential in a virtual game world, whether it is done by the team of world designers, members of a live team, game masters, guild leaders or ordinary players is an act of story construction, not story telling. That is, the story is constructed by game play

³ In single user games, game play *is* often framed by a pre-designed traditional story at a high level, generally presented via cut scenes. In this case the account presented in this paper applies to what happens *between* cut scenes. For multiplayer games, there is also the possibility of storytelling in a traditional sense occurring within the game, e.g. if either players or NPCs tell stories. But this is at a very small scale of world design and history, while the current focus is on the larger scale design of the world.

² These studies are available at <http://www.nickyee.com>

providing material for potential narratives as tellings of the story. Koster distinguishes between impositional and expressive forms of interactive narrative (Koster quoted in Meadows 2003). The *impositional* form is used in chose-your-own adventure books, adventure games and other fixed multilinear narratives, while the *expressive* form relies less on a sequence of events and behaves more like an architecture. The word expressive is also used by Mateas (2003) when he describes expressive artificial intelligence; “AI-based art and entertainment constitutes a new interdisciplinary agenda linking games studies, design practice, and technical research. I call this new interdisciplinary agenda expressive AI. In the context of game analysis and design, expressive AI provides a language for talking about “readable” behavior, that is, behavior that a player can read meaning into.” (2003: 1) Mateas discusses the characterization of the ghosts in the game Pac Man, expanding the discussion of characterization of non-player characters (NPCs) to encompass dynamic entities which do not have humanoid form. In this paper the term “expressive agents” will be used to refer to dynamic entities in virtual game worlds that in their functional setup carry possibilities for creating narrative

potential. In this sense they embody *foundational narrative potential* in their design. This term encompasses NPCs, player characters (PCs) and other dynamic entities. This term is not to be confused with the concept of *believable agents*, since that concept is usually applied only to agents that are autonomous. Player characters are always semi-autonomous agents. In addition to carrying out player commands, possible functions of these agents include enhancing the simple player-driven avatar with context-sensitive expression possibilities and varying degrees of autonomous reaction to in-game situations. A practical example of this, in a virtual world where PCs can be in combat with hostile creatures, is to change the state of the PC depending on how battles with certain creatures have turned out in the past. If the PC has been killed many times by orcs, it might be “afraid”, i.e. have a harder time to battle the orcs again, or “angry”, i.e. have more strength when battling them again. This is a very simplistic example, derived from the common game play paradigm of fighting “mobs” (mobile objects) (Bartle, 2003, p. 102), something that was implemented in the first MUD written by Richard Bartle and Rob Trubshaw in 1978.

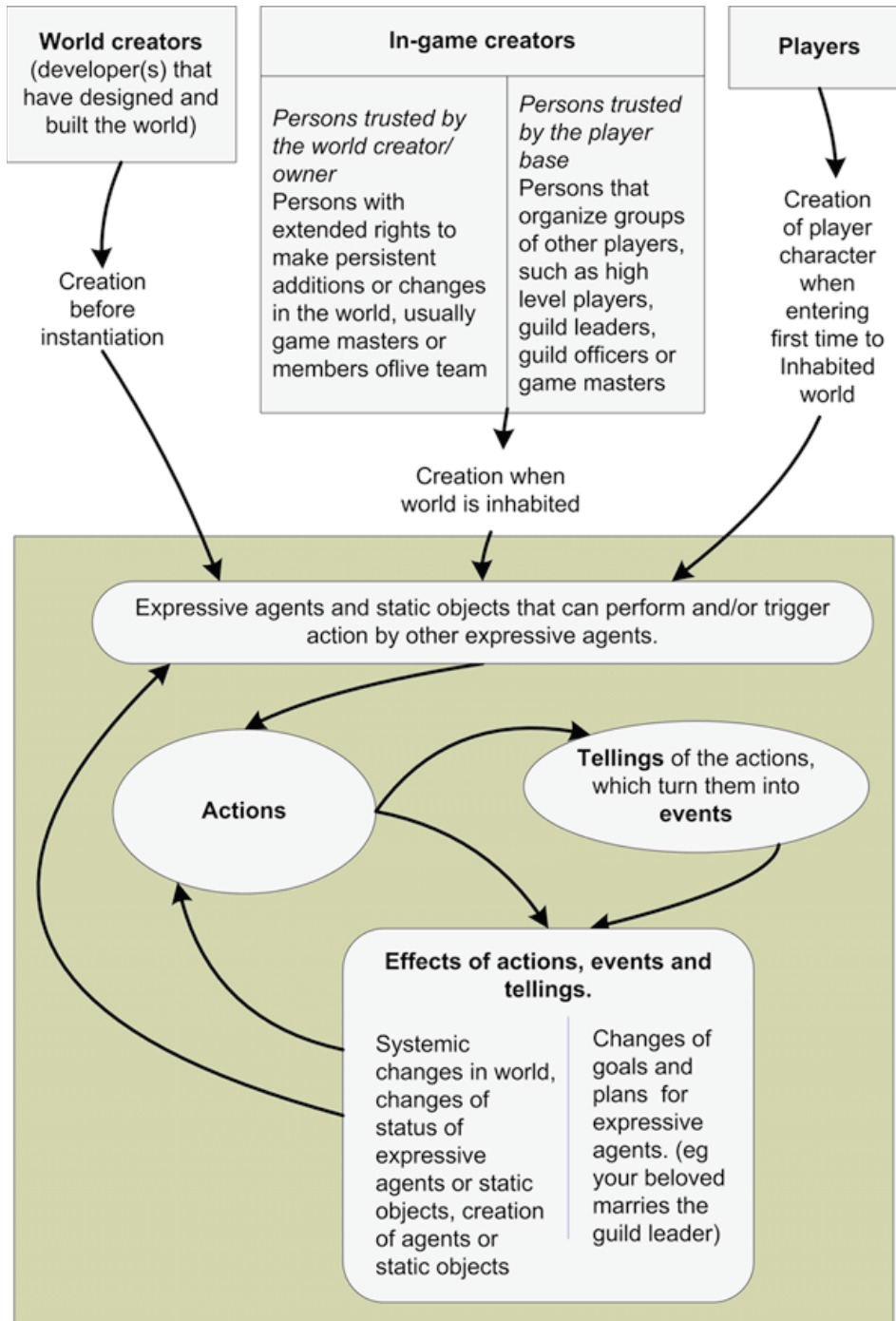


Fig. 1 Creation of narrative potential in virtual game worlds

TEXT LEVELS

When discussing story construction in the context of computer based systems such as virtual game worlds, it is useful to divide story and narration into different levels (see fig. 2). This way it is easier to communicate where in the structure some specific thing is or may be implemented, and what implications the feature has, e.g. for authoring rights and persistence. For example, few designers would probably give creator rights to players on the code level since a change on that level would change the rules of the whole game world. Note that these levels refer to different layers of text, not to software architecture design.

Text levels in virtual game worlds			
Code level	Story level	Discourse level	Narrative level
<i>Story Construction</i>			
Designed narrative potential		Played narrative potential	
Engines, framework and game programming. These together manifest the geographic structure as well as the conditions for the deep structure of the narrative, the overall story and its construction.	The overall story (if there is one), the deep structure and the individual expressive agents and the static story elements, which at the discourse level manifest the overall story, possible side-stories and separate independent stories.	The states of the individual elements in the now of the playing, and the sequential order created between the different parts of the narrative simultaneously with the movements of the player characters and the autonomous agents through the game.	The narratives told about the actions and the events in the game world. The narratives are told both in-game and out-of-game.

Fig. 2, Text levels in virtual game worlds

Practically these different text levels are usually created by persons having different roles: the

code level is written by software engineers, the story level by the people responsible for the designed narrative potential, while the discourse level and the narrative level are performed by players, game masters and sometimes live teams.

THE CODE LEVEL

The code level itself can generally be divided into three layers (see Figure 3). In this case we *do* mean pieces of software. The bottom layer is the engine which consists of very general functions, such as network and communication systems, the rendering of the system's interface, the sound system, the interface for animation, the handling of the terrain, the dialogue system, media storage, and the physics system which governs gravitation, forces, collisions and collision response.

Above this there is the framework of the game, a layer of abstract representations of the game's structures such as classes of game agents, classes of behavioural control and systems for action control and communication. The engine is usually general and may be used in various game genres, but the framework tends to be more specific for its genre, implementing a generic game system.

Above the framework there is the specific game programming, which mostly consists of data and the instantiated definitions specific to the given game.

These layers are co-ordinated to bring forth the media that become visible and audible to the player, such as environments, characters, dialogues, music, sound effects and graphical user interfaces.

In terms of MUD-based virtual worlds, the engine layer, the framework and the game programming layers are often called driver, mudlib and world model (Bartle 2003, p. 44). There are a number of major codebases that

have been developed for creating textual virtual worlds. Each of these represents a certain game play paradigm and has historically provided both game designers and players with norms of how a virtual world is “supposed to function”. (Bartle, 2003, describes the codebases and what types of game play they may result in, in terms of combat vs. battle orientation, common myths and persistence of player created content). It is important to be aware of the implications that a certain code base, or inspirations from a certain codebase, have on resulting game play and the conditions for creating narrative potential in a game world.

Code level		
Engine	Framework	Game programming
May include - Physics system - Rendering system - Dialog system - Sound system - Media storage system - Communication layer	- abstracted model of the game world and game system - the glue between the game programming and the engine(s)	Detailed programming of individual objects specific to the game.

Fig. 3, Code level

The layer divisions within the code level are very general, the details being different from architecture to architecture. Sometimes the layers can be correlated with production team structure: a game engine group is assigned to create the engine layer, another group writes the framework and undertakes game programming. In many virtual worlds players take an active part in game programming by scripting behaviours for objects they are responsible for. This is the case in many text-based virtual worlds, one of the most famous of these being *LambdaMOO*. Cherny shows an early example from *LambdaMOO* of how players program personal and characteristic behaviours for their avatars that can be triggered by keywords typed by other players

(Cherny 1994:11). This is usually referred to as *scripting*, which has been developed much further in later graphical VWs, most notably in *Second Life* and *Star Wars Galaxies*. In text-based VWs players are in many cases granted more freedom to script, i.e. to be able to build features that have a larger impact on the rest of the virtual world, this due to the fact that many of these worlds are non-commercial and build upon common efforts from players and developers (which may be the same persons) for survival.

To illustrate the relationships between the different layers in the code layer one can compare the building of virtual game worlds with the construction of our physical world. Game engines are then the equivalent of the physical laws that are common to different planets. On each planet the framework is analogous to local conditions providing the foundation for the biotope on that planet. The individual classes in the framework or in the descriptions of the object types are the equivalent of genetic codes. At the level of programming games these genetic codes are combined with data specific to individuals, comparable to individual DNA sequences.

THE STORY LEVEL

At the story level we find the deep structures of the potential stories. At this level the individual expressive agents as well as the dynamic and static story elements are designed. This can include driving forces, goals and specific abilities under certain circumstances for each individual entity. At the discourse level these entities manifest actual stories via performed actions.

The story level also includes back-story, which is a case of explicit storytelling on the part of the game/world designers, which may or may not have a branching and therefore interactively traversed/selected structure. This relates to the previously mentioned distinction

between impositional and expressive narratives. The impositional stance is used most strongly in single player adventure games and hypertext narratives, where the overall story and its content is fixed, even though, when experienced, there can be variations in the chronology and quantity of the sequences that make up the story.

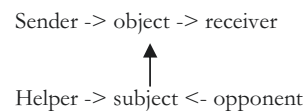
In virtual worlds we often find a mix of different story construction techniques at many different structural scales. Both *Asheron's Call 2* (AC2) and *Star Wars Galaxies* (SWG) are good examples of game worlds that contain mixed strategies, from the totally linear to the emergent, i.e. from the impositional to the expressive.

In AC2 we find a linear story arch which is mandatory for the player to go through in order to be able to get to new geographic areas in the game world. The virtual game world SWG is an example of a world where the player can perform quests that are implemented as linear narratives, but they are not mandatory for the development of the player character. (Unless the player aspires to become a Jedi after that update 10 is released for SWG.) Within virtual game worlds that mix both impositional and expressive story construction in ways like this, the expressive stance is inherent, deriving from the code level and implemented in the story level, giving dependencies, constraints and affordances in the world that govern what agents and player characters are allowed to do depending on their state. It is in this way that the agents are *inhabitants* in the world.

THE DEEP STRUCTURE

Even if all games do not contain a story, just as films, plays and novels, they all contain a deep structure. Games like chess and solitaire contain deep structures; there are goals, driving forces and constraining rules for achieving the goals. In these examples though, the goals that drive the mechanics of game play are part of the predefined conception of the game. This is not always the case in virtual game worlds where the players may define their own goals that are not always be foreseen by the designers.

The concepts of deep structure and surface structure are used by Greimas (1966), summarised by Rimmon-Kenan(1993): "Whereas the surface structure of the story is syntagmatic, i.e. governed by temporal and causal principles, the deep structure is paradigmatic, based on static logical relations among the elements".(p. 10) Greimas' Actant Theory models static relations as relations among *Actants*. Actants are entities that accomplish or submit to an act. The number of actants is six in Greimas's model:



In a story where a player character meets a wizard and accepts an assignment to slay a dragon, the actants would be divided as shown in Figure 4.

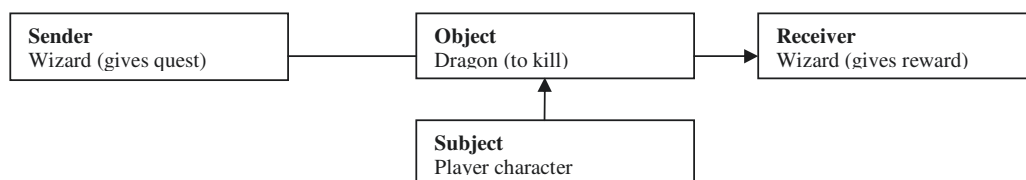


Fig. 4. An Actant model of a simple story scenario.

In this case the model is presented from the Subjects perspective, the player character. It could also be the case that the wizard is a player character, who is not strong enough to kill the dragon himself, but needs the dragon's scales for crafting a piece of armor. In that case the diagram would have the wizard as subject, the Sender would be assigned to make the armor, the object would be to talk a warrior into slaying the dragon and the scales functions: "The positional value of the Object is doubly defined by the convergence of the actantial axes: both as an "object of desire" and as an "object of communication" (p. 76)

Budniakiewicz reminds us that for Greimas the actant model and the actant grammar are foremost a way to extrapolate syntactic structure. How can this be of use when we discuss story construction in virtual game worlds?

First of all, actant theory is a conceptualization that breaks down the parts of a story into the force fields that make it possible for the narrative to come into existence. By applying this way of looking upon expressive agents and static story elements we can more clearly define the forces that, in Greimas words, make up "the semantic syntax" or the micro universe that a game world and the overall narrative consist of.

This perspective becomes especially interesting when applied to live role-plays, MUDs or MMORPGs. In these games the discourse *is made up of* an execution of these interacting forces. (This can also be said about BRUTUS, a story telling machine, a system which functions as a sophisticated narrator and uses a formal model of betrayal; this system does however not accept user input (Bringsjord and Ferrucci 2000)).

Starting with this model one can then break the larger units into smaller components with

would be the reward. Actants can, just as expressive agents, include non-human beings, but actants can also be what we would call static story elements, such as inanimate objects (e.g. a magic ring) and abstract concepts such as 'destiny'.

In *Fundamentals of Story Logic*, Therese Budniakiewicz (1992) points out that the position of the object in the model has double

clearly defined functions. Budniakiewicz speaks of two large classes: "The two big classes which make up the 'semantic syntax' are the *actants* and the *predicates*; they combine with each other to form the semantic and thematic kernel or nucleus of a textual micro-universe, The *predicates* are divided along the static vs. dynamic binary opposition: *Function* [...] designates the dynamic predicate and *Qualification* [...] the static predicate." (p. 75)

In terms of story construction for virtual game worlds this would be translated into what functions are possible for a certain class, or type of agent, and what state or states the agent must be in to execute the function.

If this way of thinking is applied to the text layers previously sketched, it would be manifested in the framework layer as well as in the game programming layer. In the framework the agents' classes, or types, would be defined with their possible functions, while the conditions, whose different combinations in the game create the states that make the execution of these functions possible, would be described in game programming.

Typical for a story driven computer game is that the player performs a series of quests which are added one by one to the player character's story discourse when it has been performed. Most single player story driven games that have an overall story have a similar structure to the folktales systematised by Vladimir Propp. Usually a story starts with

something in the game's microcosm being out of balance. The hero of the story, or the subject, is given a quest and is thereby contracted to either solve the overall lack of balance in the world, or to take the first step on that path. Usually the hero is also put through a qualifying test to prove his worth in recreating balance. After this the hero may perform a number of minor quests before finally performing the main quest that restores the balance. In many story driven games this last quest consists of a final boss-fight. After this the microcosm of the game is saved, the hero has succeeded in performing the overall quest and the player characters, and supposedly also the player's, motivations are neutralised.

Vladimir Propps (1968) pioneer work *Morphology of the Folktale* explains that the typical Russian folktale is built around seven types of persons (or more specifically; spheres of action corresponding to performers), namely 1) the villain 2) the donor 3) the helper 4) the princess (and her father) 5) the dispatcher 6) the hero and 7) the false hero (p. 79 – 80). The names of the people who contain these functions differ from tale to tale, but the actions they perform are always the same. A function can, in Propp's words, be "understood as an act of a character, defined from the point of view of its significance for the course of the action." (p. 21) The fixed number of possible functions is thirty-one. (p. 26 – 65) All of them are not necessary in the same story, but where they occur they always have the same sequential order.

The restorative three-act structure used in movies also follows a chronological sequence of events, focussed around the main character in the tale (Danzyger and Rush, 1995). The narrative is seen to be divided into three acts, where the first is the setup of the drama, the second contains a confrontation and the third

involves a resolution. Each act rises to a point of crisis, a plot point. It is the central character that gets into conflict and needs to make a choice. The restorative model is based upon the Hero's Journey.⁴ Also here we find a strict chronological sequence of events, and a concentration around the main character, the hero. The true character and development of the hero are shown by a series of situations where the hero is acting under pressure. The hero is said to have a character arc, which corresponds with our expression *individual story discourse*.

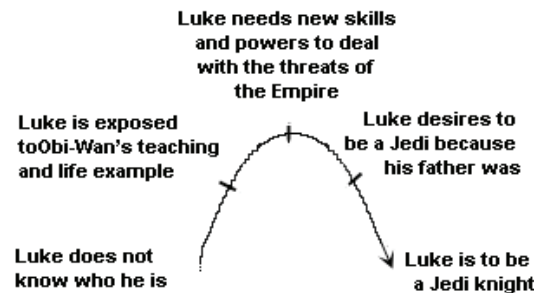


fig.5, Luke Skywalker's character arc in the movie Episode IV. The example is adapted from Freeman (2003).

The other characters in the narrative also have character arcs, but their main functions are to have a function for the hero, not for themselves. The roles are called character

⁴ The Hero's journey was described by Joseph Campbell 1949 in *The Hero With a Thousand Faces* (Princeton University Press 1949). In 1992 Christopher Vogler wrote *The Writers Journey*, (Michael Weise Productions 1992), and 1999 *Story – Substance, Structure, Style, and the Principles of Screenwriting* (Methuen 1999) by Robert McKee was published. Books geared towards game design that use the Hero's journey for giving guiding principles for game design include *On Game Design*, by Andrew Rollings and Ernest Adams (New Riders 2003) and *Creating Emotion in Games* by David Freeman (New Riders 2003).

archetypes and are, in addition to the hero: Mentor, Higher Self, Allies, Shape Shifter, Threshold Guardian, Trickster, Shadow and Herald.

In multiplayer games it is not possible to have meaningful gameplay for all participants if they all have the role of the hero, nor if they are all merely functions for a single hero. This is an obvious fact in live action role playing contexts, and very clearly expressed in the Dogma 99 manifesto (Fatland and Wingård, 2003): “§ 3 No character shall only be a supporting part”. (p. 20).

Is it at all possible to apply the idea of heroship in a massively multiplayer game world? Richard Bartle (2003) applies Campbell's model in an innovative way. He interprets Campbell's hero's adventurous journey to find the self as the player's journey within a virtual world. In this case the player's journey begins in real life, with getting hold of an account that lets him or her log on to a virtual world. That is the “departure”. The “initiation” stage takes place wholly within the virtual world, while in the “return” the player is separated from the virtual world but has learned a lot about him- or herself along the journey. Bartle also states that not everyone can complete the hero's journey, “not everyone can be – or wants to be – a hero”, but everyone can *try* to be a hero in a virtual world.

The concept of heroism does imply that heroship is something for a chosen few. In *Ashteron's Call* (AC2) everyone who reaches level 50 can undertake quests and assignments to earn the title hero in the game world, but since everyone does it the term becomes emptied of it's meaning. In *Star Wars Galaxies* (SWG), on the other hand, becoming a Jedi has true hero status in the original sense within the mythos of the virtual world, not as the player's personal journey of development by

participating in an online world. In order to acquire a Jedi character slot, a lot of effort and creativity is required from the player. A proof of the amount of effort that is required is that a Jedi character is one of the most expensive items from virtual worlds that are for sale, priced at more than three thousand American dollars on Ebay. The richness in the content and the vastness of the world both in terms of variety of functionality, strategy, geography and elements creating narrative potential, as well as a large player base, makes SWG a world where true heroship can be achieved by dedicated players.

ACTION, EVENT, STATE AND ANTECEDENT DRIVINGFORCES

In the context of story construction it is necessary to make clear distinctions between action, event and state, and in this way to be able to distinguish what implications an action has for one or several states. What states are affected depends upon an action's direction and sender.

Greimas (1990) defines the distinction between action and event in the following way:

[...] *event* was redefined to distinguish it from *action*. Whereas action is dependent only on the subject concerned with the organization of his activity, event can be understood only as the description of this activity by an actant external to action. (p. 176)

An action is, according to these terms, dependent on the subject that performs the action or activity. An event, on the other hand, is a description of the same event when the description is performed by an actant standing outside of the performed action.

A state is held by an agent and is a result of all actions performed by the agent itself and by the actions performed by other agents aimed directly or indirectly at the first agent.

In the section “A Systemic Definition of Action” Budniakiewicz (1992) asks what we mean when we say that we *do* something. She means that the use of a verb is not enough for us to draw that conclusion. Instead we “unpack” the verbs to become a description of the *antecedent states* when we contemplate the whole. Even though Budniakiewicz, just as Greimas, primarily studies syntactical structures, this terminology is useful in the current context.

These antecedent states are the wants, the goals, and plans of the agent which are interconnected in a peculiar pattern of reasoning used by the agent both before and during the performance of action, when the agent is said to ‘be doing’ something. The reasoning has been named in traditional Aristotelian commentary a practical syllogism or inference.

[...]

Let us look at what a schema of this kind works out:

Major premise: N wants to do O / bring about O.

Minor premise: N considers that he cannot do O unless he does P.

Conclusion: Therefore, N sets himself to do P / does P. (p.53)

It is worth noting what an application of our example with the wizard and the dragon would look like in these terms. The reward from the wizard is a key that is needed to enter an environment that brings the player character closer to its overall goal. N (the player) wants O (reward from wizard). N realises that he cannot get O if he does not do P (kill the dragon). Therefore N decides to do P.

We can see here how the player character’s antecedent driving-force consisting of a will to get further in the game results in a quest

structure where he/she decides to kill the dragon. The concept of antecedent driving-force differs from the current state in that the antecedent driving-force represents the expressive agent’s *initial* driving-force, while what we generally have called state is a result of the conditions stored in the agent during the progression of the game that limits, gives freedom to act and possibly adds new driving-forces to the agent.

In her article “Semiotic and nonsemiotic MUD performance”, Ragnhild Tronstad (2001) discusses what constitutes a quest and how only after its completion it becomes a story. For her, what constitutes the motivation for solving a quest is the search for its meaning: “To do a quest is to search for the meaning of it. Having reached this meaning, the quest is solved. The paradox of questing is that as soon as meaning is reached, the quest stops.”(p. 81)

In a virtual world the player characters and other expressive agents that perform quests within the rules of the game are governed by the antecedent driving-force constituted by their long-term goals, plan or will. When the goal is reached, or the plan is carried out, or its will is satisfied, the driving-force of the agent is neutralised.

Story level		
Dynamic expressive agents and static story elements	Conditions	Driving forces and goals
The specific setup of agents and objects to be instantiated.	Casual dependencies governing relations between specific agents and objects	Wills, motives, aspirations and goals of the expressive agents.

Fig. 6, story level

THE DISCOURSE LEVEL

Discourse, in the context of virtual game worlds, is the sequence of experiences (expressed by signifiers in the game world) that an expressive agent, whether it is a player character or an autonomous agent, goes through. The individual story discourse emerges simultaneously with an agent's activity and movement in the world.

It is in the discourse level that the state of the expressive agent evolves. The class describing the type of the agent describes what types of actions are possible for the agent to perform and the possible basic obstructions against performing them. When the agent is instantiated for the first time, it contains its first conditioned state. The state of the agent changes depending on its own actions, what actions are aimed at it by other agents and objects, and depending on influences from other parts of the system.

Discourse level (Dynamic)	
Story (individual story discourse)	State
The past of the expressive agent, a chronological sequence consisting of the actions performed and the events experienced.	The state of the expressive agent in the now of the playing, defined by the construction of the class the agent is instantiated from and of the agents individual story discourse.

Fig. 7, discourse level

THE OPEN NARRATIVE STRUCTURE OF VIRTUAL WORLDS

Single player adventure and role playing games, movies, novels, and multilinear interactive narratives have in common that they are closed narrative systems in the meaning that the plot, the goals, and the antecedent driving forces are fixed, their nature having been decided by the creator(s) of each work. This is also the case for BRUTUS, the story telling machine described

by Bringsjord and Ferruci (2000); the antecedent goals and driving forces are set before story generation starts.

Games set in massively multi player game worlds differ from this by being open narrative systems in the sense that player's and other active participants in the world such as members of live teams can add external goals and driving forces to the world.

These goals can be both inspired from the world mythos, or have another origin, such as personal preferences. Taylor (2003) proposes the power gamer as specific player type; based on ethnographic studies and interviews done in *EverQuest* she describes dynamic goal setting as one of the distinguishing features of the power gamer. E.g. the player might aim to reach level 50 in three weeks. There is a semi-level to this where guild leaders and players who organize other players formulate, together with a larger group of players, more long term goals, such as waging wars on another guild. This is the case in *Lineage*, for example. In SWG it is not uncommon for a guild to decide to help one player to become a Jedi, which is a more powerful type of player character (in terms of the game rules in the world) than the player character that all players create when they start playing a game. In order to acquire a Jedi-type character a lot of effort and time needs to be invested. These goals, formulated by individuals, are most often inspired by the mythos and the rules of the specific game world. When these goals are being formulated, agreed upon and strived for they are adding to the narrative potential in the world.

The individual player goals are not always inspired by the game world itself. With the growing market of items, virtual world specific currencies and player characters are also sometimes of a purely economic interest in achieving certain goals, e.g. to achieve Jedi status in SWG in order to sell the player

character at Ebay for 3000 US Dollars, or to gather 10 million credits on one of the most populated servers and trade them for 150 US dollars. Players with this type of goal setting are a fairly small segment of the player base, but the formation of companies earning their revenue by selling virtual-world objects for real-world money suggests a growth of this segment.⁵

Another type of goal inspired by circumstances outside virtual worlds is that of professional gaming in the form of competing in tournaments. This is mostly in multi player games in the first person shooter genre. Pedersen's (2002) study "Are Professional Gamers Different? - Survey on online gaming" shows that one of the dreams of being a professional gamer is to travel and compete in tournaments.

It can be argued though that these goals can also be seen as motivations. I want money, therefore I have the goal to earn 10 million credits in SWG that I can sell on Ebay. Or, I want to go travelling and participating in tournaments, therefore I have the goal to become very skilled at playing a particular game. Motivation is a broader and more intangible concept to bring in to the discussion than goals deriving from motivations. Richard Bartle's (1996) four player types, (the achiever, the socializer, the killer and the explorer) and Nick Yee's (2002) five facets of player motivations (relationship, immersion, grief, achievement and leadership) provide guiding principles for major player motivations that can be regarded as sources that define goals

⁵ An example is the company Internet Gaming Entertainment, who employ full time staff in low wage countries such as China to get hold of rare items in the game to sell for real money. Currently they have 100 employees. <http://www.ige.com/>

for individual players and groups of players. There is a risk here of mixing up motivation, preferred type of activity and goal setting. Taylor (2003) shows that dynamic goals set by an individual player often lead to a very diverse set of activities. For example it is difficult to be really successful in a massively multiplayer game as a lone achiever or explorer – a high level of success is dependent on a large social network and good reputation. One cannot take for granted that goals are achieved by in-world achievement. Lets say that a motivation is to have the status of a hero, and the goal is to be a Jedi in SWG. To be a Jedi in SWG means true hero status, and as such it also has monetary value. Without going into issues of meaning, value or cheating here, clearly the goal of becoming a Jedi can be achieved by out-of-game activities that provide money, which in turn can be used for instant achievement in a virtual world.

No matter what comes first for the player when he or she dynamically sets goals, preferred activity or motivation, no matter if they derive from the world design or from motivations outside the game world, it is clear that narrative systems in the virtual world are open to goals defined by other persons than the originators of the worlds. This is, from the aspect of narrativity, the feature that together with the world's nature as a *place* most distinguishes virtual game worlds from other types of narrative systems. Virtual worlds as places support the emergence of stories. Emergence in this context means: the emergence of a higher level structure from the interaction of many simpler, lower level primitives. In this case emergent narrative must be understood as a system in which lower level elements interact to result in the emergence of a pattern of events that may be told about in ways conforming to a specific higher level pattern of narrative structure. The originators of the higher level narrative in

these cases are people active within the world, especially those who take part in planning long term goals or plans that result in sequences of events that lead to achievement of the goal or fulfillment of the plan, such as players, live teams, game masters and guild leaders.

The narrative system is also open in the way that the history of the world is told in many different ways, and from many perspectives. Most virtual world live teams write regular newsletters about what is happening in the world and have official websites where this history is gathered and edited. In some virtual worlds it is possible to leave individual marks which become part of the worlds history. One example is *A Tale In The Desert* (ATITD) where players of the first version of the game build monuments that will bear the player's marks in the second version of the world. Another, example is the official scribe, or in-game journalist James Wagner who writes about events in *Second Life*. The most massive resource of documentation of the history of a world is the player diaries and forums on the websites of different guilds. It is also common for whole guild histories to be written by the most active players in a guild, highlighting marriages, wars that have been won and other important happenings.

ENLARGING THE PARADIGMS OF VW GAME DESIGN TO ACCOMODATE VARIETIES OF GOALS

Progress of player characters in virtual game worlds is commonly expressed by numerical values that increase, representing strengths and skills needed in the specific game world. The type of progress that Bartle points to in the development of the self by embarking on the player's journey is equally present, but not expressed via the game interface. It is questionable if values of personal development of the player can ever be expressed in such a setting. These two perspectives represent very different ways of looking at progression; the

first numerical one is instrumental while the second one is more intangible. Bartle has described the representation of the player character in terms of levels of immersion; going from avatar, to character, to the highest level of immersion where the representation is a persona - a state where the player does not make a difference between himself and the character. A player who feels that the game character is a persona rather than an avatar has not only achieved statistical proofs of achievement, but also a sense of synthesis, of really *being there*, in the game world. The paradigm of levelling up has been so prominent that it is important to remember that there are other types of progress and development that can be achieved. Possibly the fact that virtual game worlds are open systems that can accommodate goals deriving from other people than the creators of the games, can open up the common levelling paradigm into the development of systems that support a wider variety of goals. This could have the effect of an increasing focus, both in design and implementation, on expressive agents.

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D.5 Lindley and Eladhari 2005

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Narrative Structure in Trans-Reality Role-Playing Games: Integrating Story Construction from Live Action, Table Top and Computer-Based Role-Playing Games

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ABSTRACT

Trans-reality role-playing games are conceived of as a form of role-playing game evolving from and integrating established table-top, live-action and computer-based role-playing forms. Each of these established forms has specific strengths and modalities for the ongoing articulation of the history of a game world regarded as an unfolding story. Integrating these forms in a trans-reality role-playing game involves the evolution of their techniques and technologies to allow each to function as a staging approach for game play within a single coherent game world. To achieve this integration, new technologically based design concepts are required to allow players within the different strategies to interact with each other as characters within the same game world.

Keywords

MMORPG, LARP, RPG, TRRPG, pervasive, cross-platform, game, trans-reality, design.

INTRODUCTION

Trans-reality games are games combining virtual gaming with game experiences staged and played in physical environments. The development of design principles and methodologies for trans-reality games requires models of how play functions vary with different game staging and scenarios, and how these variations can be integrated within games that involve different modes of physical, virtual and mixed reality game play. In the case of Trans-Reality Role-Playing games (TRRPGs), a coherent, common and persistent story world must emerge that integrates

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different Role-Playing Game (RPG) forms including Table-Top (TTRPG), Live-Action (LARP), computer-based, and especially Massively Multiplayer On-line (MMORPG), RPGs. A TTRPG can be based upon common game systems consisting of core rules and basic models for characters and objects, their features and capabilities, combat, economics and trading. Virtual, table-top and live action RPGs involve different ways of expressing player moves that can be regarded as performance primitives for the articulation of the unfolding game story. Developing a TTRPG requires technical solutions that allow these performance primitives to be mapped to and function within a common game world, accessible to all players independently of their local game staging and play modes. This paper presents and explores some proposed technical design approaches that might provide a feasible foundation for achieving the vision of a TTRPG as a collective story world accessed by performers using very different stages and languages of expression.

STORY CONSTRUCTION IN ROLE-PLAYING GAMES

Previous work has analysed the relationships between simulation, game play and narrative in computer games (Lindley, 2005). These elements work together in the unfolding creation of the history of the game world, a story world detailed by the players. The diegesis of a story consists of its specific objects and events. The selection and presentation of elements of the story, with expressive variations of emphasis, constitute a plot. The plot is expressed in an act of telling, i.e. a particular narrative. The available text is the narrative, while the other layers of meaning are inferred from the text and its relationship with other texts.

Considering narrative construction and encoding within RPGs reveals very different relationships to this model. A TTRPG is typically based upon a predefined world and scenario that a game master and group of players use to improvise a new, primarily verbal, narrative through the unfolding play sessions of a TTRPG campaign. Improvisation involves assembling sequences of fictive blocks, basic fragments or units of fictional/narrative significance that may be strung together to form a higher-level story or narrative (Mackay, 2001). Fictive blocks include moves and text provided by the game system together with those drawn from the players' imaginations and experiences. This process most strongly resembles the collective creation of a verbal narrative, the simulation level being achieved partly by imagination and partly by the use of more specific simulation rules such as those involved in simulating combat interactions using miniature figures and dice.

A computer-based MMORPG, however, provides players with a finite and fixed set of possible moves, together with the media foundation for realising moves as audiovisual and simulation events. Hence the MMORPG player generally chooses from a comparatively limited set of predefined fictive blocks, supplemented by textual interaction with other players via chat facilities. This is a severely constrained improvisational freedom compared with the other RPG forms; the computer RPG removes much of the space for individual interpretation and imaginative elaboration found in the other forms by providing very explicit visualisations together with very limited options for choosing performance primitives .

Collaborative story formation in LARPs is different again. While a TTRPG collaboratively produces a kind of collective text upon which individual acts of imagination build, a LARP consists of a kind of performative multtext; there is a different story for each player, none occupying a privileged position as the holder of an authoritative story perspective. The LARP setting may vary in its diegetic freedom between that of a MMORPG and that of a TTRPG,

depending upon the literalness of representation of its setting, costumes, props and performances. LARP performances have the full advantage of all avenues of direct, face-to-face human communication, leading to the possibility of the highest levels of immersive and emotional experience.

A TRRPG must integrate these different staging modalities and their respective performance and communications affordances in a way that allows a common story world to develop. Each modality presents its own specific strengths, requirements and deficiencies in terms of expressive potential. Technical solutions for TTRPGs must therefore meet basic requirements promoting player perceptions of inhabiting a common game world together with specific requirements arising from the table-top, live action and computer based interaction environments used by different players.

GLOBAL REQUIREMENTS FOR A TRANS-REALITY RPG

A TRRPG must integrate the different narrative modalities of RPG forms to create a coherent common story world, as represented on Figure 1. Ideally this involves a careful mapping between player roles, technical mechanisms and narrative functions in ways that preserve or enhance the strengths of the different play modalities involved and disseminate these strengths throughout the overall TRRPG game.



Figure 1: A common game world.

A comparison of the features of different RPG forms is presented in Table 1. This comparison is broad, including typical, possible, and not always necessary characterisations.

Feature	MMORPG	Table-top RPG	LARP
apparatus/technology	- interactive 3D world, characters, game objects, mobs, NPCs - automation of game systems, rules and procedures	- players, pens/pencils, paper, dice - printed scenarios, maps, rules and systems - table-top, miniatures, boards, items	- players, pens/pencils, paper, dice - printed scenarios, maps, rules and systems - locations, sets, props, costumes - communications and audio-visual equipment
size of game space	very large	large to huge	small to large
game sessions	several years	several years	several days
play sessions	several hours daily	several hours weekly	several days
visibility of rules/mechanics	low	medium	high
primary representation media of story	2D projection of 3D world, animation, text, chat and emotes	imaginative, verbal. text and figurines	verbal, bodily performance and text
fictive block/ performance primitives	triggered actions/ animation sequences, chat text, NPC text	verbal expressions (in and out of character), move or position miniatures, play card, use randomiser	Physical actions, verbal expressions
object manipulation	via avatar	imaginative, move miniatures	direct hands-on
inter-player physical location	no relationship	close group	close to widely spread group(s)
visualised diegetic elements	all	maps, character types and relative locations, mobs and NPCs, immediate location	positions/locations, body language, game objects, dress
positional accuracy	high	low to high	high

Table 1: Comparison of features of RPG forms.

A TRRPG cannot be expected to achieve the integration of these forms without fundamentally changing some aspects of the play experience and its supporting infrastructure, since integration requires interfaces unique to TRRPGs. In particular, table-top and live-action games evolve more towards augmented and mixed reality games (eg. Szalavári 98, Björk 2001, Piekarski 02, Mag 2003, 2004). Before describing some TRRPG technical design approaches to illustrate this, it is useful to state some proposed requirements aimed at encouraging players in different staging situations to perceive themselves as playing a common game. These requirements are:

- there should be a unified game space within which in-game actions are understood to occur; this game space can include more than one game world
- the game space should be equally persistent for all players
- the game space should be logically consistent and compatible for all players

- the same game characters, objects, non-player characters (NPCs) and mobs (monsters etc.) should be present within the world for all players
- the effects of game world events upon characters should be perceived as such and in the same way for all players
- some subset of game systems, rules, mechanics and procedures should be shared by all players

The game space could consist of more than one world (eg. as different planes of reality within a fictional diegesis). Here, however, we consider the case of a single game world that has different but integrated representations, some virtual and some physical (eg. table tops or LARP settings). Trans-reality in this case refers to the representational media of the game, rather than its diegesis (a diegetically trans-reality game involves game play crossing different in-game realities; see Lindley, 2005b).

TECHNOLOGIES FOR TRANS-REALITY RPGS

Technologies for the different staging contexts of TRRPGs can include the following (many of which are reviewed in Åkesson et al, 2004).

For computer-based play:

- conventional computers, game consoles and peripherals
- stereoscopic visualization and virtual reality systems

For table-top play:

- technologies for detecting the positions, identities and orientations of table-top miniatures, such as radio-frequency id readers, infrared-detectors, touch screens or CCD cameras with associated vision processing
- technologies for determining the use and values of randomizers such as dice; these include many of the mechanisms used for determining the states of miniatures
- visual displays such as front or rear projection for game state information (eg. character statistics), environments (dungeon passages, town streets), etc.
- audio output devices, such as stereo or surround sound systems
- audio input devices (microphones)
- augmented reality devices, such as headsets with positioning information
- robotic and animatronic devices

For LARP-derived game play:

- technologies for detecting the positions, identities and orientations of players, sets and game objects; these could be the same as for table-top games, but also include wider area technologies such as Blue Tooth, wireless and GPS systems
- visual displays and audio input and output devices, as for table-top games
- robotic and animatronic devices, possibly on a large scale

GAME DESIGN FOR TRANS-REALITY RPGS

Specific design solutions for a TTRPG can be regarded in terms of both shorter term design concepts and longer term concepts requiring or depending upon what may in many cases be considerable ongoing research but nevertheless representing a not too distant future of how these kinds of games might be created. Plausible designs might be based upon the following basic elements:

- a central server, database and game state engine representing the overall state of the game world together with the rules and procedures of the game implementing game systems. Game systems may include systems for combat, trading and magic. The game world should be described geographically and its description should include game objects such as characters, NPCs, mobs, artifacts and special items.
- a player controls their own character within a table-top, virtual or live-action play session.
- a player in one staging context should be able to experience and interact (via their character) with representations of the characters of other players in different staging contexts

For players using conventional computer systems, the relationship between their client and the server is quite standard for current MMORPGs. The major differences would be the presence within the game world of player character groups having different time schedules from typical MMORPG players, representing the table-top and live-action players. Interactions with these players may also involve specific constraints as discussed below.

TTRPGs offer the possibility of using physical game pieces such as dice, miniature figurines, boards and other equipment as tangible interfaces with a TTRPG. Design approaches include:

- each character may be represented as a miniature figurine incorporating a method for automatically determining its position, its orientation and its identity upon a game board. The method could be a bar code or an infrared transmitter in the base of the figure. This allows the central game system to track the relative position of each character in relation to other characters and the in-game location and orientation they are in. However, despite the use of tangible character representations, TTRPGs tend to use game time steps having a standard in-game time duration but variable play duration. Representing positions in the other staging contexts will therefore require predictive extrapolations subject to correction.

- the game may be played on a game board having suitable interfaces for the figurines (eg. a built-in bar code or IR scanner). This can be simplified by using a board with a fixed number of discrete positions for figurines, rather than a continuous usable surface.
- use of a display device for showing the locations of figurines within the game world by projecting maps or icons onto the game board, as well as displaying character and other game object state information. Mobile devices can be used for displaying more private character state data.
- use of audio input devices with associated processing to capture and disseminate the players' in-character speech acts and out-of-character descriptions. This could be done by having players key a microphone at appropriate times. However, there are many and often long term design challenges involved in this. A simple design might simply record these expressions and, for example, play them in association with visualizations of characters in virtual or live play contexts. Speech to text processing could be used to enable display of these expressions as text. A longer term and more interesting solution would be to generate animations procedurally based upon computational interpretation of the meanings of movement descriptions.

A design question here is: how to represent the characters of other players, NPCs and mobs that are not controlled within a local TTRPG. Some possible solutions are:

- represent them graphically and project them onto the game board. This is simple but creates a representational mismatch with the use of figurines
- a player or game master moves generic figures by hand to positions indicated by projection, with the game board sensing when validate moves are completed. This could include using game pieces having a built-in visual display, such as an LCD screen, to display game agent graphics (eg. a picture of a character), which could also be animated (see Figure 2).
- use a form of automatic movement, eg. electromagnetic movement, pick-and-place robotics or even complete small scale robots. In this case the timing of different paces of the motion of game characters among local and remote players would have to be addressed.

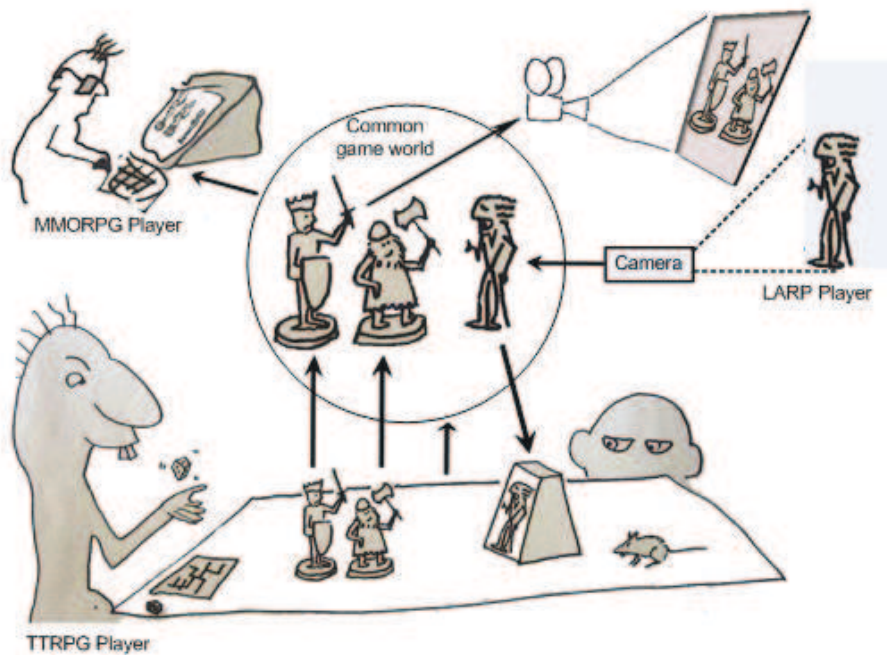


Figure 2: A table-top game includes a representation of a LARP player.

Similar issues are involved for integrating LARP game play. A simple way of integrating LARP play is to prevent intermingling of LARP and other player characters and define clear interfaces between the two. For example, the LARP players could be in a room corresponding to a room in the central game world. For the LARPer, the views from windows are created as camera views within the virtual world back-screen projected onto simulated windows in the LARP setting. Then for the other players, the LARP is video recorded as views inside the windows, mapped as textures in the virtual world (see Figure 3) and also displayed (perhaps onto a vertical screen) on the table-top for the TTRPG players.

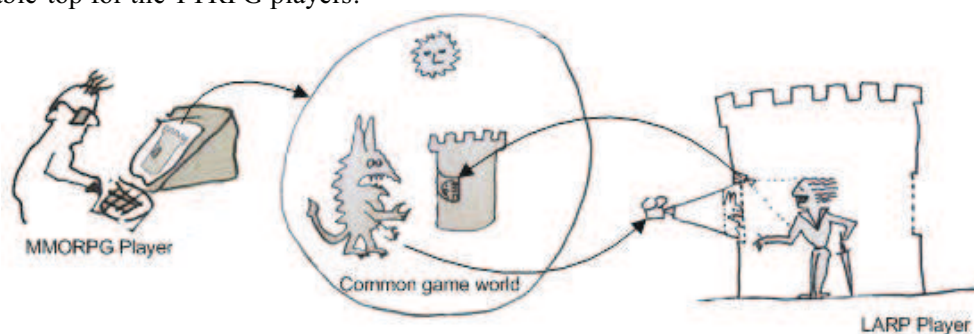


Figure 3: Integration of virtual world play and LARP play.

For inter-mingling LARP and other players within the game world, the positions and orientations of the LARP characters need to be accurately tracked and mapped onto centralized game world models of those characters for representation in the other staging contexts, using the same

methods as used for computer-controlled characters. In principle this can be accomplished by high accuracy optical motion capture. Cheaper but less accurate methods may use IR emitters or tags on costumes or game objects. An alternative would be to use human players as NPCs for non-LARP players within a LARP, eg. using movement and speech instructions transmitted via mobile devices). In the longer term, robots and animatronics might function in these roles.

CONCLUSION

This paper has considered a number of technical approaches for the development of TRRPGs. A great deal of ongoing work is needed to test and refine these concepts and to tune game play within such a system. The overall concept nevertheless appears to be feasible, allowing for very different modalities by which players may collaboratively construct rich game story worlds.

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D.6 Eladhari et al. 2006

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The Soundtrack of Your Mind

Mind Music - Adaptive Audio for Game Characters

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ABSTRACT

In this paper we describe an experimental application for individualized adaptive music for games. Expression of emotion is crucial for increasing believability. Since a fundamental aspect of music is its ability to express emotions research into the area of believable agents can benefit from exploring how music can be used. In our experiment we use an affective model that can be integrated to player characters. Music is composed to reflect the affective processes of mood, emotion, and sentiment. The composition takes results of empirical studies regarding the influence of different factors in musical structure on perceived musical expression into account. The musical output from the test application varies in harmony and time signature along a matrix of moods, moods which change depending on what emotions are activated during game play.

Categories and Subject Descriptors

J.5 [Computer Applications]: Arts and Humanities—*Performing Arts, Music*

Keywords

adaptive audio, believable agents, music, game, role playing games, game design

1. INTRODUCTION

Just as games often borrow narrative structures from films, musical structures are borrowed. For the audio this creates the same problem as for the narrative: the games are interactive and usually not linear. The area of audio need similar research and design goals as narrative do: adapting the composition to the media.

The Mind Music is an experimental application that explore

how adaptive music can be used to increase believability and immersion in games. By using a model for of mind (the Mind Module) that provide a character with personality, emotions, mood and sentiments we attempt to generate music that reflects the affective processes of a character. The aim with the test application, a simple game in arcade style, is to illustrate how affective processes can be represented in real-time to a player via music.

The Mind Music was designed as a feature for a game called Garden of Earthly Delights (GED). GED is a concept for the extension of conventional Massively Multiplayer Online Role Playing Game (MMORPG) mechanics to integrate pervasive, mobile and location-based game mechanics. GED was developed in Integrated project on Pervasive Games (IPerG), which is a large-scale EU project where several research institutes and companies study various aspects of games[5].

The content of the paper is organized in the following way. We first draw upon relevant research and describe the design considerations taken into account. In the next section we describe the Mind Module that provide the data necessary for the the real time generation of the music. The composition of the music is described, mainly the factors of harmony and time signature. In the end we describe the integration of the system and draw conclusions.

2. RELATED RESEARCH

A shared property of music for film and of music for digital games is that it is functional. Cohen has described eight functions of music in multimedia[11]. The functions that are of particular interest to games include that music can be used to direct attention to important features of the screen, to induce mood, (this is supported by several experiments [30]), to communicate meaning to further the narrative, to enable the symbolization of past and future events through the technique of *leitmotiv*, to heighten the sense of absorption, and to add to the aesthetics.

When Bates[10] and his colleagues coined the expression *believable agents*, the idea took a stance in arts, generally in literature, theater, film, radio drama etc but especially in character animation for Disney characters. Bates described

the agents as "an interactive analog of believable characters discussed in the Arts" and argued that artists hold similar goals to AI researchers, wanting to create seemingly living creatures where the illusion of life permits the audience's suspension of disbelief. He meant that emotion is one of the primary means to achieve believability. The area of believable agents has mostly been approached by making applications that to varying degrees create believability by using graphics showing facial expressions and gestures, and by using language, spoken dialog and dialog in text, most notably within the OZ Project[1] and the NICE project[2].

Since Minsky's *Society of Mind*[27] was published in 1986 several implementations of mind models have been made, for example by Egges, Kirshagar and Magnenat-Thalmann at MIRALab [15, 16] who primarily have done implementations where the emotions are expressed through dialog and animations. Another notable example is a virtual reality training environment tool for fire men[18]. The Mind Module (MM) described here in section 4 is yet another model in the same tradition. It builds, as many other applications in this field, upon a personality model derived from the trait model popularly called "The big five"[24], on affect theory inspired by Tomkins [34, 35], and on the research by Frida[19] and Moffat[28]. The distinguishing features of the MM is that it is specially designed for use for characters in role playing games, and that the sentiments, described in section 4.2.4 can be used to create preferred individual responses for characters depending on immediate circumstances in a game world.

Though there is no consensus among researchers about the popular notion of music being "the language of emotion", there seem to be a consensus around the crucial need for further research in the area[22]. Never the less there is some empirical evidence to lean on that are of interest for experiments in the field. These show how different factors in musical structure effects the perceived emotional expressions (reviewed by Gabriellson and Lindström[20]). Recent notable implementations in the area include Berg and Wingstedt's studies with the REMUPP tool[36], showing how musical parameters can contribute to expressing the emotions of 'happiness' and 'sadness'[21]. Taylor, Torres and Boulanger recently presented a real-time system that allow musicians to interact with synthetic virtual characters as they perform[33], and Livingstone and Brown proposed a dynamic music environment where music tracks adjust in real-time to "the emotion of the in-game state"[23].

In the game development industry the term "adaptive audio" is normally used to describe music and audio that reacts appropriately to game play. Adaptive audio is more closely knit to the implementation of the the game play than the traditional pre-composed music and audio that often is tied to certain locations in the virtual geography of the game, or tied to certain events and/or actions. Just as Livingstone and Brown notes[23] the event based approach with looped audio tracks leads to music that is repetitive. This has the effect that the player becomes adept at determining the game-state on basis of the track, and the music is reduced to serving as a mild distraction. Adaptive audio is currently underutilized in games [37], but there are of course several exceptions, such as *Castlevania:Dawn of*

Sorrow[6], *Fahrenheit*[7], *GUN*[8] and the online game *Star Wars Galaxies*[3].

3. DESIGN CONSIDERATIONS

Since music, with some philosophical reservations (see for example Davies [14]), can be seen as "the language of emotion" we believe that experiments with adaptive audio could benefit the research field of believable agents. Music can be used to give the player an idea of what a character is like by *hearing* it's affective processes, while the audio output depends on how a particular character with a particular personality and history interprets a particular context. To quote Cohen: "Real life entails multiple emotions, simultaneously and in succession. Miraculously, yet systematically, these complex relations — this 'emotional polyphony' — can be represented by the musical medium." ([12] p. 267).

Normally in digital role playing games the characteristics of a player character is shown to the player via symbols on the screen. These can for example be numerical figures, text or icons. The more abilities and properties that the player needs to see during game play, the more complex the user interface becomes. An illustrative example is the number of addons that players of online game *World of Warcraft*[4] develop and share in order to enhance and personalize the user interface of the game to fit their needs.¹

There are several benefits to use music to represent affective processes of a character in a role playing game. One is that these complex states, this "emotional polyphony" actually *can* be represented by the musical medium. If music is used instead of visual symbols the player does not need to keep track on a set of changing symbols on the screen in order to get information about the affective states. A second benefit is the possibility to have different representations of the affective state and the affective reactions. The design of the GED game included features for expression of emotional state via posture and facial expression if the player used the 3D client for the PC. For example, if a player character experienced fear the posture and the facial expression would change when a certain threshold value was reached. This would be visible to not only to the player herself, but also to any players within the range of visibility. A small change however, would only be communicated to the player experiencing the state – via music. A third benefit of using music to reflect the affective processes is the potential positive effect on the immersive qualities of a game. Tests show that music indeed can induce mood to a listener[30]. In game genres such as role playing there is a heavy focus on drama and immersion, something that has been a challenge to the digital role playing games. Using music and adaptive audio to support immersion and drama may be one way of enhancing the quality of digital role playing games. A fourth possible benefit could be that the believability of the character who's affective state is represented in fine granularity is increased.

While it might not be so difficult to envisage a system that plays a leitmotiv illustrating fear or sadness in situations that the system can identify as "scary" or "sad" the issue

¹See for example the URL <http://ui.worldofwar.net>. The 12th of March 2006 137 applications were possible to download in the category "Interface Addons".

of more compound affective states is more demanding. The Mind Module (described in section 4) caters for compound states, where for example a character in a gloomy mood could experience mixed feelings such as combinations of joy, guilt and confusion.

3.1 Requirements

The Mind Music is an attempt to create a musical soundtrack of a game life that expresses the individual moods and feelings of each game character. Such a soundtrack would express and represent the affective processes of a character.

In order to achieve this in a virtual world the following is required:

- An implementation of a model of mind that can give an avatar a personality, moods, likes and dislikes, and feelings that are connected to the context of the avatar.
- A mapping between the individual avatar and the ontology, or domain, of the game world.
- An adaptive music implementation that can express the different affective states of the avatar.

3.2 Implementation

State of mind can for example be expressed through emotionally loaded ambient sound mats, situation specific melody themes and variations in the rhythm. In the design for the GED game the player would be exposed to three main musical elements:

- Ambient sound mats for description of emotional states based on input from the mind module.
- Situation specific melody themes, such as leitmotifs for objects that have the same meaning for all players, or players parts of larger groups. An example of a leitmotiv is when the shark comes close in the movie *Jaws*. In this system a "scary" leitmotiv would be played when something that the player character fears comes closer.
- Variations in the rhythm expressing the level of energy/excitement.

As sketched above the musical experience for the players would be individual, but given the common features it would be possible to have united "sound" for the game that expresses the aesthetics of the particular game.

In our test application we only experiment with musical features for the Mind Module. We implemented a simple game application in arcade style. The test application uses modules originally designed to be used in the full blown virtual world of GED, the Mind Module, further described in section 4, and compositions for adaptive audio, see section 5. The test application is only intended as an experiment for the adaptive music, and therefore only the parts of the system relevant to this are used. The player avatar is represented by a simple dot that the player can move in order to touch icons of 13 types, each representing an emotion.

A short sound or melody is played when the the player-dot is touched. The mood of the player changes depending on what "emotions" it is touched by and the music changes according to this in discrete steps.

In the following section, we describe the Mind Module, it's architecture as a spreading activation network, and the affective nodes that it consists of.

4. THE MIND MODULE

The role of the Mind Module(MM) is to provide the system with emotional output from the individual player character. The MM performs computational operations on the input values, which come from virtual sensors defined at various levels of abstraction, and outputs in the form of emotional reactions and/or potential emotional reactions that in turn become inputs to the sensors of the mind modules of receptive entities.

4.1 Spreading Activation Network

The MM is implemented as a spreading activation network as defined and described by Quillian[31], Collins and Loftus[13], and Anderson[9]. The network consists of interconnected affect nodes. The traits, the emotions, the moods and the sentiments described below are all different types of affect nodes that affect each other. When a particular node is activated, nearby nodes are activated as well. As one node is processed, activation spreads out along the paths of the network, but it's effectiveness is decreased as it travels outwards. Experimentally this model can be assessed with RT studies by the assumption that "spreading" of activation takes time – less associated concepts take longer to get to and more associated ones take less time. For highly individualized game play experiences this type of architecture is particularly appropriate. As Anderson concluded: "Because activation can sum and varies with associative distance and strength, level of activation of a node is sensitive to the particular configuration of activation sources" [9]. On our case the activation sources are gathered from the individual settings of character personality as well as by events perceived from the game world.

4.2 Affect Nodes

Emotion can be regarded as a brief and focused (ie. directed at an intentional object) disposition, while sentiment can be distinguished as a permanent and focused disposition [28]. Mood can be regarded as a brief and global disposition, while personality can be regarded as a global and permanent disposition. Hence emotion, mood, sentiment and personality are regions of a two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other. In the mind module the decay rates of the four types of affect nodes are implemented to mimic this, see Table 1. That a node has a fast decay rate means that the node is active only for a short time. This is the case with the emotion nodes - they affect the rest of the network only for the time when they are active.

In the test application for the Mind Music we concentrated on the thirteen emotion nodes and on the two mood nodes. A generic personality with norm values is used for the test applications, and only 13 sentiments are instantiated. These

	Slow change	Quick change
Not object dependent	Personality Trait	Mood
Object dependent	Sentiment	Emotion

Table 1: Decay rates and dependency upon game specific objects are set for different types of nodes according to the following principles.

sentiments are tied to classes, not specific objects, where in the game each sentiment is tied to a type of icon that the player can "touch". This simplistic setting gives a very constrained mapping between the separate entities in the world, in this case the dot representing the player and game objects of thirteen different kinds.

4.2.1 Personality

The personality of a character defines how it is likely to react in different situations. The model used is inspired by the five factor model([24]) in which personality is classified based upon the trait scheme shown in Table 2.

Factor	Facet
Openness	Imagination, Artistic Interests, Emotionality, Adventurousness, Intellect, Liberalism
Conscientiousness	Self-Efficacy, Orderliness, Dutifulness, Achievement-striving, Self-Discipline, Cautiousness
Extraversion	Friendliness, Gregariousness, Assertiveness, Activity-Level, Excitement-Seeking, Cheerfulness
Agreeableness	Trust, Morality, Altruism, Cooperation, Modesty, Sympathy
Neuroticism	Anxiety, Anger, Depression, Self-consciousness, Immoderation, Vulnerability

Table 2: Traits used by the Mind Module.

In a role playing setting this system of traits define how likely a player character is to react in particular ways in particular situations. For example, a character who has a high value of the trait anger will more easily react with anger than a character who has a low value. In our test application however, where only one player is active as a "dot" the personality settings get a different meaning. Depending on the traits of the "character" that starts the game it is more likely to play music along the lower parts of the mood matrix (see section 5) if the personality is geared towards for example neuroticism. The personality can be changed by the player via an XML file which is provided with the application. If it is not changed norm values are used.

4.2.2 Emotions

In certain situations events that the player character experiences will invoke emotions. What emotions are invoked and how strong they are depends upon personality and on the character's likes, dislikes, and previous experiences (sentiments). The Mind Module uses the emotions listed in Table

3.

Positive	Neutral	Negative
Amusement	Confusion	Distress - Anguish
Interest - excitement	Surprise - Startle	Fear - Terror
Enjoyment - Joy		Anger - Rage
Relief		Shame - Humiliation
Satisfaction		Sadness
		Guilt

Table 3: Emotions/Affects used by mind module.

The choice of emotions is based on research into affects and affect theory by Tomkins[34, 35], Ekman[17] and Nathanson[29]. The Mind Module caters functionality for emotional reactions that are expressed through graphics as gestures, and through music and sound, but in this scenario no reactions are implemented. The only perceivable effect of the emotion is on the variations of the music played on the two mood scales (see section 5.1).

4.2.3 Mood

The mood of a character summarizes how the character "feels" at the moment. The mood is a processed summary of current state of a character's mind - the personality traits, the emotions and the sentiments. The mood of a character is measured on two scales that are independent of each other, an inner (introvert) and an outer (extrovert) scale, although it is likely that they will have similar values. Hence it is possible to feel harmonic and annoyed at the same time, or gloomy and cheerful. Having two scales for nodes opens up the possibility of more complex states of mind than a single axis of moods that cancel each other out, see figure 1.²

In the test application developed to explore possible audio expression of affective processes the relations between the emotion and mood nodes, expressed in terms of weight, are as explained in Table 4.

4.2.4 Sentiments

A player character can have a certain emotion associated with a certain object or a certain type of objects in the world. The emotion "fear" tied to objects of the *type* spiders would create a sentiment that simulates arachnophobia. A set of three sentiments with the emotions "Interest-Excitement", "Enjoyment-Joy" and "Satisfaction" tied to a *specific* object, another player character, would mimic "being in love". In the mind module a sentiment node is an association between an emotion and either a certain individual object or

²The reader may associate to Russel's circumplex affect space[32] that just as the mood matrix represent polarities on several axes. Russel's circumplex affect space is a representation of humans conceptualizations of emotional experience comprising two bi-polar dimensions of perceived activation/deactivation and pleasure/displeasure. These two models should not be confused. The mood matrix is an implementation specific interpretation for games on how the emotions in the affect theory may be used in junction to the 'big five' personality trait model, and functions along the lines of the research by Frijda[19] and Moffat[28], while Russel's affect space representation is a model constructed for understanding of the nature of human affect.

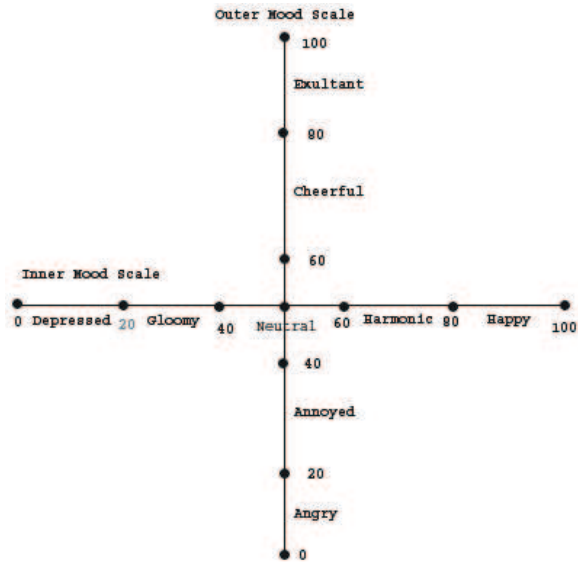


Figure 1: Mood Matrix

a certain type of objects. When the player character who owns the sentiment perceives either of these objects within perceptual/influential range, there is an immediate change in the value of the emotive node for fear. If the value exceeds a pre-specified threshold, an emotional reaction is triggered. In this scenario, the effects are constrained to variations in the music. Furthermore no new sentiments are instantiated in run time, instead the simple game play in the test application uses 13 sentiment objects each tied to one of the emotions. These objects are represented by icons that the dot representing the player can "touch".

In the following section we describe the music that was composed for the test application.

5. MIND MUSIC

Empirical research concerning the influence of different factors in musical structure on perceived emotional expression (reviewed by Gabriellson and Lindström[20]) gives a solid base of information on which we have been able to use as inspiration for the composition of the Mind Music. The most studied factors are harmony, rhythm, tempo, loudness, pitch and mode. Since the Mind Music plays several tracks simultaneously that in many cases are independent of each other we have narrowed down the number of factors in order to decrease the level of complexity to two factors; harmony and time signature. We have also been inspired by the results of a study by Berg and Wingstedt [21], mode and tempo (among several other factors), are studied in respect to how "happiness" and "sadness" is perceived by the listener.

5.1 The composition for the mood scales

In the Mind Music the inner mood is represented by harmony, while the outer mood is represented by time signature. Our design intention is to let the inner mood represent the private, inner mood of the character, while the outer is

Emotion	Weight to Inner Mood	Weight to Outer Mood
Amusement		+2
Interest - excitement		+1.5
Enjoyment - Joy	+2	+2
Relief	+1.5	+1.5
Satisfaction	+2	
Confusion		-1.5
Surprise - Startle	+1.5	
Distress - Anguish	-2	-1.5
Fear - Terror		-2
Anger - Rage		-2
Shame - Humiliation	-1.5	
Sadness	-2	
Guilt	-1.5	

Table 4: How the mood scales are affected by emotions.

representing the more extroverted side of the mood, how the character emotionally is relating to the game world and to other characters. A challenge for the composer has been to compose segments that will sound "good" in all possible combinations in the matrix. The sounds are manifestations of the different modulations that can occur within the mood matrix. For the inner and outer mood, there are 25 different modulations as the mood scales have 5 hard segments each. These were created as MIDI files using Direct Music producer[26].

5.1.1 Inner Mood Music Composition

Notes used within the selected segment of the inner mood:

1. **Depressed** - 'whole tone' scale, all notes have the same to one another (a whole note). This sounds rather mysterious and eerie - 1 octave = C-D-E-F#-G#-A#-C *Difficulty*: there are only six different notes in an octave due to the whole tone. structure)
2. **Gloomy** - *Difficulty*: some notes that feel 'off' - 1 octave = C-C#-E-F-G-G#-B-C
3. **Neutral** - minor scale. Usually minor and major scales tend to represent the sad and happy feelings, but since the minor scale is so common it is chosen for the neutral inner mood and some of the 'weirder' scales for the more negative inner moods - 1 octave = C-D-D#-F-G-A-A#-C
4. **harmonic** - harmonic minor scale. There is only a slight deviation from both the minor and the major scale. It is right in the middle of both; too cheerful for minor scale, too sad for a major scale - 1 octave = C-D-D#-F-G-A-B-C
5. **Happy** - major scale. - 1 octave = C-D-E-F-G-A-B-C

5.1.2 Outer Mood Music Composition

The outer mood is represented by the time signature of the music, since that doesn't interfere with the harmonic qualities of the inner mood music. Time signatures also go in

line with of the extrovert nature of outer mood scale. Time signature controls, to use a popular expression, the "groove" of the music - it is often visible in how a listener "bobs" his or her head. A change in time signatures is possibly more profound than a harmonic change, since the listener need to adapt to the new "groove".

1. **Angry** - 5/4 time signature, so 5 pulses before a new bar starts. This is not an easy time signature for western cultures as it seems to last 1 pulse too long in respect to the 'normal' 4/4 time signature.
2. **Annoyed** - 7/8 time signature. 7/8 has 7 pulses in one bar, but since we divide the bar in 8 pieces it is shorter than the 5/4 and even the 4/4 (which is essentially an 8/8 time signature).
3. **Neutral** - 4/4 time signature. The most common and immediately understood time signature.
4. **Cheerful** - 6/8 time signature, with six pulses in a bar and accents on the first and fourth pulse. This is commonly used in ballads and songs about ships and the sea for its 'high-ho' qualities.
5. **Exultant** - 3/4 time signature, a waltz rhythm, with three pulses in a bar. Not the same as a 6/8 time signature, which is a common misunderstanding, but a 3/4 doesn't have the middle pulse that the 6/8 has (the fourth pulse), so it is perceived different.

5.2 The Composition for the Emotions

Musically, the matrix of the two mood scales is the very foundation. Inner and outer mood control the fundamental elements within the soundtrack, the way it feels and how it pushes itself forwards through time. When the short melodies for the emotions are composed, they cannot interfere with the structure of harmony and time signature, they have to be represented in another element of the musical composition. Even though harmony and time signature are set by the mood scales, this does not limit how the composition is 'filled in', i.e. the amount of notes, instruments, sound effects or sound altering effects (like reverb or delay for example) are still open to the will of the composer. Direct translations like linking the inner mood scale to the harmony of the soundtrack can just as easily be used in the integration of the emotions into the composition; chaos can be represented by fast, random notes within the spectrum of the harmony, alienation can be expressed by the amount of reverb on the percussive instruments. In this case, the emotions are simply represented by short leitmotifs that can announce a fast change in the player's emotional state. Direct Music producer[26] is an appropriate tool for working with these extra melodies, as they need to function with the musical result of all possible modulations of the mood matrix. Via Direct Music producer certain melody parts can be programmed to follow the rules of any set harmony, which resolves the potential problem of matrical adaptive composing, i.e. having to make every emotion multiple melodic modulations for any possible harmony that can occur.

5.3 Systems Integration

The software systems platform consisted of an experimental 2D game engine that was developed for the purpose to integrate the mind module with the music system. It further incorporated a simple game play for analysis of the performance and the correct functionality of the system. The platform was based on GLUT, OpenGL on Windows and developed in C++.

The game items consisted of the player representation and a number of sentiment objects, representing 13 different emotions. The positive sentiment objects move in a scripted way and the negative ones move in formations and tend to chase the player. The role of the player is to hit the positive sentiment objects and to avoid getting hit by the negative ones if the player wants to hear music that is "happy" on the inner mood scale and "exultant" on the outer mood scale. If the player instead wants to hear "depressed" and/or "angry" music the game play strategy should be reversed. As a result, the inner and outer modes are changed depending on which objects the player hits and the frequency of hits.

The music system was implemented by mapping 25 possible emotional states (a grid consisting of five outer and five inner modes) to an equal number of pre composed audio loops, waiting for each loop to terminate before the next is started.

The Mind Module was developed in C++ and for use with this systems platform made as a DLL with the necessary functions exported. Input data, specific to this implementation, was read from XML files. These input data gave the Mind Module the necessary information required for activation of the affect nodes. These files also served as an effortless way of experimenting with setting different weights on the sentiment nodes in order to try out different paces of change in the music on the two mood scales, and for changing the personality trait settings.

6. CONCLUSIONS AND FUTURE WORK

The work with the Mind Music was challenging in many ways, and in retrospect we can see a number of issues that need to be addressed. For example, the larger the combination space is that the different elements of the audio operates in, the more difficult it is to rely on that the music sounds "good" or "appropriate" to game play in all possible combinations. On the other hand, a smaller combination space may lead to predictableness. If the player is fully adept at determining the the game state information based on the audio the music ceases in its functional role and thus becomes less interesting[25]. Another issue is that the music and sounds played for illustration may not have the meanings that the composer has intended for the individual player. If there is a large mismatch between intended meaning in the representation and what is perceived by the player the intention of the application is lost. Even though there is a lot of empirical research showing how to use musical structures and factors to have the intended meaning it does come down, for each application, to a number of aesthetic decisions made by the composer. A possible, but not necessary feasible, approach to this could be to, in the beginning of the game, ask the player what emotions he or she perceives that certain musical elements have. These could in turn be stored as activation data used by the application to combine the musical elements for the individual player. This

would give a character a personal music setting, a 'music personality'.

In section 3 we outlined four main possible benefits of using music to represent affective processes of a character in a role playing game:

1. The ability to express complex relations of the affective processes - an "emotional polyphony" - through music instead of through visual symbols.
2. The ability to induce mood to the player as a mean to increase the level of immersion in the game.
3. The possibility to differentiate between the expression of affect that the avatar expresses through facial expressions, postures and gestures to other players from the affective states and processes that are represented by the music. The music represents affective states and processes of the character rather than reactions, and these are private to the player.
4. Possibly increase the believability of the character by a finely granulated representation of it's affective processes.

The first and the second benefit in the list above are supported by research in the field that is referenced in the paper (especially [20, 21]). Even so further research where the applications are geared towards games are necessary. Given the nature of our test application as a simple arcade style we have been able to use these findings which seemingly functions as desired. However, to convincingly argue for this, tests with potential users are necessary. The prototype game GED is not developed further, but the Mind Music will be reiterated and used in other game research projects. A user test of the current application will be conducted in cooperation with the Swedish Institute of Computing Science (SICS) prior to further development. We also wish to further explore the benefits listed as number 3 and 4 in the list above, in a prototype game with a role playing setting for multiple players. It is our hope that the test application presented here can serve as an inspiration to other researchers for exploring how adaptive music can increase the believability of agents in applications for education and entertainment.

7. ACKNOWLEDGMENTS

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D.7 Koivisto and Eladhari 2006

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User Evaluation of a Pervasive MMORPG Concept

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ABSTRACT

In this paper, we describe a pervasive cross-platform Massively Multi-Player Online Role-Playing Game (MMORPG) and how the paper-prototyping method was used in its design and evaluation. We present the discoveries made from using the paper prototype and categorize them into three categories: *Gameplay*, *Game Usability*, and *Pervasiveness*. We compare these findings with data that is gathered by playtesting game software and conducting focus group discussions to point out how the resources that can be used for game evaluation should be spent in a game project. This comparison shows us that testing a game with the paper prototype method and real players provides valuable results on improving the gameplay in the early phase of the game project. The test results that are related with the gameplay and pervasive features are described in detail in order to also show what kind of issues need to be considered when developing similar games.

Categories and Subject Descriptors

H.5.1 [Information Systems]: Information Interfaces and Presentation – Multimedia Information Systems

General Terms

Game Design, Human Factors.

Keywords

Pervasive game, game design, Massively Multi-player Online Role-Playing Game, MMORPG, paper prototyping, lo-fi prototyping, playtesting, cross-platform.

1. INTRODUCTION

This paper has two goals. The first one is to show *how* and *when* paper prototyping with real players should be used for testing pervasive games, and the second one is to describe the player attitudes towards the pervasive features that we found in our testing. Pervasive games often mix the real world events or places with the gameplay. One of the earliest examples of these kinds of games is the Pirates! game [2], where the players take the role of pirates and use the real world as the gaming arena. Magerkurth et al [12] categorize several kinds of pervasive games, ranging from “smart toys” to augmented and location-based games. A pervasive game can be defined as “a game that is always present, available to the player. These games can be location sensitive and use several different media to convey the game experience” [1].

Paper prototyping (also called lo-fi or physical prototyping) is a commonly used method for finding usability and user-interaction problems in utility applications [14]. Many game designers have also found paper prototyping to be a useful design tool in the early design phases of game projects (see e.g. [6][15]). Usually, the method is used by game designers without involving the real players, often due to the time and resource restrictions. However, involving the players already early in the project can save time and money in the end of the project (see e.g. [3]).

User-Centered Design (UCD) [13] focuses on the users and their tasks at each stage of the project. In the UCD, user experience is the key driver for the design. The UCD is particularly needed in projects where new technologies are used or the target audience is not well-known. Scenarios have been found useful in game development to involve the users more in the early design phase [3]. Acting and taking roles has been also found to be a good method in both finding out what are the potential user scenarios for an application or device and generating ideas for game design [8]. Wizard of Oz method has been used to simulate user-interaction with early prototypes [7]. Our approach for evaluating pervasive games combines features from these approaches. When testing the game design, we had real players playing the game individually. We used scenarios and a game master, who simulated all the other players and the game events. This proved to be a good way, not only to find problems and development ideas considering gameplay, but also understanding the user attitudes towards the pervasive features of the game. In this paper, we compare this simulated scenario-based prototyping method with the other evaluation methods used in the project and analyze it.

Our perspective is more evaluation than design. However, these two parts of the iterative game development process (Figure 1) are very hard to separate early in the project – since the data from the evaluations are used for iterating the design. Evaluating the game at each stage of a game project is an integral part of the iterative game design process [10][6]. Paper prototyping is a method that fits particularly well in the very early phase of a game project when player input is particularly valuable. Testing a paper prototype can provide more useful results than organizing focus group discussions, as we will see later when we compare testing similar game ideas with focus group discussions and paper prototype testing with real players. This paper deals with the *paper prototype playtesting that is done with the real players* and term “paper prototype playtesting” refers in this paper always to this kind of evaluation method.

The game that we evaluated is called *Garden of Earthly Delights* (or GED). The GED is a cross-platform game that extends the conventional Massively Multiplayer Online Role-Playing Game (MMORPG) game mechanics to integrate pervasive, mobile, and location-based game mechanics.

The contents of the paper are organized in the following way. We first introduce the GED prototype and the features that are needed to understand the results from the testing. In the next section, we present the method that was used for testing, and describe the test setup and test player demographics. Lastly, we present the results from testing, analyze the test method, and draw conclusions.

2. GED

GED is a fantasy role-playing game based upon a persistent, virtual, multiplayer 3D environment. The game can be played with a game client that runs on a stationary computer, like any current typical MMORPG. In addition to this, the game is extended to include the physical world as a parallel game space in which players can access the game and control game characters via mobile technology. Mobile players can also interact within the game in ways that take their physical location into account. The game mechanics for characterization, socialization, and magic apply in both the virtual and the physical world. The GED design includes gameplay uniquely facilitated by the co-presences of a physical and a virtual game world (i.e. parallel reality), including five possible play models for the mobile players based upon their relationship with the virtual game space:

1. *Virtual*: playing the game with a PC in a conventional MMORPG virtual world.
2. *Mobile*: location-based gameplay in the real world. The virtual world has 1-1 mapping with the real-world game area.
3. *Astral*: the players playing the game in the *Mobile* mode go to the *Astral* mode, and instead of moving physically to a place, move their presence virtually. This can be used for going to places that could not be physically reached.
4. *Dormant*: players who are not logged in the game with either their mobile phones or PC can be still seen in the game world by the others as aura balls, and the other players can interact with these aura balls. The players who are in the *Dormant* mode can receive notifications from the game world to their mobile phone when someone interacts with their aura ball.
5. *Offline*: the players can log off completely from the game. The other players cannot interact with a player who is in the *Offline* mode.

The players in different modes can see each other in the game world, with some exceptions. The players who are offline cannot see anyone else and cannot be seen by the other players. The players who are in dormant mode cannot see the other players but can still receive notifications from the game world events. The players in the *Dormant* mode are visible to the other players as













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aura balls. The players in the *Astral* mode see the players in the other modes similarly as the players in the *Mobile* mode.

Table 1. The visual presentation of the players who are in different play modes. The rows (underlined) state the mode in which the player is and the columns state the mode in which the other players are.

	<i>Virtual</i>	<i>Mobile</i>	<i>Astral</i>	<i>Dormant</i>	<i>Offline</i>
<u><i>Virtual</i></u>					None
<u><i>Mobile</i></u>					None
<u><i>Astral</i></u>					None
<u><i>Dormant</i></u>	None	None	None	None	None
<u><i>Offline</i></u>	None	None	None	None	None

	3D avatar		2D avatar		Aura ball
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The players choose their side from two factions. The ultimate long-term goal of the game is for the players to win a territorial battle fought between these two factions. The power relationships between these factions depend on the presence of players and NPCs who belong to the factions. This encourages the players to leave their aura ball in the game world, even if they are not actively playing the game (i.e. choosing the *Dormant* mode instead of the *Offline* mode).

The game design schematics encourage collaboration between players in the *Virtual* and *Mobile* modes. The players in different modes have the advantage of seeing different pieces of information. For example, the players who are in the *Virtual* mode can see what weaknesses the other players have. The players in the *Mobile* mode need this information when they choose which spells to cast on the other players. The players in the *Mobile* mode can see which faction the other players belong to. The players in the *Virtual* mode do not see this information even if it is needed by all the players.

Playtesting the different modes with a paper prototype set some challenges for establishing the game world in such a way that the players could envision it within different contexts. In the following section, we describe how the paper prototype was built, how it was used, and what kind of test users we had playing the game.

3. PAPER PROTOTYPE PLAYTESTING

3.1 Evaluation Methods Used in the Project

Various evaluation methods were used in the development of the GED prior to paper prototype playtesting with real players. During the early phase of the project, we received 69 comments from experts regarding various game features, impacting the game design document. The idea of integrating pervasive features in contemporary MMORPGs was evaluated in five focus group discussions with MMORPG players and in one similar group discussion with MMORPG developers [10]. The feedback from

the focus groups suggested that players liked the idea of using features that they can control and do not affect too much in the actual gameplay with the PC client. These features included, for instance, having a mobile access to the communication channels or in-game markets. Rather than avoiding design features that influence PC gameplay, we concentrated on experimenting with them. One of the central GED features is parallel-reality, or dualistic reality that mirrors the real world and the game world, being distinctively mapped directly with each other.

The game design team also conducted a one-day paper-prototyping session where the game designers played the game together to test the core mechanics of the game. The main findings from these sessions reflected the game balance; the players needed more incentives to play the game in *Mobile* mode. The results from this testing were used to enhance the game design before software implementation began.

The game was tested using a paper prototype and real players in parallel with software development of the game. *Ideally, the paper prototype playtesting would have taken place at the end of the design phase*, when the first version of the game design documentation was complete but no code has been written yet. The testing provided valuable feedback on the game features, as we will see in section 4. This feedback would have been beneficial before the implementation phase.

More recently, the game design has been also evaluated by game design experts in a project workshop. The evaluation methods that have been used in development of the GED are shown in Figure 1.

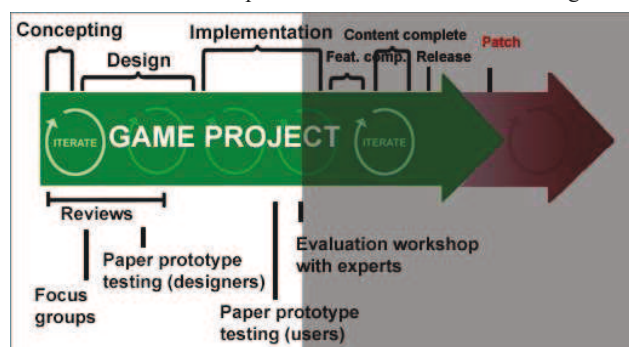


Figure 1: The development process of GED. The border of the white and gray area shows at what point the project is currently. The evaluations done in the project are shown below the arrow.

3.2 The Setup for the Testing

We organized the paper prototype playtesting in September 2005, creating the following scenarios for the players to test:

1. In the first scenario, the player had just bought the game and started playing it. The player's first quest to kill spiders introduced the concept of mind energy (that is used for casting spells) and the battle system. **Research question:** how well do the core game mechanics work?
2. The second scenario introduced the player to the mobile mode. The player was first playing the game in computer mode, but he received a quest that required him to switch to the mobile mode and go to a physical place. Here the player also learned how other players in different modes are represented and how to interact with them in the game world. **Research questions:** How does the

mobile play work? What do the players think about moving in the physical world? How well do the players understand how the two game modes interoperate (e.g. how the objects can be seen in different modes), and does it make the game experience more interesting?

3. The third scenario demonstrated a situation in which the player had played the game for a couple of months, joined a sect (i.e. guild), and made friends in the game. The player needed to help his sect in the physical world and eventually ended up in a situation where he needed to go to the *Astral* mode. **Research questions:** Do the players understand how mobile and PC game worlds interoperate? Are the players motivated to go out into the physical world to help their sect? Do the players understand the *Astral* mode and consider it fun to play in that mode?

4. The fourth scenario demonstrated receiving an alert when the player was doing something else. **Research questions:** How does the player feel about getting alerts from the game when doing something else? Would the players act because of the alerts?

When the scenarios were ready, we created a paper prototype of the game. The PC and mobile version of the prototype can be seen in Figure 2 and Figure 3. The prototypes consisted of game screens, menus, dialogue boxes, and paper dolls. In the mobile mode, we overlaid a hand-drawn illustration of the interface on top of a mobile phone to remind the player all the time of the fact that the game is played with a mobile phone.



Figure 2. The paper prototype of the PC gameplay (Virtual play mode)

We decided to create simplistic drawings instead of using similar graphics that were supposed to be in the final game. There are a few reasons that support this approach. Creating a more realistic looking design is time consuming and making further changes to the design requires even more time [14]. A fine-looking prototype may also make the designers more hesitant to make these changes when needed [15]. If a more finalized design is used, the players may assume that the design represents screenshots from the actual game, distracting them from providing meaningful feedback. A paper prototype states clearly to a test subject that the visual design is in-progress, putting the game design into focus for the testing.



Figure 3. The paper prototype that was used to test the gameplay on mobile phone (the Mobile and Astral play modes).

There were also other, more practical, arrangements that needed to be done to organize the testing, such as organizing the meetings with the players and buying rewards for them. Afterwards, we estimated that organizing this kind of testing for 8 players with 3 researchers in the testing situation took about 15 working days total, including the analysis and writing an informal report. However, if traveling and other kind of typical project overhead needs to be counted in, the amount of time can be slightly bigger. The thoroughness of the analysis may also change these figures.

The testing took two days, and three researchers were needed for moderating and facilitating the test sessions. The test method is a modified version of a typical paper prototype testing method for testing utility applications [14]. One of the researchers was an *interactive storyteller* who guided the player through the game objectives and reacted to the players' actions (similar to a game master in table-top role-playing games), one simulated the *computer* and kept the game interface of our paper prototype updated, and the other was the *observer* who also acted as a game *manual* when needed (see Figure 4). In addition to explaining what happens in the game, the storyteller posed various situations to the player, for instance, getting a message from the game when partying with friends. This was used to simulate the other players and the location based features in the game. This kind playing situation is not similar to a real one, but our results suggest (see section 5.1) that we were able to make the players understand the gameplay better in this way than by describing the features in focus group discussions.

All the three roles for the organizers were very much needed, and it is not recommended to undertake this kind of testing with fewer persons, at least when testing the game with real players who typically have a limited amount of time to spend on testing.

The players were encouraged to think aloud when playing the game. An example of a playtesting situation is described in the following:

Storyteller: Your friend Emma has invited you to join a sect war in a park that is 500 meters from your home in the real world.

Player: I will take my mobile phone and log into the game.

[The "computer" gives the player a mobile phone with a sketch of the game screen on top of it]

Storyteller: When you log in the game, the game screen looks like this, what do you do next?

Player: I will start to walk towards the park...Oh.. And I will select this letter icon here, maybe I have some new messages?



Figure 4. A player, storyteller, and "computer" in a testing session.

The test sessions lasted 1.5 hours on average. In the beginning of the session, the player received a short introduction to the project and the game itself, and then proceeded to play the game. After playing through the scenarios, the players were interviewed in a semi-structured manner.

3.3 Demographics

The focus groups that were organized at the onset of the project [10] suggested that pervasive MMORPGs could eventually draw a different kind of community than in the current MMORPGs. This is why we wanted to include players who were experienced in both playing MMORPGs and also Live-Action Role Playing (LARP). LARP games include physical gameplay, and we wanted to see if players who were already accustomed to this kind of playing would be more positive towards the *Mobile* game mode in the GED. However, due to the qualitative nature of our research, we cannot draw any other than anecdotal conclusions from this issue.

We individually tested the game with eight players. All of the players were MMORPG players (who had played MMORPGs for 2 years on average). Many of the players had played *World of Warcraft*, but there were also players of other MMORPGs. Five of the players had only some or no experience of LARP games, three had played LARP games for several years and also organized LARP games. All of the players in the "hard-core" LARP group also had a strong table-top role-playing game background, and about half of the players in the non-LARP group stated that they had only sometimes played table-top role-playing games. All of the players in the non-LARP group were university students while the LARP group had mixed backgrounds.

There was one female in both groups, and the percentage of females in the testing was 25%. The test subjects were all Swedish and they were 24-35 years old, with the average age being 26.

4. RESULTS FROM TESTING

The test sessions were videotaped and a transcription was written of each session. The findings were extracted from these transcriptions, categorized and prioritized, and written in spreadsheet form for further analysis.

We have categorized our findings in three categories:

1. *Usability*
2. *Gameplay* (the core mechanics of the game)
3. *Pervasive features* (the pervasive features of the game)

The findings from the test sessions are summarized in the following sections. The issues related with the *Usability* of game interface are described not as much in detail as the ones in *Gameplay* and *Pervasive features*. We decided to do this since the findings in *Gameplay* and *Pervasive* categories are more interesting when considering future pervasive game projects. There were two kinds of findings 1) findings that were data of the player's behavior or positive comments made by players (called "observations" in this paper) and 2) findings that were related with potential problems in the current design (called "problems" in this paper).

4.1 Usability

The observations concerning the usability of the game were reflective of the player's interpretation of the game interface. One example suggests that if the player clicks a Non-Player Character (NPC), it will open a menu or dialogue with the NPC.

With the paper prototyping method, we found usability problems related to the visibility of indicators, typing with a small keypad, presenting information on a small screen, memorizing things, finding certain functionalities in the game interface, needing more help, and confusing terminology. One major usability problem with casting spells was also found. The current version requires the players to choose how much mind energy they want to spend for casting a spell. If the pace of the battle is very fast, it may be annoying to spend time defining the amount of mind energy being used every time. This problem can be solved by using default values or changing the spell casting system if needed.

4.2 Gameplay

The positive observations on the gameplay were related with learnability and characterization. For the majority of the players, the game was not difficult to understand, even if it included different playing modes. The players with role-playing experience especially liked the detailed way the character's personality was defined at the beginning of the game. Most of the players enjoyed playing the game (see Figure 5) and all of them were interested to play a software version of the same game in the future.



Figure 5. A player celebrating after winning a battle

One interesting detail in the game design is that each character has a mind model [4][5]. The mind model reflects the character's mind and can have an affect on its behavior in certain situations. For instance, if the character has phobia for spiders and sees one, the mind model can take over and the character may run away in fear. About half of the players considered losing control of one's character to be an interesting feature. However, there were also strong comments against this feature, with one player noting (P6): "*Lack of control is no good if you realize it*". This is quite understandable since having control is usually a good guideline for a good game design [7]. Most of the players liked the idea that the player would not actually lose control but the mind model would affect how the character looks (for instance, happy when among friends).

The playtesting also revealed one potential loophole in the game design, confusing naming of a player faction, and that the design of only one pool for health and magical energy can be tricky to balance. One significant finding was that the current design lacks content that is compelling enough to keep the players engaged. The players would also have liked more solo content² in the game. In the IPerG project, this is a problem since we do not have vast resources for creating open play spaces, quests, and items to make the game interesting enough in the long-term. This is an important finding showing that creating these kinds of prototypes in research projects with limited resources is not necessarily feasible.

4.3 Pervasiveness

The test method provided lots of data about the pervasive features of the game. The players were worried about showing their exact location for the players who are playing the same game. This finding is supported by our results from the focus groups [10] that were conducted earlier. One player (P8) noted that he would not go to place where there are other players of the same game, and that the Internet is a nice place in which you can be anonymous. When asked if knowing the other player's location would be a problem, another player (P4) commented: "*Yes it would be a problem. Some of them get really angry.*" There were other players who were not as worried about showing their real-life

¹ The references to the players who participated the testing are noted with P and the reference number. More research data from the test sessions can be requested from the authors.

² Content that the player can play alone

location, especially if the other players would be friends. However, this shows that careful consideration must be taken into account regarding how exact information about the player's location is revealed. Further, it would be desirable for the players to directly control how this information is displayed and who has access to it.

The players did not consider moving in the real world to be problematic, as long as the rules of the game did not require them to do so. The players were not eager to move far from their location to play the game. The comments collected consistently revealed that needing to move in the real world to do something in the game would not be a problem if the player does not have anything else to do. When players were asked if they would move in the real world to play the game, we received following kinds of comments: (P3) "Depends on how far I need to go", (P1) "Maybe if I would not have anything better to do", and (P4) "If it was a friend and I would have time, why not". Some of the more negative comments considering this issue stated that there should be a good incentive to go to the real world to do something. One of the players noted that he would like to play the game in the *Mobile* mode without needing to leave his home.

The results considering the alerts that the players can receive when they are not actually playing the game were along the same lines as in our focus groups earlier in the project. The alerts were occasionally considered to be a "cool" feature. However, there were concerns that even if the player would be able to turn the alerts off, they would not necessarily have them off, with one player (P7) noting: "If you are a hard-core gamer, you are going to have those alerts on." Having a possibility to log out completely (the *Offline* mode) from the game was considered to be important. The players gave following kinds of comments on the *Offline* mode: (P7) "I would like to choose if I'm in the game world or not ... If I would be borderline playing all the time, my reality would get pretty weird" and (P2) "I think it is good that you can have the dormant mode and log out completely because I would choose dormant if I would not like to be disturbed". This supports the conclusion that the player has control when she or he is playing the game, and the incentive to be online all the time should not be too high – in order to avoid social problems. Ermi and Mäyrä also reported in their scenario-based study [3] the need for security and control over when the game is played.

The players commented that doing simple things in the game, like checking out what is for sale in the market, would be a nice thing to do with a mobile phone. We already predicted these kinds of results because the same was already suggested by the results we collected from focus groups.

Another important finding was that it is challenging to link fast-paced computer gameplay with slow-paced mobile gameplay. This discovery was not clearly revealed in the prototype testing, but emerged in an evaluation workshop with other gameplay experts, who offered that it may be difficult to balance the pace of moving in the virtual game world with moving in the physical game world. Moving in the physical world is probably slower than in the virtual one, when there is one-to-one mapping between the two worlds. Paper prototypes are not good in catching these kinds of problems, unless the problems can be assumed before hand.

The other findings dealt with behavior patterns, like using a car to go to a physical place, or not turning on the mobile client before

reaching the physical location where the player was required to go. The players also suggested ideas for further development.

5. ANALYZING THE METHOD

In the previous section, we listed the main findings from the paper prototype playtesting of the GED game. In this section, we compare the findings and results that can be achieved by other kinds of evaluation methods.

In the beginning of the project, we organized focus groups where similar topics about combining physical and virtual gameplay in a MMORPG were discussed. Some of the results that were found in the paper prototype playtesting deal with similar issues as those that were discussed in the focus groups. We compare these results, and analyze why there were differences.

We compared the game design document review reports³ with the findings from the paper prototype playtesting, but there was very little similarity. In the case of this project, it can be due to the game design document itself: at the point when it was reviewed, it contained many "nice-to-have" features that were eventually not included in the final game. Further, the reviewers stated in their comments that some of the game features were not described enough in detail. This could imply that only reviewing the game design documentation before starting the implementation work is not necessarily enough. The paper prototype playtesting can be used to ensure that the game design works as planned and it also requires the game design to be concrete and complete.

We also wanted to compare the paper prototype playtesting method with playtesting software prototypes with real players in a laboratory. Since GED software prototypes were not complete enough we used data from the testing of three mobile games as comparison.

5.1 Paper Prototyping and Focus Groups

As previously noted, many of the findings in the paper prototype playtesting were along the same lines as our findings from the focus groups that were conducted earlier [10]. In the focus groups, we presented features that could be used to make the contemporary MMORPGs more pervasive (see Figure 6). These features were extracted from the initial GED design.



Figure 6. Examples of the concepts shown to the focus group participants

The biggest difference between the results was that in the focus groups, the features related to parallel reality received very

³ The reviews were done by two experienced game designers

negative feedback. In the paper prototype playtesting, the players were also concerned with similar issues as the participants of the focus groups, such as privacy, but the general feedback was more positive. When the focus group participants more often noted that they would not be interested at all in going to do something in real life, the players who tested the paper prototype, were more often interested in this kind of gameplay. This may be partly because it can be difficult for the focus group participants to imagine how to use products that they have not seen in practice [14].

Of our eight test players, three were experienced LARP game players. However, we did not notice any, including anecdotal difference, between the two player groups when considering the parallel-reality gameplay. However, the players who were active role-players⁴ were, not surprisingly, more interested in the detailed characterization system in the game.

The players in paper prototype playtesting did not have time to consider the issues from as many different points of views as in the focus groups. In the focus groups, the comments and experiences of other players affected the opinions of the participants. It may be more beneficial to use the paper prototype playtesting method first, and then have a focus group discussion afterwards. However, this would be more resource consuming.

5.2 Paper and Software Prototypes

As we saw in the results section, the paper prototype method is most efficient in finding potentially problematic areas especially in the gameplay and pervasiveness. Some findings also dealt with the game usability. Finding the problems related with the actual gameplay is very important in the early phase of the project. In case of pervasive games, the same applies with the pervasive features. These are the features that are the most difficult to change later in the project, and changing some of these design choices can mean implementing a completely different game. Usability problems are good to find early in the process too, but they are typically easier to change later in the project. This is why the paper prototyping method is an extremely useful tool in the early phase of the project. When testing the game with real players we can also gather a lot of data on the *player attitudes and behavior*. This cannot be achieved when testing the game with experts (unless they are the target group). Orchestrating the testing takes some time, as seen earlier in this paper, however, fixing the problems that are found in the testing phase can take a lot more time, or even be impossible, later in the project.

To put the findings into a perspective, we analyzed results of playtesting three feature complete⁵ mobile games. All of the mobile games had been playtested in a laboratory with real players. In these test sessions, average of 7 players played the game 1.5 hours on average in a playability laboratory, where at least one researcher observed them all the time. The test set-up of these sessions was quite similar with the set-up of the paper prototype playtesting, except rather than having researchers simulating the game, a feature-complete game was tested. The games were not pervasive games, but the categorization can be

⁴ The same players who were active LARP players were also active players of pen-and-paper role-playing games.

⁵ The word “Feature complete” means that the game already contains all the features that are supposed to be in the game. See also Figure 1.

still used to compare the results. The results can be seen in Figure 7 and Figure 8.

In the paper prototype playtesting, 79% of the results concerned gameplay and pervasive features, while 21% usability issues. In the playtesting of the mobile games, 35% of the results concerned gameplay and the rest usability issues. The paper prototyping produced considerably more results that concerned the gameplay and pervasive features. As stated earlier, these are the most important areas to polish in the early phase of the project. The larger amount of total findings in the paper prototype playtesting can be explained by the fact that the mobile games that were tested were near completion, without many problems to report. Also, some of the observations made in paper prototype playtesting suggest ideas for further development.

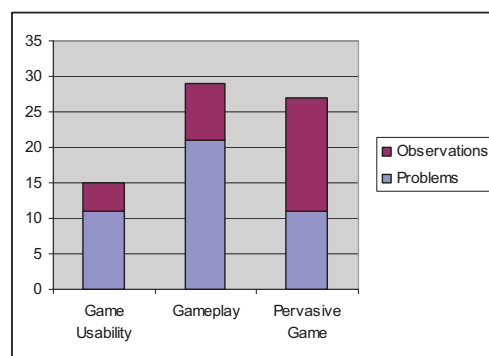


Figure 7. The test results from playtesting the paper prototype of our pervasive game. The numbers indicate the number of problems or observations found in the testing

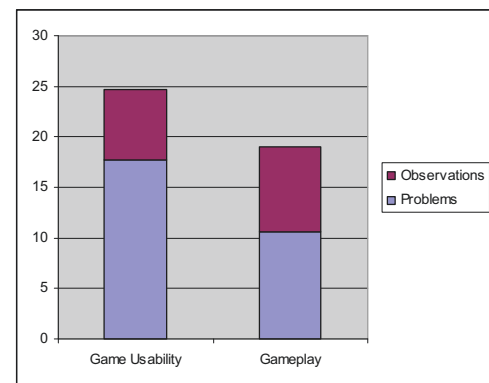


Figure 8. The test results from playtesting three feature-complete mobile games. The numbers indicate the average number of findings.

6. CONCLUSIONS AND FUTURE WORK

We presented several research questions that we wanted to find answers to with the paper prototype. The questions considered the core gameplay and what the players think about the pervasive features in the game. The prototype provided answers to all of these questions, as seen in the results section. In addition to this, we found several detailed gameplay related issues, including 15 usability problems and observations.

When comparing the results to playtesting games with real players in later phases of the project, it is evident that the paper prototyping method is valuable for finding data related particularly with gameplay, and in the case of pervasive games, with the pervasive features. This makes paper prototyping an extremely valuable tool for game evaluations in the early phase of the game development. The testing can - and should - be already conducted when the game design document is ready, and the earlier it is done, the less time-consuming changes need to be done in the code.

We also compared the paper prototyping method with focus group discussions. It seems that it is easier for the players to evaluate something more tangible that they can try in practice. Even if the focus group discussions successful in getting accustomed to the preferences, needs, and behavior of the target group of a product, it can be hard for people to imagine products that they have never seen in practice. The players who tested the paper prototype were more interested in the parallel-reality features of the game than the players who were introduced to similar ideas in the focus groups. We anticipated that the LARP players would have been more positive towards the parallel-reality features, but there was no difference between the players in the group of non-LARP players and LARP players.

In addition to analyzing the test method, we also presented our findings related with the *Gameplay* and *Pervasive features* of the GED in detail. The results that concern *Pervasive features* can be especially interesting for other researchers who are developing or researching pervasive games. To summarize the results, the players who participated in our test sessions were concerned with their privacy and revealing detailed location information. Some of the players were concerned about the alerts and being in the game world even when not actively playing. The game allowed the players to stop playing the game for a while and continue later. However, the players were still worried if the temptation to be in the game would be too high, especially for the hard core players.

The prototype game GED has come to an end, but the findings from our evaluation will be used in the development of other pervasive game prototypes in IPerG project. We will continue researching pervasive gameplay, using the mind model, and experimenting with various design and evaluation methods.

7. ACKNOWLEDGMENTS

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Playing the Character

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Abstract

In this paper we explore what it can mean for the role playing experience to interact with computer mediated role playing game (RPG) through a character that instead of being the representation of the player, is a character with an own identity that the player relates to. We assume a fictive setting of features that are the base for this exploration. In this setting the character is the channel through which the player interacts with the game, but is a separate entity with an own name instead of being the representation of the player's assumed character or role. Role playing a character in third person view may be a matter of rhetorical framing, which means that the view upon detachment that we wish to investigate rather is a matter of changing the rhetorical framing than the basic design of the generic interaction pattern of the role playing game. However, a significant difference is that in this setting the player is able to converse with the character rather than through the character. We propose different specifications needed to create a believable character, such as a model of mind for the characters that allows actions conducted by and towards the characters to have an impact on the character's emotional state as well as dialogue features required for believable conversations with a virtual character.

1 Introduction

Most, if not all, digital role-playing games are played using an avatar, i.e. the player has a representation in the game. In this paper we will explore the consequences of detaching the player from the avatar and instead let the player play *with* a character with its own identity rather than using the avatar as an extension of the self.

By augmenting the non player character (NPC) with deep personality, emotions and mood, in the form of a “mind module” (see section 5, below), and the ability to communicate using more or less unrestricted dialogue (see section

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7, below), we believe that it is possible to create a believable character able to respond to the player's behaviour.

There are at least two reasons for detaching the character from the player; first, a character that starts to behave individually can by mistake cause player detachment, which in that case could be considered as a design flaw, and second, if the player and the character are two separate entities, they can communicate, influence each other and affect each other. This in itself could form a new and exciting gaming experience.

The two approaches may not be so different, it may be a matter of different rhetorical framing, one in which we perceive ourselves and the character as one and the same, and the other in which we regard the character as a separate entity, rather than the basic design of the generic interaction pattern of the role playing game. However, a significant difference is that in this setting the player is able to converse *with* the character rather than *through* the character.

This paper is a pre-study that explores possible technical requirements for creating believable characters, capable of expressing emotions and forming relationships, for computer mediated role playing games.

2 The Player Perspective

A game is either played in first person view, i.e. without representation in the game world, or in third person view, represented by an avatar. The complexity of the avatar ranges from being the player's extension into the game world, such as pac-man, to being a character with an elaborate set of properties, defining an individual range of available game features and actions. There are different types of games played in first person perspective, such as the popular first-person shooter games and games in which the player play "God", such as most real-time strategy games and simulator games such as *Sim City* and *The SimsTM*.

There are also examples of games that use neither perspective, but rather something in-between, such as *Petz* and *Babyz* (Stern, 2003), where the user takes care of a virtual pet and baby respectively. In this case, the player's representation in the game world is dependent on the player for its well-being, but is at the same time an entity separated from the player.

Research projects, such as *Façade*¹ (see for instance Mateas and Stern, 2002, 2004) and *Interactive Story-telling*² use a similar approach. In *Façade*, the user is interacting with the characters in the drama, from a first person view, using natural language. The characters respond verbally as well as non-verbally to what the user says and include the user in the conversation. In this way, the player becomes an actor in the drama with an impact on how the story emerges. In the *Interactive Story-telling* project, the user is seen as an active spectator,

¹See also <http://www.interactivestory.net>

²see publications at <http://www-scm.tees.ac.uk/users/f.charles/publications/publications.htm> and presentation of *Interactive Story-telling* project at <http://www-scm.tees.ac.uk/users/f.charles/>

with the ability to change the main character's plan using speech interaction, but without acting in the drama.

3 Scenario

We are proposing a game scenario in which the player interacts with the game through a virtual assistant. The main motivation for detaching the player from the avatar, or character, is to open up for a new playing experience where dialogue, emotions and interpersonal relationships have vital in-game consequences and are necessary for game progression. We are inspired by massively multi-player games as well as the single player game *The Sims*TM, since both game forms use gameplay elements that support socialization and interpersonal relationships.

The use for a detached player character becomes apparent in the development of pervasive or trans-reality games as defined by Lindley (2004). In games played using a combination of different platforms, such as mobile phone and PC, we can imagine a situation in which the player calls his/her virtual assistant and persuades him/her to perform a specific action in the game that cannot be performed otherwise. An example of a game that use a similar technique is the BBC game *Jamie Kane* (<http://www.bbc.co.uk/jamiekane/howtoplay.shtml>), where the player can chat and have email contact with fictional characters.

3.1 Start Up

Before entering the game, the player gets to choose between three different characters to play with. The personalities of these characters are defined according to a fixed set of personality parameters. The different characters also have specific opinions about certain objects that will be part of the game world (or domain). In the game the character's mood and emotional reactions to events are dependent on personality. Thus, different objects in the world can have entirely different meanings for different characters. Also, if something intense or dramatic happens to the character while interacting, this will have an effect on future gameplay.

3.2 The Own Identity of the Character

When speaking of identity in multi player role playing games, the discussion often revolves around the player's relation to his or her representation in the game world. Is the player playing "herself" using her own identity or is he or she partly or entirely performing a role, and therefore an alternate identity? In the proposed scenario no such distinctions need to be made as the intended design should make it clear that the player's own identity is clearly separated from the character's. The character is thus not a representation of the player, but has an identity of its own.

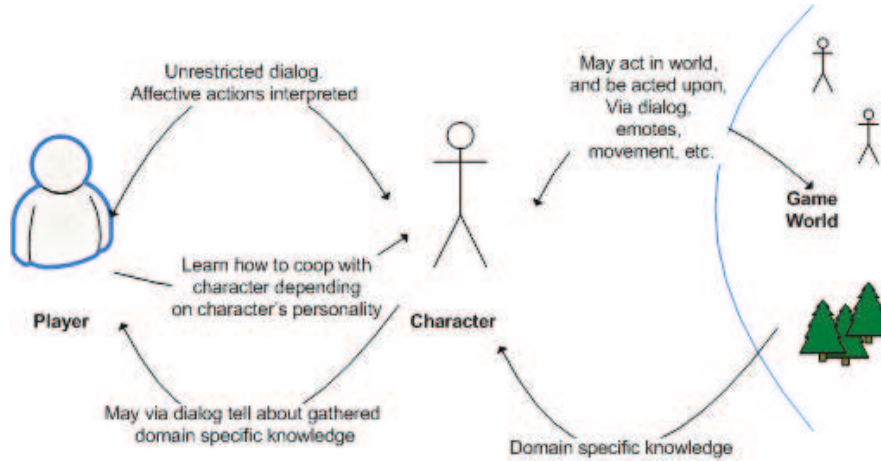


Figure 1: The Player, the Character and the Game World

In our scenario the player acts as a "ghost", and can see the same things as the character, but lack the ability to direct manipulate the game world, including the character. Instead, the player needs assistance from the character in order to progress the game, manipulate game objects, navigate or communicate with other characters. The player's ability to interact in the world is thus through the character, using natural language dialogue. Learning to communicate successfully with the character becomes part of the gameplay, where success only can be accomplished by getting to know the character and create a "good" relationship with it. "Good" in this context is defined by the nature of the "sentiments" shared by the player and the character (see section 5.0.4 below).

The play style implied by this design seems to fall between categories of player approaches. Lindley (2005) divides player approaches in drama-heavy role playing settings into three categories; the audience, the performer and the immersionist. In many respects, our design would probably please players who uses the audience approach to play since the player may observe the character playing, but at the same time a performance is taken place between the player and the character, as well as a performance directed towards entities in the game world that is acted out via the character as a result of the player - character interaction.

4 Believable and Moody Characters

When Bates (1994) and his colleagues coined the expression **Believable agents**, the idea took a stance in arts, generally in literature, theater, film, radio drama etc but especially in character animation for Disney character. Bates described agents as "an interactive analog of believable characters discussed in the Arts"

and argued that artists hold similar goals to AI researchers, wanting to create seemingly living creatures where the illusion of life permits the audience’s suspension of disbelief. He meant that emotion is one of the primary means to achieve believability.

In our scenario we use an experimental implementation of a model of mind implemented by Mirjam Eladhari called the Mind Module which is further explained in section 5. The Mind Module (MM) delivers emotional output from agents depending on personality of the instances. These emotional values are used to allow the agents to choose between a range of affective actions, also part of the MM. Some of these actions are in the proposed scenario designed in accordance with Grice’s maxims of communication (Grice, 1975, described in detail in section 6.1), while others are designed to violate the maxims. An agent that has an introvert personality or is in a bad mood may respond in a way that may seem irrational, moody, or immature to the player. It is our belief that this rather unconventional method may increase the believability of the characters. A test situation with quantifiable data in forms of logs and in-depth interviews with the subjects may in the future show whether there is support for this claim.

5 The Mind Module

5.0.1 Personality

The personality of a character defines how it is likely to react in different situations. The model used is inspired by the five factor model (McCrae and Costa (1987)) in which personality is classified based upon the trait scheme shown in Table 1.

Factor	Facet
Openness	Imagination, Artistic Interests, Emotionality, Adventurousness, Intellect, Liberalism
Continuousness	Self-Efficacy, Orderliness, Dutifulness, Achievement-striving, Self-Discipline, Cautiousness
Extraversion	Friendliness, Gregariousness, Assertiveness, Activity-Level, Excitement-Seeking, Cheerfulness
Agreeableness	Trust, Morality, Altruism, Cooperation, Modesty, Sympathy
Neuroticism	Anxiety, Anger, Depression, Self-Continuousness, Immoderation, Vulnerability

Table 1: Traits used by mind module.

In this system traits define how likely a player character is to react in particular ways in particular situations. For example, a character who has a high value of the trait anger will more easily react with anger than a character who has a low value. In our test scenario the player may choose between three pre-authored characters with fixed personalities in the beginning of the game. Since the character that the player interacts with in this setting already have a fixed personality it is not a situation where the player molds the personality of the character. It is instead a matter of getting to know the character and find out good ways of cooperating with it.

5.0.2 Emotions

In certain situations, events that the player character experiences will invoke emotions. What emotions that are invoked and how strong they are depends upon personality and on the character's likes, dislikes, and previous experiences (sentiments). The Mind Module uses the emotions listed in Table 2.

Positive	Neutral	Negative
Amusement	Confusion	Distress - Anguish
Interest - excitement	Surprise - Startle	Fear - Terror
Enjoyment - Joy		Anger - Rage
Relief		Shame - Humiliation
Satisfaction		Sadness
		Guilt

Table 2: Emotions/Affects used by mind module.

The choice of affects is based on research into affects and affect theory by Tomkins (1962, 1963), Ekman (1994) and Nathanson (1992). The Mind Module caters functionality for emotional reactions that are expressed through graphics as gestures, and through music and sound, but in this scenario the reactions will be restricted to verbal expressions in the dialog and text information displayed on the command line. Also, in the test situation the players will be presented to a simplified set of emotions specific to the scenario in order to avoid confusion.

5.0.3 Moods

The mood of a character summarizes how the character "feels" at the moment. It is shown to the player in the form of simple facial expressions. The mood is a processed summary of current state of a character's mind - the personality traits, the emotions and the sentiments. The mood of a character is measured on two scales that are independent of each other, an inner (introvert) and an outer (extrovert), although it is likely that they will have similar values. Hence it is possible to feel harmonic and annoyed at the same time, or gloomy and cheerful. Having two scales for nodes opens up the possibility of more complex states of mind than a single axis of moods that cancel each other out, see figure 2.

5.0.4 Sentiments

A player character can have a certain emotion associated with a certain object or a certain type of objects in the world. The emotion *fear* tied to objects of type spiders would create a sentiment that simulates arachnophobia. In the mind module a sentiment node is an association between an emotion and either a certain individual object or a certain type of objects. When the player character who owns the sentiment perceives either of these objects within percep-

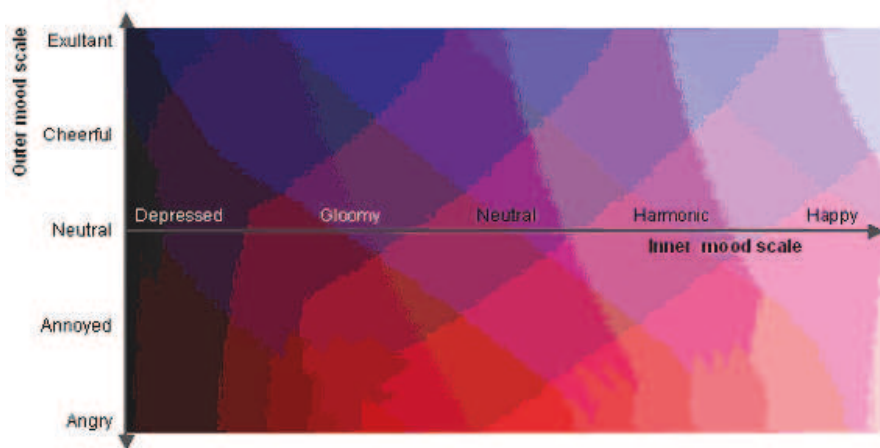


Figure 2: Mood Matrix

tual/influential range, there is an immediate change in the value of the emotive node for fear. If the value exceeds a pre-specified threshold, an emotional reaction is triggered. In this scenario, the important sentiments are those that define the relationship between the player and the character.

5.1 The architecture of the Mind Module

The role of the mind module is to provide the system with emotional output from the individual player character. The mind module performs computational operations on the input values, which come from virtual sensors defined at various levels of abstraction, and outputs in the form of emotional reactions and/or potential emotional reactions that in turn become inputs to the sensors of the mind modules of receptive entities.

5.1.1 Spreading Activation Network

The mind module is implemented as a spreading activation network. The network consists of interconnected affect nodes. The traits, the emotions, the moods and the sentiments described above are all different types of affect nodes that affect each other.

Emotion can be regarded as a brief and focused (ie. directed at an intentional object) disposition, while sentiment can be distinguished as a permanent and focused disposition (Moffat, 1997). Mood can be regarded as a brief and global disposition, while personality can be regarded as a global and permanent disposition. Hence emotion, mood, sentiment and personality are regions of a

two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other. In the mind module the decay rates of the nodes are implemented to mimic this, see table 3. That a

	Slow change	Quick change
Not object dependent	Personality Trait	Mood
Object dependent	Sentiment	Emotion

Table 3: Decay rates and dependency upon game specific objects are set for different types of nodes according to the following principles.

node has a fast decay rate means that the node is active only for a short time. This is the case with the emotion nodes - they affect the rest of the network only for the time when they are active.

5.1.2 Interpretation layer

Application specific data is stored in xml files. In our scenario the most important parts are

- the fixed personalities of the characters the players can choose between
- the linking of reactions and affective actions
- the linking to the dialog system, in particular the dialogue manager

6 Dialogue - Theoretical Framework

6.1 Grice’s Conversational Implicature

(Grice, 1975) suggested a general principle for language use that participants in a conversation is expected to observe. He called it THE COOPERATIVE PRINCIPLE: “*Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged*”. Assuming such a principle is acceptable, he continues, one may distinguish four categories, or maxims, which will yield results in accordance with the conversational principle. These maxims are:

- **Maxim of Quantity**
 1. Make your contribution as informative as is required (for the current purpose of the exchange).
 2. Do not make your contribution more informative than is required.
- **Maxim of Quality**

Try to make your contribution one that is true, and

1. do not say what you believe to be false.
2. do not say that for which you lack adequate evidence.

- **Maxim of Relevance**

Be relevant

- **Maxim of Manner**

Be perspicuous, and

1. avoid obscurity of expression.
2. avoid ambiguity
3. be brief
4. be orderly

These maxims are normative rather than descriptive and it is important to see that these principles act on a deeper level than what can sometimes be noticed. Consider for instance the dialogue contributions in the following example:

1. *Do you know what time it is?*
2. *The mail was just delivered*

At a surface level (2) seems to violate the Maxim of Relevance. However, the cooperative principle presumes a mutual compliance, meaning that even if the answer at first glance seems irrelevant, the speaker of (1) will interpret (2) as a relevant, however partial, contribution. The speaker of (1) may therefore infer that the speaker of (2) intended to convey that the time is around the time of when the mailman usually comes. These inferences Grice call *conversational implicatures* and they explain how we can form a coherent discourse from utterances in a conversation that appears to be unconnected (Levinson, 1983).

6.2 Halliday's Situation and Meaning Potential

Halliday (1978) defines situation as the context in which the language is used. Language cannot be experienced in isolation, it “comes to life” when surrounded by a context. What is said gets its meaning in the situation, which is constituted by the participants, their background and interpersonal relationship, and the activity taking place in the interaction. Halliday's situations can be compared with Wittgenstein's language-games and Austin's speech acts (Wittgenstein, 2001 (1953; Austin, 1962), where utterances are regarded as *actions* rather than truth-conditional statements.

Situations can be classified into different **situation types** according to the activity (*field*), the participants (*tenor*) and the role language plays in the situation (*mode*). These variables also determine the range of meaning and the forms used for their expression, which in all constitute the *register*.

Halliday (1978) regards language use as a tristratal system consisting of semantics, grammar and phonology, each of which is a system of *potential*. Grammar, for instance, is a potential of *what we can say*, while semantics is a **meaning potential**, i.e. a potential of *what we can mean*, it does not correspond to what is actually said or how it is said.

6.3 Implications for Dialogue System Design

6.3.1 The use of Grice’s maxims for cooperative dialogue systems

Grice’s maxims have been used in the design guidelines for (cooperative) spoken dialogue systems developed by Niels Ole Bernsen, Hans Dybkjær and Laila Dybkjær³. These guidelines can also be used to evaluate dialogue systems, by analysing if and how the system violates the cooperative principles. For a game dialogue system the guidelines could be used to analyse how the system can be designed to actually violate the rules at times, in order to simulate the diversity and unpredictability of human behaviour. A character can for instance be designed to be a pathological liar, which would be quite unthinkable in a task-oriented system, which is designed for the sole purpose of assisting the user in solving a particular task.

6.3.2 The use of Halliday’s meaning potential for defining the domain

When designing a dialogue system, we must decide *what* the character can talk about. Most task-oriented systems work within a specific domain, which is a way to increase robustness for the system. These domains are tailored for the specific area in which the dialogue system operates, such as handling bank transactions or travel arrangements. Dealing with more open-ended conversations may require another approach in defining the domain, such as by use of the meaning potential for specified situation types as described in section 6.2 above. Inspired by Halliday, we may describe a social event, such as a party, as displayed in Table 4, below.

Situation Type	Party
Field	Music, drinks, food, people,...
Tenor	Entertainers, socializers, troublemakers,...
Mode	Form relationships, joke, flirt...

Table 4: Example of a situation type for defining the meaning potential

Which all together determine the meaning potential. In defining the meaning potential, we also define what is *relevant* in the context of the situation. We may

³see <http://www.disc2.dk/tools/codial/index.html> (general information) and <http://www.disc2.dk/tools/codial/guidelinetable.html>

of course allow the character to violate Grice’s maxim of relevance in order to create the unpredictable, but perhaps believable, behaviour that we mentioned earlier, but it is justifiable if the character cannot understand an irrelevant contribution from the player.

7 Dialogues in Games

7.1 Dialogue Types

Games are constituted by actions and events that the player must partake and quests or puzzles for the player to solve, and a major reason for communicating with characters in a game is to get a lead on what to do next as well as motivation for doing it. In most games these dialogues are purely functional and displayed to the player through static dialogue interfaces. We differentiate between three main types of potential verbal (text or speech) interaction:

(Meta)-Commands Corresponds to high-level commands and functions, such as *save*, *load* and *quit*.

Functional Dialogue Dialogues between the player character (PC) and a non-player character (NPC) in the game. They provide the player with background story, quests, hints and such. Most adventure and role-playing games have this feature.

Social Dialogue By which we mean in-game conversations between characters in the game as well as player-character conversations. The main purpose of these dialogues is to develop and uphold relationships and emotionally affect the other participants. The dialogues in the Sims™, for example, are of this nature. In this paper we are mainly concerned with the player-character interaction.

In our scenario, the social dialogue form the prerequisite for functional dialogues, i.e. situations in which the player wants the character to perform an action. Each dialogue may fail or succeed, depending on the outcome of the conversation. If the player wants the character to perform an action in order to help the player progressing the game, s/he has to learn how to best communicate with the character.

7.2 Dialogue Features

A dialogue system that can handle more or less unrestricted conversation between the player and a character (or several characters) requires at least the following dialogue features:

Turn-taking regulations i.e. how the participants in a conversation regulate when to take the turn, and who, if there are more than two participants. One has also to consider individual differences among the participants,

such as eagerness to take the turn as well as keeping it and their tendency to interrupt and give feedback. The interpersonal status among the participant must also be considered. (More on turn-taking regulations can be found in for instance Sacks et al., 1974; Jan and Traum, 2005). These parameters can to some extent be coupled to personality type; an extravert personality type may for instance be coupled with a high degree of talkativeness.

Multi-party dialogue i.e. dialogues with more than two participants. For multi-party dialogues among virtual characters there are several issues to take into account; there may be difficulties in identifying the speaker, especially if the participants cannot see each other, there are more agents competing for the turn, and it is also difficult to know who is addressed and who can receive the message (Traum, 2004). In the test scenario it will be possible to initiate a multi-party dialogue.

Mixed initiative where either the player or the character may initiate and control the dialogue. The initiative may change during the interaction. Mixed-initiative require more parameters to consider than just being able to take initiative, for instance the participants' interpersonal roles as well as the dialogue history, task and goal (Chu-Carroll, 2000).

Individual Grounding Strategies refers to how we acknowledge the current speaker by giving feedback in order to establish a common ground, which is the set of things that are mutually believed by both speakers (Jurafsky and Martin, 2000).

8 Affective Actions

The player and the character can perform a social/affective action towards each other. Both the performance of affective actions and being the target of them affects the character's mental state. The affective actions used in our scenario are limited to those that are possible to perform in a conversation. Table 5 shows a selection of affective actions that may be tried out in the test.

Note that the effects on the target and on the performer listed in table 5 are schematic. The nature of the effect depends on the character's mood and personality both concerning what the emotional response is to a certain action and how strong it is. In many cases it is also dependent on the sentiments that the character has towards the target and vice versa. For example, doing a friendly action towards the target has a more positive effect if there are active positive sentiment objects. Positive in this context means that the coupled emotion nodes are of the first, positive, category of emotion nodes, see Table 2.

The affective actions are actively chosen by the player, they are not effects of other social actions.

9 Summary

The scope of this paper is somewhat spread, where the core question concerns the relation between the player and the character, when the character has been detached from the player. We are presenting a tentative scenario in which the design goal is to provide the player with a new exciting experience that challenges the player's social skills.

The scenario includes a character with its own identity, tied to the player only in terms of a potential friend, or "assistant", that the player can interact with. The player must use his/her social skills to be able to manipulate the character. The character responds to the player's behavior in the form of affective actions, the performance of in-game actions and verbal responses.

We have presented different requirements needed to create a believable character, such as the mind module and a game dialogue system.

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Affective Action	Effect on target	Effect on performer
Agree enthusiastically	Joy	
Misunderstand on purpose	Distress Confusion	
Joke with someone	Amusement IF counter action is Laugh	Joy IF counter action is Laugh else Distress Sadness
Refuse to laugh at someone's joke. (Presupposes <i>Joked with</i>)	Distress Sadness	
Laugh at someone's joke. (Presupposes <i>Joked with</i>)	Joy	Amusement
Comfort (target must be sad)	diminish Sadness	
Cheer up (target must have low inner mood)	Amusement	
Give affirmation	Joy	
Threaten	Fear	
Blame	Shame	
Insult	Anger	
Compliment	Joy	
Interrupt insensitively	Anger Distress	Depends on relation
Ignore what someone tries to tell you	Anger Distress	Depends on relation
Be very attentive	Satisfaction	
Make person feel guilty (short term affect)	Guilt	Satisfaction
Make Self into Martyr (longer term guilt sentiment on target)	Guilt	Satisfaction
Forgive (target must have Guilt Sentiment)	Relief removal of guilt sentiment	
Show aversion	Distress Humiliation Sadness	
Show affection	Joy satisfaction	
Flaunt Big Secret	Interest	Amusement
Reveal Big Secret (Presupposes Flaunt BS)	Satisfaction	

Table 5: A selection Affective Actions.

D.9 Eladhari 2007

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The Player's Journey

Mirjam Eladhari

This paper discusses in-game characterization with a special focus on the conditions for character and identity development in massively multi-player online role-playing games (MMORPGs). Characterization is one of the tools that students in any narrative art form learn about in the very start. Narrative characterization is about describing *other* characters to an audience, viewer, player or reader. In virtual game worlds (VGWs) things are different because players characterize *themselves*. While much has been written about development of identity in virtual game worlds, (e.g., Bruckman 1992; Turkle 1995) there is so far not much material approaching the development of own fictional identities—player characters—from a poetic-aesthetic perspective. It is necessary to recognize not only that virtual game world creation is an art, but also that playing is an art in itself, providing performances both for the individual player and for the virtual society of the specific game world.

Can one talk about characterization at all if it is not a *performed* identity, or role, but instead a *real* identity expressed within a fictional setting? Can one talk about “true character” when the character in question is a real person, set in a fictional world, expressing an identity which may or may not be fictional, who may or may not be role-playing while performing it? In the following I draw upon thoughts from Bartle (2003) about the concept of persona, from McKee (1997) about the notion of true character, from Campbell's (1949) concept of the hero's journey, from Fine's (1983) thoughts on role-playing versus gaming, and from other sources to see if it is possible to take a few first glimpse under the veil. In particular, I am looking for possible ways to use characterization to create more meaningful dramatic experiences and to

deepen the possible immersion into the game world via closer identification with one's own player character. Methods for game mastering may be one way, while evolved rule sets and autonomous functions for player characters may be others.

MMORPGs and the Importance of the Player's Representation

MMORPGs have a set of more or less general features that control what type of game activities are available (Eladhari 2003), yet there are a few striking aspects of VGWs which make them unique and different from other forms of art. One of these aspects is how the openness of the narrative structures makes it possible for players to add their own goals to game worlds, which in turn results in added narrative potential in the world (Eladhari and Lindley 2004). This chapter, however, focuses more closely upon characterization—the core of good storytelling. In the VGW setting avatars are characterized by different persons who play. This may be compared with how literary authors try to simulate characters when their characters “come to life” with themselves driving the story. Here we have a similar situation, but it is a *performance* rather than a simulation.

VGW avatars are not only vehicles for movement or self-characterization, they are the functional cores of each individual playing experience. They are both the focus and the focalization point, i.e. the point from which to focus. As a player you see the world through the eyes of your avatar—your focalization point. When other players look at you they see your representation, your avatar—you are a focus. Furthermore, the state of your avatar controls what you can or cannot do in any given moment. From a design and engineering point of view, the avatar represents all effort to build the whole system, all of its functionality boiled down to be used by one super or base class that is the one that the player will use—to execute the whole

piece; to set the world into moving, living, changing; to add to its society, its dramas, its norms, its webs of social networks, its layout and architecture and to the world soul that is the synthesis of all pieces functioning, moving and rubbing together. If a minimal design change is made in player character (PC) functionality, the whole system must be changed. One could say that the player is a concentrated mirror of the whole world—in that size, too: a small mirror that reflects the whole world. The mirror is the player's peeping hole into the VGW. It is not only an interface; the whole setup of the character is dialectically related to the world. How PCs are engineered (i.e., what possible states, abilities and properties they can have) is wholly dependent on the world mechanics itself and vice versa.

Characterisation and true character

Characters and characterization are obviously central in VGWs. But what is characterization in this context? McKee (1997:100) makes the distinction between characterization and true character, defining characterization as such as what is merely observable:

Characterization is the sum of all observable qualities of a human being, everything knowable through careful scrutiny: age and IQ; sex and sexuality; style of speech and gesture; choices of home, car, and dress; education and occupation; personality and nervousity; values and attitudes—all aspects of humanity we could know by taking notes on someone day in and day out.

All these things applied in a game would be what we could see and note about another PC or about a non-player character (NPC) fairly easily by having a few conversations and maybe teaming up once or twice for common causes, like hunting or questing. True character, on the

other hand, would not be seen so easily. According to McKee (1997:101), “*true character* is revealed in the choices a human being makes under pressure—the greater the pressure, the deeper the revelation, the truer the choice is to the character’s essential nature.”

In order to see this in another player character, a deeper, long-term relationship is needed. In most cases these are friendships, but can also be love relations, curious obsessive enmities, or any other relationship that is more than an acquaintance. In relation to us as humans it is not uncommon to ask ourselves what we would do in a critical situation. Would you deceive your friends under pressure of losing your own life? If you were in an immediate life-threatening situation, would you panic or act with rational urgency? People who have been in critical situations often reflect upon their behavior afterwards and feel that they found out more about themselves when they reflected on how they reacted. This is true in the accounts of disaster survivors such as the sinking of the Titanic or the destruction of the twin towers in New York City, just as it is of players in VGWs.

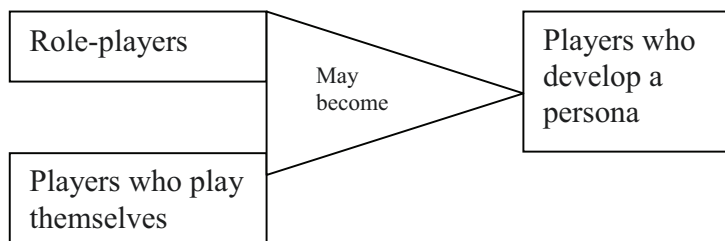
Role-play, Game-play and Persona

One question that arises in massively multiplayer online game (MMOG) contexts is whether the true character shown in the VGW is the true character of the PC or the true character of the player. We assume that in most cases what is shown is the true character of the player, this being due to two main factors. First, most players of MMOGs do not role-play a fictive character but instead play themselves in another world. Second, the assumption may be tied to one’s level of immersion in the game world and thus in the identity via which the world is experienced. Bartle (2003) has described the representation of the PC in terms of levels of immersion, going from avatar to character to persona—the highest level of immersion. The persona refers to a state

where the player does not differentiate between her/himself and the character. In Bartle's taxonomy, the player has an avatar if s/he only uses it as a puppet to control as her/his *representative* in the world. A player who regards the object that s/he controls as her/his *representation* in the world would have a character. The character is an extension of a player's self, a whole personality for the player when s/he is in-game. Most players play at the level of *representation* and often have several characters. In the most extreme state of immersion, the object that a player controls is not seen as a representation. Rather, the player has the experience of *being* the object:

A persona is a player, in a virtual world. That's in it. Any separate distinction of character is gone—the player is the character. You're not role-playing a being, you are a being; you're not assuming an identity, you are that identity; you're not projecting a self, you are that self. If you're killed in a fight, you don't feel that your character has died, you feel that you have died. There's no level of indirection, no filtering, no question: You are there. (Bartle 2003:155)

A player who feels that the game character is a persona rather than an avatar has not only achieved statistical proofs of achievement, but also a sense of synthesis, of really *being there*, in the game world. Therefore, players can be divided into three different groups:



These distinctions are by no means clear-cut. A role-player may develop a persona, a player who plays her/himself can sometimes experience having a persona or role-playing, and so on.

However, what all these modes of playing have in common is that the *player* is the one who carries out both the characterization of and the expression of the true character of her or his avatar/player character/persona in the current VGW.

In VGWs the characterization of the PC is done by the player within the gameplay framework provided by the developer. This means that we can divide up characterization into a number of dimensions.

1. The design of the gameplay framework, specifically the design and implementation of types of PCs (character classes).
2. The player's configuration of a PC before entering the VGW and possibly also formulation of a fictional background story for the PC.
3. The player's performance and development of the PC in the VGW.

Let us now explore these dimensions, each in turn.

1. Creating a Character

How a character is created depends of the details of the specific gameplay framework, but most VGWs let the player choose from among a range of different character types, such as race, class and profession (see IMAGE 1). Some game designs allow players to also choose a gender (often there is a neutral gender as one of the options for certain classes) and to customize the appearance (skin- eye- hair color, height, build, and so on). Often, different classes are better

for certain professions, but usually the choice is free.¹ The main skills chosen determine what the PC is especially good at. In game this gives the player a certain role in groups that are formed to do something specific, like quests or hunting sessions. Groups usually need to be put together so that they, as a whole, have the necessary skills and properties to succeed at a certain task.

In most games player can also change the properties of the character. The properties are the game-specific properties that define how strong, fast (and so on) the character is, which is often combined with skill levels that determine how efficient a certain action is. For example, if a player creates a character that is going to use a dagger as a weapon in *Asheron's Call*, s/he will probably choose a high value for the property Quickness. If the player intends to create a character that will use magic in some form he or she will probably place higher values on all properties that are related to the mind. These specific examples of using magic and daggers apply to MMOGs having a fantasy mythos (e.g. *Asheron's Call*, *Asheron's Call 2*, *EverQuest*, *Final Fantasy XI*), but similar setups are found in worlds with other genre-types, such as sci-fi (e.g., *Anarchy Online*, *Star Wars Galaxies*). A paradox for character creation is that players need to decide on important personal properties before they have entered the game world, so at the moment of creation they may not know what will be important to them.

¹ This freedom sometimes has a less efficient result for achievement or “success” within the game system if a sub-optimal race is chosen for a particular functional class. In those cases players refer to “gimped” characters.

2. Player Characterization in the Game World

Once a player has entered a game, there are two dimensions to characterization. The first is how the PC can be perceived by other players, while the second is how the player perceives her or his own PC. Players can usually not see all of the properties of another player's PC.

Characteristics at a glance

Suppose a PC approaches another PC in-game. Things that are visible and audible in close spatial proximity are the characters' class, gender, specific physical appearance, motions and possible sounds associated with the PC. In most VGWs it is also possible to target the character and ask for more information. In some games the targeted PC gets a text message that another PC is accessing their information. In some games the amount of information that can be retrieved is dependent on skills in getting information (as in *Asheron's Call*). The information usually consists of information about the character's main skill type, level of advancement and the currently-wielded weapon. In many cases (as in *Final Fantasy Online*) it is also possible to see whether the PC is interested in joining a group. So what do we make of this? Depending on our current needs, goals or preferred type of activity, we can see if it is worth starting a conversation with the other player/PC or not.

Trial conversation

Suppose that we start a conversation with the other PC. First of all, as in all media, dialog is a powerful tool for characterization. Cherny (1994:11) shows an early example from the text-

based VGW, *LambdaMOO*, of how players program personal and characteristic behaviors into their avatars that can be triggered by keywords typed by other players.

Besides pure dialog, in conversation it is also possible to use emotes, to add gestures and other type of information into the conversation. How much of this can be animated differs from game to game. Emotes are available in text-based MUD forms, and in many cases this gives a large degree of freedom to the player if it is combined with the freedom to program behaviors. This is usually referred to as “scripting” and is something that has become more sophisticated also in recent graphical VGWs, most notably in *Second Life* and *Star Wars Galaxies*. Scripting is often used to put together chains of highly individualized emote sequences. In *Star Wars Galaxies* it is possible to set a mood for the character. The dialog system then adds comments in addition to the typed dialog. For example, if a character has the mood set to “wounded” and types “oh” the output in the form of text is the following: ““oh” Immigrain says, dismay in her eyes”. Also the facial expression is set to correspond with the mood (although not all moods have a corresponding facial expression). Another expressive feature is that certain words that the player types when talking freely in the area (i.e. not in a specific chat channel) triggers a PC animation sequence. For example, if the player types “yes”, an animation shows the PC nodding.

Getting to know

Suppose that we decide to do something together with another PC. Let us also suppose that we both have just joined the game world and that we therefore decide to do a “delivery quest” together. A quest of this type has the objective of delivering an item from one NPC to another, a type of quest often given to low level characters in many MMOGs. Such quests are simple and give players opportunities to see more of the game world while becoming accustomed to the

interface. Through the interactions associated with doing the quest together with another PC, we “get to know” the other character. That is, we get an idea about how this player character behaves and who s/he is.

“Self-characterization”?

All of this raises the question: How is characterization in VGWs different from how we get to know people in everyday, face-to-face life? One obvious difference is that it is *not* everyday life. Instead of being constrained by the properties we were born to, such as gender, appearance, health and conditioning by social class, by culture, by environment and by family, we are constrained by the mechanics of the game world rules and of its norm systems. If we compare this to moving to another country we could argue that both are situations where you change a lot of old constraints for new ones.

Can we still talk about characterization? In *Life on the Screen*, Sherry Turkle (1995) describes how she (as an English-speaker) felt when she lived in France. She became the “French-speaking Sherry” who “was not unrecognizable, but she was her own person. In particular, while the English-speaking Sherry had little confidence in being able to take care of herself, the French-speaking Sherry had to and got on with it” (p. 209) These things also happen in virtual worlds—but in real life we don’t perceive ourselves as performing any kind of “self-characterization”. We may in Goffman’s (1959) sense consciously create certain appearances to make a certain impression, but we don’t talk about characterization. Characterization is a concept strongly tied to pre-authored fiction. Methods for characterization are taught in contexts of learning to characterize characters in movies, novels, and, when it comes to games, NPCs. We could argue that VGWs are fictional and therefore all types of expression of information about a

certain player character must be seen as characterization. But many players see the time that they spend in a VGW—and especially their lived relations with the other players—as a parallel reality, possible to compare to a vacation or to any kind of social situation that has other types of conditions than the “everyday” has. This is also comparable to Oldenburg’s (1989) notion of different kinds of social places, where the home is number one, work is number two and the local pub is the third place. You go to the third place to socialize with other people, who in turn have many good effects for the individual and the community, but your primary reason for going there is that it is fun. For many players the VGW is such a third place.

In his sociological study of role-playing *Shared Fantasy*, Fine (1983) makes a distinction between game players and role players. The gamer plays the game as himself, while the player who wishes to lose himself in the fantasy is the true role-player—s/he plays the character. According to Fine, the gamer uses gaming as an extension of self, motivated by the question “Would I survive under these circumstances?” The gamer’s play tends to be more oriented toward succeeding in the game scenario than in the role-playing. For role-players, on the other hand, the emphasis on the role is much greater, to the point of the player claiming to be “another person” or “schizoid” (Fine, 1983:211).²

For the sake of argument, suppose that characterization is something that only the role-player does because a role-player makes a conscious effort to characterize the character s/he is performing, in a similar way that an actor would, except that there is no audience on which to make an impression apart from fellow role-players. The distinguishing factor would be the *conscious* act of characterization. But in fact (from a systemic point of view) the role-player and

² It ought to be pointed out that Fine’s study concerned multiplayer games, not massively multiplayer games.

the game-player use the same tools for expression and they do make impressions that are characterizing them as players and game characters. We still make impressions, and we are still (at least most of us) conscious of how others perceive us. Considering that MMOG players on average play around 20 hours per week (Yee 2002) it is probable that gameplay styles vary over time—maybe the role-players do not role-play *all* the time and vice versa.

To use the term persona as described by Bartle (2003), it takes time to become a persona in a game and that time is needed for development. The intention to evolve the PC over time into a persona is probably not tied to whether the player is game-playing or role-playing. A role-player actually *becomes* the character s/he plays, while the game-player develops a second identity, or second self, that s/he *becomes* when s/he is in the game world. Is the role-player still making a conscious effort to characterize the PC? If not, we lose our distinguishing criterion. Fine's (1983:211) assertion that the role player aspires to "lose himself to the fantasy" goes along the lines of Bartle's conception of the player becoming a persona, where "there's no level of indirection, no filtering, no question: you are there" (Bartle 2003:155). In Bartle's view, which I share, the "celebration of identity is the fundamental, critical, absolutely core point of virtual worlds" (p. 159). To develop a second self, or a persona, is "the final level of immersion" and "virtual worlds enable you to find out who you are by letting you be who you want to be" (pp. 161, 160).

3. The Development of Identity

Now we seem to be entering a realm where we have gone from *characterization* to talk about the development of *identity*. Sherry Turkle (1994:158) wrote that in MUDs, "there is an unparalleled opportunity to play with one's identity and to 'try out' new ones. MUDs are a new

environment for the construction and reconstruction of self.” Taking identity as a concept, it often refers to “one,” just as we only each have *one* physical body. However, in contemporary theories the concept very often refers to having several identities depending on context; this is something that we all recognize in today’s differentiated society where we use different (context-dependent) roles. Our embodiment, however, follows us into virtual spaces, despite Barlow’s (1996) words in his Declaration of the Independence of Cyberspace that “our identities have no bodies.” In VGWs, we are not restricted to having only one virtual body.

Development of Identity through Sequences of Events

The development of identity, where part of the process is to change and mature, comes with challenges. We learn about ourselves all the time, but especially in situations that are comparable to those in which fictional characters show their “true character”—under pressure, in conflict situations, and in situations that involve difficult choices. Is there a “player’s journey” just as there is a “hero’s journey” (Campbell 1949; Vogler 1992) in which a true character is revealed? And if *yes*, is this the true character of the player’s character, or of the player’s in-game persona?

In the hero’s journey, just as in Propp’s (1968) *Morphology of the Folktale*, we find a strict chronological sequence of events and a concentration around the main character: the hero. The hero is said to have a character arc, which is the path of growth that a character undergoes, and the character’s choices in difficult situations reveal his or her true character. The other characters in the narrative also have character arcs, but their main functions are to function for the hero, not for themselves. They inhabit other character archetypes and include, in addition to

the Hero: Mentor, Higher Self, Allies, Shape Shifter, Threshold Guardian, Trickster, Shadow and Herald.

Single-Hero Centered Structures in Multiplayer Games?

In multiplayer games it is not possible to have meaningful game play for all participants if they all have the role of the hero at all times, nor if they are all *merely functions* for a single hero. This is an obvious fact in live-action role playing contexts, and very clearly expressed in Section 3 of the Dogma 99 manifesto (Fatland and Wingård 2003:20): “No character shall only be a supporting part.” The challenge is that of how to accomplish heroship for all PCs, while also allowing PCs to play *other* functional roles for *other* PCs in *their* functions as heroes.

The concept of heroism in this sense builds upon a couple of central concepts. One concept is that of *singularity*, to “be the one” (who saves the world), i.e. to be chosen. Another central concept is that the individual does something admirable and *good* according to a specific norm system. A third central concept is that heroes are the ones who songs and stories are written *about*. For the hero’s sake, this is not anything that happens while the adventure goes on; the hero becomes a hero only once the story is told. There is no heroism if there is no scribe, or writer of ballads, and an audience to whom the story is later told. The songs are sung in contexts where the hero is seldom present. There is a part of this happening in virtual worlds—we can see it on player pages and guild pages on the Internet, but it is in most cases secondary to the play. What is most important to the player is the journey, not the tale about the journey.

The Journey as a Route to Self-Knowledge

Richard Bartle (2003) compares the online player's journey with the hero's journey, step-by-step along the route Campbell (1949) described. Bartle interprets the hero's adventurous journey as the player's journey towards mastering two worlds, where the player's goal in the journey within a virtual world is that the virtual self and true self become the same. In this case the player's journey begins in real life, with getting hold of an account that lets the player log into a virtual world. This represents the "departure." The "initiation" stage takes place wholly within the virtual world, while in the "return" the player is separated from the virtual world but has learned a lot about her/himself along the journey.

Exactly what players learn about their true selves varies. Amy Bruckman (1992) explores one consequence of the player's journey with a PC named Tao. Tao tells her that he learned a lot about himself through spending time in the virtual world. For example, he learned how to organize people, give orders, and went through the difficult experience of serving as a defense council for a friend. Bartle's conjecture is that "playing virtual worlds is a kind of hill climbing activity through identity space" (2003:440). Tao's conclusion that, "these experiences have helped me to know my self better" (p. 35) is partially in line with the challenges any hero faces and is experienced by other role-players in virtual worlds (see Turkle 1995). Significantly, his conclusion is also somewhat different from the task we are used to heroes completing: successfully fighting evil.

A More Interesting Journey?

How would it be possible to make this journey more interesting? We have already seen that there are a lot of tools that provide players with the means to characterize their PCs, but

what about the expression of true character? Suppose that we get along well with the PC that we went on a delivery quest with, that we start doing more things together, and eventually end up joining the same guild, a permanent grouping of players, and thus develop a social network together within the VGW. How do we see the “true” aspects of the other player’s character, and how is our own true character expressed?

What I am getting at is this: How can we create situations that involve challenges, conflicts and choices that would express the true character of a player—or a PC? We could make it easier for ourselves and say that we don’t care about that distinction and ask how the true character of a persona would be expressed. But in doing so, we would ignore the long phase of playing that takes place before a persona is developed. We could probably also presume that the expression of true character would help the player to develop a persona – and thereby get a deeper and more meaningful experience of playing and inhabiting a virtual game world. For the sake of this argument we would also need to state that we see the development of a persona and as a good thing—we want to find further means to support the development of a persona. An important step in this process is the first identification with the PC. The fact the PC creation is done by the player her/himself creates a sense of ownership from the beginning, comparable with an initiation ritual. But then there is a matter of deepening the bond and the sense of identification of the player with her or his PC. If the player feels that the discrepancy between the perceived real self and the PC’s identity is too great, or feels uncomfortable for some reason, the player might quit the game entirely, start playing another game, or create a new character.³

³ An exhibition by Robbie Cooper, entitled *Alter Ego*, in Proud Galleries in London, England on October 8-26 2004 (http://www.proud.co.uk/exhibitions/exhib_ego/) consists of photographs of

Character classes are usually varied, and there are several tools for the players to express themselves—as themselves playing in another world, or as fictional roles they perform. The classes may be considered as more or less stereotypical, mostly depending on design heritages from the Advanced Dungeons and Dragons system, the different code bases that to a large extent form the game play paradigms in VGWs and on content based heritages from fantasy and science fiction mythos. Nevertheless players are provided with a large range of tools for

players of virtual worlds, alongside screen shots of their avatars. Richard Bartle reflected upon the exhibition on the TerraNova website, giving an example of the player April who left *EverQuest* since she felt that her representation in the game did not match her real life self. Bartle's post on Terra Nova October 16, 2004 reads: "Some of the person/avatar pairs said more than others. The one I found most interesting was a young woman called April who played as Jaynex. She claimed to have lacked confidence before she got into virtual worlds, and to have gained confidence as a result. She'd begun on [*EverQuest*], but had gradually become frustrated with it and had moved on to [*Star Wars Galaxies*]. There, she'd created an avatar that she'd made look exactly like her. Some points about this: 1) The avatar does not look exactly like her. It may look like how she sees herself, but there are some striking differences, most notably hair and eye color. 2) She had to leave [*EverQuest*] because her [*EverQuest*] self no longer matched her. In other words, the avatar wasn't a good fit any more. How many other people stop developing because they're locked into their avatar, rather than starting a new avatar (or changing the way their avatar looks)? 3) She may have the same look (in her mind) as her RL self, but she doesn't have the same name. She still doesn't feel that's her."

(http://terranova.blogs.com/terra_nova/2004/10/reflections_to_.html#comments)

characterization in the sense of what can be seen, including more static properties as well as behavior and styles of play and expression. And players *do* use this in very innovative ways. When it comes to expression of characterization and true character, players' imagination and creativity takes them a long way. Nothing in the current *system* supports the expression of individual true characterization of the player characters or the personas. How can the game design provide more support in this? Basically there are two main ways of doing this—by game mastering and by implementing means for it in the game play framework.

Supporting Expression of True Character via Game Mastering

A controversial example of game mastering is the (now infamous) event involving the trader Malaki in the VGW *A Tale in the Desert*. Trader Malaki was said to trade valuable goods, yet he “would not trade with women, and made references to trading /for/ some of them as slaves. This did not go over well at all, and he was eventually hounded out of Sinai, by a small revolt led by Logicritus, after peddling one or two of his wares for some expensive items. He later turned up in Karnak to do the same, with the same result.”⁴ This stirred up a lot of emotions and discussions in online forums. What it meant game-wise was challenging and called for reactions. Some players with male PCs *did* trade with Malaki, while others refused. The PC Logicritus even started a small revolt. Andrew Tepper (2004), creator and owner of *A Tale in the Desert*, commented on the event:

Along comes a foreign trader, with shiny new goods, and an attitude that's totally offensive, totally out of line with the culture that has developed in our Ancient Egypt.

Would you trade with him? Would you put aside your morals, if it meant you'd get an

⁴ For details, go to: <http://wiki.atitd.net/tale2/TheTraderMalaki>

advantage that many people don't have? In real-life, would you patronize a store that had a "No Jews allowed" policy? What if they had *really* good prices? Would you do it and hope nobody saw? Maybe feel guilty? The best books, movies, television—can provoke a range of emotions. I like books that make me feel happy, enraged, triumphant, guilty, enlightened, sad. I want to have all of those emotions available in an MMO, and emotions occur in players, not characters.

A side note: in this particular instance the riot and the negative reaction came from the *players*. Had it been only NPCs having a norm system as in ancient Egypt, or players strictly role-playing within the norms of the fictional historic society, there would have been nothing strange or notable with the trader's behavior because such behavior was not necessarily discriminatory within that normative system.

This event is important because it represents a test of the *player's* true character. In a role-playing situation this might instead have been reflected upon afterwards, in an out-of-game setting. But if a player plays her/himself suddenly transported to ancient Egypt, the strong emotions are more understandable. It may be argued that the player's were indeed role-playing, considering that the norm system that evolved in this particular fictional version of old Egypt does not tolerate discrimination of women and supposes that the (whole) player base shares this perspective. If so, this becomes an example of how game mastering can bring out expressions of true character not only by players, but also PCs. The danger with this is to push it too far and thereby alienate players from the game world.

Even though the world is virtual and the setting is a game, it is not possible to trivialize the emotional impact of events involving the player's own character—Dibbell's (1993) story about the rape committed by MrBungle in the text based virtual world *LamdaMOO* clearly

showed that our virtual personas are vulnerable. An even earlier example is van Gelder's (1985) "The Strange Case of the Electronic Lover," which takes up issues of mind-to-mind encounters, gender swapping, deceit and construction of alternative personas. Whether the players in the virtual worlds play as themselves or adopt roles to play game mastering is a powerful tool for creating dramatic and challenging situations that can support the expression of true character.

Supporting Expression of True Character via the Framework of Game Rules

Besides game mastering, another way of supporting the expression of true character and the development of persona would be to extend the functionalities of the object the player controls to better reflect an actual personality. The personality would consist of the distinctive and characteristic patterns of thought, emotion, and behavior that define an individual's style and influence his or her interactions within the VGW. As an example, let us say that a character has a phobia for a certain type of objects in the world. How shall a player deal with that if an object creates an involuntary reaction of fear for the character? Let us also suppose that this phobia is either chosen by the player her/himself, or that it was caused by a prior traumatic event within the game world. The reaction to this would also be dependent on the PC's personality and different PCs might react differently to a situation involving specific emotions. There is an obvious danger in implementing systems that make a PC behave or be inclined to behave in a certain way—too large an amount of control over the PC would be taken away from the player, thus alienating her/him, which is directly opposite of our intentions. But, for the sake of the argument, we can suppose that it is possible to tweak the system in a way that does not take control away from the player, but that it instead poses a challenge.

There are innumerable ways of implementing personality-specific behavior outputs depending on the type of personality models are used and the type of game play framework.

There are a number of models derived from research in social sciences, and of course it is possible to define game-specific personality models from scratch. Some models are under development (Moffat 1997; Egges, et al. 2003; Eladhari and Lindley 2003), where the personality models are mainly inspired from the NEOAC model of personality traits.

Considering the vast field of theories around personality, affect and temperament, this is a field that leaves room for numerous different ways of experimenting with what mind, identity and personality would mean in the context of VGWs. The prevalent gameplay paradigms derived from previous games are by no means mandatory, even though they have formed both players' and developers' expectations of what a MMOG should be like. Games having different gameplay paradigms, such as *A Tale in the Desert*, which is a non-combat game featuring political violence (metaphoric backstabbing) rather than physical violence (actual stabbing), has still been able to find a stable player base.

A system incorporating the personality modeled and developed by the player into the PC may well be a support for both creating and experiencing situations more dramatic and individualized than most VGWs currently provide. Together with game mastering this might be a tool that both expresses the true character of the PC or the persona and leads to experiencing more immersion in the game via closer identification with the object that the player controls. It may also be a basis for the creation of individual, dramatic story arcs. However, it is crucial to bear in mind that even though the creation of VGWs can be an art, playing in them and inhabiting them can also be a performative art form in itself. VGWs may in the future provide systems that support the emergence of true individual story arcs, game mastering that can bring

out the true character, and more sophisticated support for the development of personas, but it is the player's task to inhabit them, play them, and maybe develop within them. That is the player's journey.

Conclusion

Most virtual game worlds today have elaborated tools for characterization of player characters, but less for bringing out their "true character." The expression of true character in game worlds could lead to deeper and more meaningful dramatic experiences as well as supporting a higher degree of immersion into the game world via closer identification with the avatar, which in turn could support the development of a persona. One hypothesis is that this may be achieved partly by game mastering and partly by developing more sophisticated architectures for the player's representations in the worlds. To author individual dramatic story arcs for each player is not possible for a designer of massively multiplayer game worlds. It is instead the player's individual journey that creates the story, along with living, creating, and developing within the world.

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IMAGE 1. Screens for choosing heritage group and profession in Asheron's Call.

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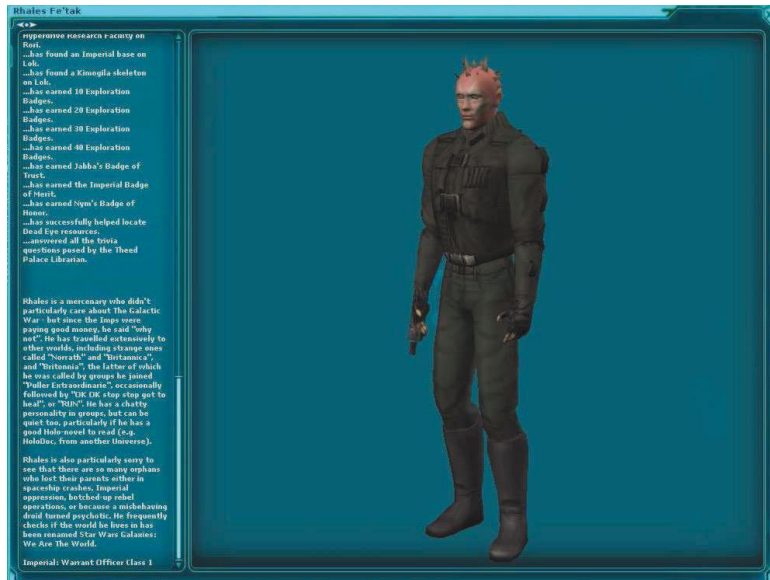


IMAGE 2. The screen representing the player character Rhales that is displayed when another player examines Rhales in *Star Wars Galaxies*

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IMAGE 3: The player has chosen the mood "vengeful" which for a player character in Star Wars Galaxies is reflected through the character's facial expression.

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IMAGE 4. Two player characters taking a break while doing a quest in Star Wars Galaxies.

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Good Moods

Outlook, Affect and Mood in Dynemotion and the Mind Module

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ABSTRACT

In this paper we describe two systems for autonomous characters intended to simulate the minds of characters in virtual game worlds. These systems, the Dynemotion People Engine (DPE) and the Mind Module (MM), are here presented with special focus placed on the design and implementation of the parts of the architecture that simulate what is colloquially called mood. The mood feature is presented to the user in both applications as a fine-grained matrix that summarizes the character's state of mind, typically a complex state. Thus in both systems the mood feature functions as a qualitative guide describing the affordances for the interaction with one's own avatar or another character at a given moment. This simplifies the design and balancing of game design in terms of authorial affordances and provides a more familiar context for user-character interactions.

Categories and Subject Descriptors

I.2.0 [Artificial Intelligence]: General—*cognitive simulation*; I.2.1 [Artificial Intelligence]: Artificial Intelligence—*games*

Keywords

mood, personality, trait, character, multiplayer, affect

1. INTRODUCTION

While trait theory from personality psychology and affect theory have been used as inspiration for systems that give agents emotions and personality, there is no obvious theory in the field of psychology or cognitive science to lean on when it comes to modeling what we in daily speech call mood. In this paper we use the word mood in this everyday sense, to mean an overall state or quality of feeling at a particular time. Mood changes faster than personality, but typically more slowly than individual emotions. The mood of a person in real life is a complex state. It is temporary and highly contextual, but can linger even if the context

changes. It is also individual, i.e., the way mood changes and fluctuates depends on the individual's personality and internal psychology, not just the context of the moment.

This paper began to take shape when the authors of this paper met for the first time. When comparing our systems - the Dynemotion People Engine (DPE) and the Mind Module (MM), we found striking similarities though the systems had been developed without knowledge of each other: Both systems are agent-based architectures for characters in multiplayer games, and use the Five Factor Model (FFM) as a framework for the personality of the characters. While the emotional system of the MM is inspired by affect theory [17] and the OCC model [14] and the DPE uses an original model based on an underlying Maslovian system, neither of us had found applicable theories to draw upon for modeling the summarizing state of mood, but both saw the need for such a feature. A summarizing display of a character's state of mind is useful both from an authorial perspective and from a user's perspective. In design readily understanding a character's mood is useful for understanding character motivations and interactions. From a user's point of view a representation of mood is necessary to have an accessible concentrated display of the current state of mind that otherwise might be too complex to understand in a multi-tasking game-world environment.

In both DPE and MM mood is a state that can be seen as "the tip of the iceberg" of underlying emotions. A character's mood depends on their personality and on what he or she has experienced in its current context.

Additionally, DPE and MM have similar solutions for displaying mood: both use the concept of a color coded matrix where the mood fluctuates along two axes that allow a high granularity of what the "mood" is, expanding beyond the binary notions of "good" and "bad" mood.

In this paper we present Dynemotion and the Mind Module with a focus on the summarizing state of a character's mood. We compare these systems, present a small qualitative user study and discuss the systems from a technical and authorial point of view.

1.1 Related Work

In psychology, trait theory has been developed to describe real life personality. Trait theory, pioneered by Allport in the 1930s [1], is one of several major branches of theories of personality, where the other branches roughly can be categorized as type, psychoanalytic, behaviorist, cognitive, hu-

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manistic and biopsychological theories. From the trait theory, several different personality assessment tests have been developed by psychologist, one of the most prominent being the Five Factor Model (FFM, also called “Big Five”), which can be assessed for individuals using a questionnaire called the NEO PI-R [10].

Factor	Trait
Openness	Imagination, Artistic Interests, Emotionality, Adventurousness, Intellect, Liberalism
Continuousness	Self-Efficacy, Orderliness, Dutifulness, Achievement-striving, Self-Discipline, Cautiousness
Extraversion	Friendliness, Gregariousness, Assertiveness, Activity-Level, Excitement-Seeking, Cheerfulness
Agreeableness	Trust, Morality, Altruism, Cooperation, Modesty, Sympathy
Neuroticism	Anxiety, Anger, Depression, Self-Continuousness, Immoderation, Vulnerability

Table 1: Traits in NEO PI-R (also called OCEAN).

Emotion modelling has during the past decades emerged as a separate field of study, where the theory presented by Ortony et al in 1988 proved to be an important landmark, now often referred to as the OCC model [14]. The OCC model is purely theoretical, written in the field of psychology, but several applications in the fields of AI and cognitive science have used it as an inspiration for frameworks for autonomous agents that simulate human emotion. Other work in the area of virtual characters that use both the FFM and the OCC as conceptual frameworks include work by Guoliang [5], Klesen [6], Kshirsagar[8], 2000) and El Jed [3], a virtual reality training environment tool for fire men. Guoliang’s work include a factor for an agent’s mood, where mood is briefer than a trait, but longer lasting than an emotion (this work also highlights the lack of unified definitions of mood in the literature). An excellent discussion of the field of virtual characters with personality, emotions and mood can be found in the State of The Art Report “Building Expression into Virtual Characters” by Vinayagamoorthy [18]. In contemporary games a few like The Sims 2 [16] have a bearing on this topic, where the characters have a mood represented as a diamond over the head of the character, which changes in colour depending on the mood. The mood in this case is a state that summarises how well a character’s needs, such as ‘hunger’ or ‘social’ have been fulfilled.

2. DYNEMOTION

The Dynemotion People Engine (DPE) is a system developed by Online Alchemy, Inc. for creating agent-based AIs embodied in a virtual world context. The DPE is intended for use in games and simulations for training, therapeutic, and other uses. The AI aspects of DPE characters can also be applied to the player’s avatar in a virtual world, providing the player with additional information about and insight into their character and the world.

2.1 Basic Attributes

DPE characters have personalities, desires, goals, and emotions. They observe and learn from the world around them,

they are able to exchange opinions and experiences, and their memories affect their later goals, actions, relationships and personality. DPE agents have a personality typically based on the Five Factor Model (FFM). This creates a long-term baseline for the character’s associations with their environment. For example, a character with a high Neuroticism score would be more likely to experience greater anxiety given an observation of the same “fearful” object than would another character with a lower Neuroticism score. Personality in DPE characters is not immutable, but can change slowly over time based on their experiences.

At the heart of the DPE is a set of quasi-Maslovian motivational desires that act as largely independent sub-agents. The type and number of these desires is variable, but they typically follow the outline of Maslow’s hierarchy of needs [9] including physical, safety, social, skill, and “contribution” or self-actualization needs. Through observation of external conditions (including observed objects, people, and events with emotional associations) and internal states, and modified by the character’s memories, associations, and personality, these desires determine the character’s goals and action choices.

2.2 Emotions

Significantly, each of the desires enables the mapping of separate internally perceived emotional content. That is, each desire creates an emotional state-space, such that a character might feel hungry, hopeful, lonely, and proud all at the same time based on the states of different internal desires. In broadly defining ‘emotion,’ we follow an approach informed by the Schacter-Singer “two factor” theory [15], including all cognitively apprehended aspects of physiological or qualitative psychological states and processes.

Some of these emotions appear and fade quickly, while others are much longer lasting (surprise vs. empathy, for example). This enables a much more nuanced and layered set of emotions that are tracked internally beyond just “happy” or “sad.” For example, “happiness” can correspond to various combinations of pleasure, delight, amity, satisfaction, empathy, and joy (an incomplete set of inexact names for “happy” emotions moving up the Maslovian hierarchy from physical to peak experiences). These emotional distinctions are not taken from any existing model, but are derived from the applicable emotions for each desire. These distinctions are necessarily qualitative, but have met with comprehension and acceptance in early user tests.

2.3 Mood Display

While DPE characters, like humans, have a richly textured internal emotional landscape, it is not always possible (or desirable) to communicate the many layers of feeling at all times. When interacting with another person, a pinched look on their face may indicate a variety of conditions from indigestion to social rejection; we map a complex internal space to our faces, gestures, and speech. This mapping condenses many conditions into a smaller state space which in turn aids in fast comprehension of overall qualitative emotional state - what we typically call someone’s mood. To aid in comprehension of one agent’s emotional state, or mood, by another agent or by a human user, we map the internal layered model to a two-dimensional space that is also color-coded to provide a qualitative, locational visual indication

of the overall mood. Internally each desire’s emotional state maps to this mood space, but the mood is typically displayed as an aggregate of all internal emotions.

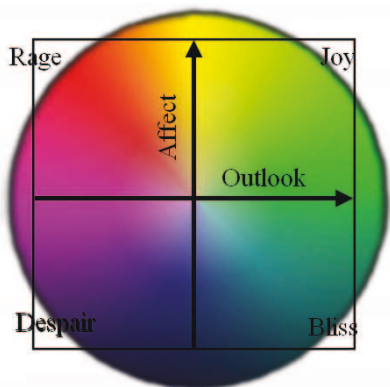


Figure 1: The Dynemotion Mood space and color

This mood mapping has two axes: the x-axis is termed “Outlook”; it is the overall positive or negative valence to how the individual is feeling - in broad terms from avoidance to attraction, unhappy to happy, or generally “bad” to “good.” The y-axis is a depiction of expressed energy, and is thus called “Affect.” In broad terms this varies from inert or insensate on the low end to very high-energy (surprised or excited) on the upper extreme. Combining these two axes together yields the two-dimensional mood space shown in Figure 1. Normalizing the two axes so that each covers the range [-1,1], we can describe the four extremes and other important points. High Outlook, high Affect (1,1) is high-energy happiness; this corresponds to pleasurable or joyful moods, or other forms of active positive feeling. High Outlook, low Affect (1,-1) equates to satiation or a peaceful, zen-like calm. Low Outlook and low Affect (-1,-1) describes an unmotivated (low-energy) unhappiness, best exemplified by despair. Low Outlook, high Affect (-1,1) can be seen as rage. The primary difference between these two negative poles is that in the latter the individual is ready to act, to lash out, while in the former the lack of energy indicates that no action is deemed possible or relevant.

In between these points we have the ends of the axes: high Affect (wired/excited); high Outlook (pleased); low Affect (lethargic or insensate); and low Outlook (not merely unhappy but also encompassing extreme repulsion or fear reactions). The color mapping applied to this quadrant system is based on a typical color wheel, but with some adjustments: the color becomes more saturated as values diverge from the center ((0,0) is emotionally neutral and thus gray), and the colors become darker with decreasing Affect. This yields a bright red for anger, a light green for joy, a blue-green for peaceful calm, and a deep blue-violet for despair.

In our early user testing, these color combinations have been readily recognizable as shorthand for mood when displayed on or around avatars. A group of characters with a red glow or red disks at their feet are quickly seen as being an angry mob, for example. Given the qualitative nature of the colors, as a character’s mood changes, corresponding changes in their displayed color value is an understandable indicator

of their emotional shifts. We have also experimented with assigning text-string indicators to different locations in this quadrant space (up to 64 separate mood names in an 8-by-8 grid); this text appears to work well as an adjunct to the color and positional indication, but is not sufficient on its own to quickly communicate a character’s mood.

It is interesting to note that these four quadrants correspond to the four medieval humors thought at the time to govern an individual’s internal emotional and physical balance: sanguine (high-energy happy); phlegmatic (low-energy happy); melancholy (low-energy unhappy); and choleric (high-energy unhappy). While this cannot be taken as anything more than an anecdotal correspondence, it highlights the fact that in devising systems to simulate or emulate emotions and moods, there is little more than personal experience and anecdote in the literature to base these on. The popular OCC model is itself an analytic approach to defining emotions by separating their referents - a paradoxically logical approach to quantifying what are ultimately qualitative states. An important area for continuing research is in devising emotional systems that are progressively more recognizable, complete, and predictable from the point of view of multiple, cross-cultural studies with humans.

3. THE MIND MODULE

The Mind Module (MM) is a semi-autonomous agent architecture built to be used in a multiplayer environment as a part of the player’s avatar. It can also be used with autonomous characters, but here we focus on its application to player characters. The MM models the avatar’s personality as a collection of traits inspired by the FFM, maintains dynamic emotion state as a function of interactions with objects in the environment and trait values, and summarizes the avatar’s current emotional state as an inner and outer mood.

3.1 Affect Nodes

The current iteration of the MM consists of a weighted network of interconnected nodes of four types: traits, emotions, sentiments and moods as shown in Figure 2.

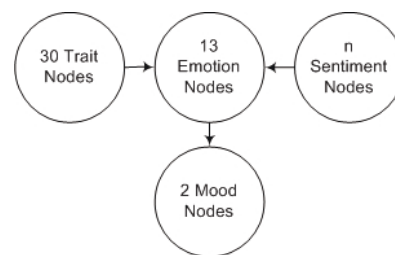


Figure 2: Affect Node Types

Emotions can be regarded as brief and focused (ie. directed at an intentional object) disposition, while sentiments can be distinguished as a permanent and focused disposition [12]. Similarly, mood can be regarded as a brief and global disposition, while personality can be regarded as a permanent and global disposition. Hence emotion, mood, sentiment and personality are regions of a two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other as illustrated in

Figure 3. A value of a node with a fast decay rate is non-zero for only a short period of time after the stimulus that causes the value of the node to change, and thus affects the value of other nodes in the network for only a short period of time.

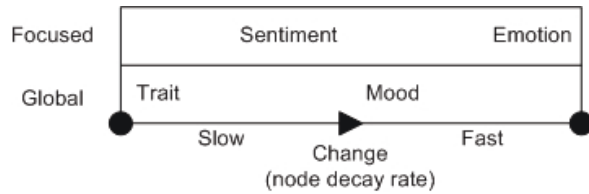


Figure 3: Two-dimensional affect plane

3.2 Personality and Emotions

The personality of a character defines the nature and strength of the emotions a character “feels” in different situations. The MM gives each avatar 30 trait nodes, inspired by the FFM, as shown in Table 1. The traits are grouped into five factors, with the value of a factor being a weighted linear combination of the values of the traits.

The choice of the 13 emotions (listed in the Mood section below) used by the MM emotions is based on research into affects and affect theory by Tomkins [17], Ekman [2] and Nathansson [13].

Through a mapping of weightings between emotion nodes and trait nodes, the MM defines how much the value of an emotion node fluctuates for each avatar. For example, the emotion node Amusement is connected to four trait nodes with the following weightings: Cheerfulness: 1.1, Depression: 0.9, Imagination: 1.2 and Emotionality: 1.1. Thus, stimuli that would lead to Amusement will lead to more Amusement the higher the trait values for Cheerfulness, Imagination, and Emotionality, and less Amusement the higher the trait value for Depression. Systematic information about effects of personality on emotion applicable for the MM is scarce. The current weightings between traits and emotion is experimental and is evaluated with the goal to create interesting game play experiences rather than simulating a set of beliefs of about the workings of the human mind.

3.3 Mood

The mood is a processed summary of current state of a character’s mind. The mood of a character is measured on two scales that are independent of each other, an inner (introvert) and an outer (expressive). Each scale ranges from -50 to 50; this corresponds to Depressed to Bliss on the inner scale, Angry to Exultant on the outer scale as shown in Figure 4.

The inner mood is the private sense of or harmony that can be present even if the character is in an environment where events lead to a parallel mood of annoyance. Reversely, a character in a gloomy mood can still be in a cheerful mood space if events in the context give that result. The nature of the outer mood is social, and as such tied to emotions that are typically not only directed towards another entity but also often expressed toward an entity, such as anger

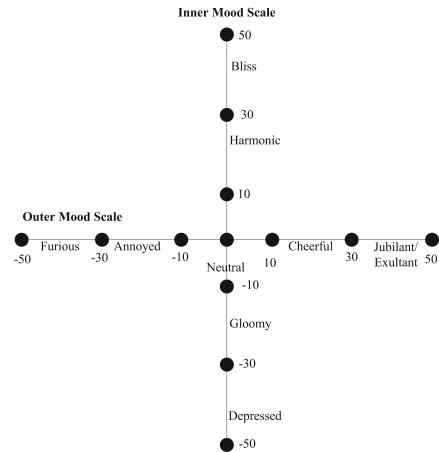


Figure 4: Mood matrix

or amusement. The two scales for the mood nodes open up the possibility of more complex states of mind than a single binary axis of moods that cancel each other out. The weightings between the mood nodes and the emotion nodes are shown in table 2.

Emotion	Weight to Inner Mood	Weight to Outer Mood
Amusement		+2
Interest - excitement		+1.5
Enjoyment - Joy	+2	+2
Relief	+1.5	+1.5
Satisfaction	+2	
Surprise - Startle	+1.5	
Confusion	-1.5	
Distress - Anguish	-2	-1.5
Fear - Terror		-2
Anger - Rage		-2
Shame - Humiliation		-1.5
Sadness	-2	
Guilt	-1.5	

Table 2: How the mood scales are affected by emotions.

The weightings in table 2 are those tested in the prototype described in this paper, and are subject to change. Just as with the mapping between traits and emotion there are few sources in psychology to draw upon for these details, and since the purpose of the implementation is to facilitate game play experiences rather than a true simulation of the human mind, the iterations of this aspect of the MM is tested and reiterated accordingly.

The real-time, or current, mood of the character is dependent on the nature and strength of the emotions the character has experienced the past hours. The strength of the emotions is different for different characters depending on their personality traits. The nature of the emotions differs depending on what sentiment nodes the characters have toward other entities in the context. Hence two characters going through a similar series of events potentially have dif-

ferent emotional experiences and therefore end up in different mood spaces.

3.4 Sentiments - Emotional attachments

A player character can have emotions associated with game objects. For example, a character with arachnophobia would have the emotion Fear associated with objects of type Spider. Such associated emotions are called sentiments. These are represented in the MM via sentiment nodes that link emotion nodes to specific objects or object types. Thus, if the player's avatar has a sentiment of Fear towards Spiders, and a Spider comes within perceptual range, there will be an immediate change in the value of the Fear node; the exact value of the change will be a function of the strength of the sentiment as well as the values of the traits that modulate the value of Fear.

The sentiment nodes of the MM allows several sentiments ie, of different emotions, to be attached toward an other entity, thus creating a compound set of sentiment. Sentiments can in a game world context be created several ways. The *emergent sentiments* origin from interactions with other entities in the world, thus creating emotional memories. The *authored sentiment sets* have certain pre-set combinations. For example "infatuation" is a combination of interest/excitement/amusement and joy toward another character. The authored sets of sentiments have a longer decay rate than the one's emerging from interaction.

The MM thus provides the player with information about the avatars feelings toward other entities in the world. Proximity to objects or characters affect the emotions, and thus the mood of an avatar, functioning as information the player can use to form an agenda for game play. Thus, in comparison to DPE the MM relies more on the player's own goal formulation.

3.5 Case study: Affecting the mood of a character using Affective Actions

In order to explore how players would take to the use of mood in a social game play context we devised a test scenario in a paper prototype, see Figure 5.



Figure 5: Guided paper prototype play test. A player is using an affective action

3.5.1 World of Minds

The context for the test was World of Minds (WoM), a prototype game world where the personalities of the inhabitants are the base for the game mechanics. When interacting with other characters, the reactions depend upon the player character's current mood and personality.

The basic game play of WoM is simple: Players need to defeat physical manifestations of negative mental states. In order to do so, they can cast spells on them, but the spells available are constrained by the avatar's personality, her current mood, and how far the avatar has progressed in learning new spells. Each avatar has mind energy (mana) and mind resistance (hit points). Each spell costs mind energy to use, and attacks reduce mind resistance. The experience of the character defines how large the possible pool of energy and resistance is at a given moment. The regeneration rate of resistance depends on the inner mood, while the regeneration rate of the energy depends on the outer mood, as shown in figure 6.

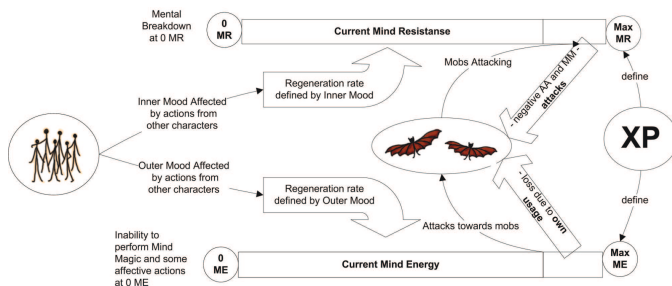


Figure 6: Fluctuations of Mind Energy and Mind Resistance

A central feature in WoM is that players can affect each other's moods by using affective actions (AAs). AAs are actively chosen by the players, they are not effects of other social actions. If a player targets another avatar she can choose from a selection of AAs. For example the AA "Comfort" can be used successfully on targets that have an active emotion node of Sadness, but only if the player's own avatar is not in the area of Furious on the mood matrix. If the AA Comfort is used successfully the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character.

Sentiments for avatars in WoM are generally instantiated as a result of a player character's action or of a result a player's choice. In the current implementation sentiments are instantiated when an emotion node reaches a threshold value, in most cases set as 90% of its maximum. Figure 7 is an illustration of how an affective action or a spell causing amusement is interpreted by the MM. The values on the arrows between the nodes are weights.

3.5.2 Play-test

Our approach for evaluating the game design via a paper prototype draws on User-Centered Design, where the user's experience is a main driver for design, as well as from rapid prototype and playtesting approaches that are becoming more common in game design [4]. During the playtests, the test leader walks individual players through a paper simu-

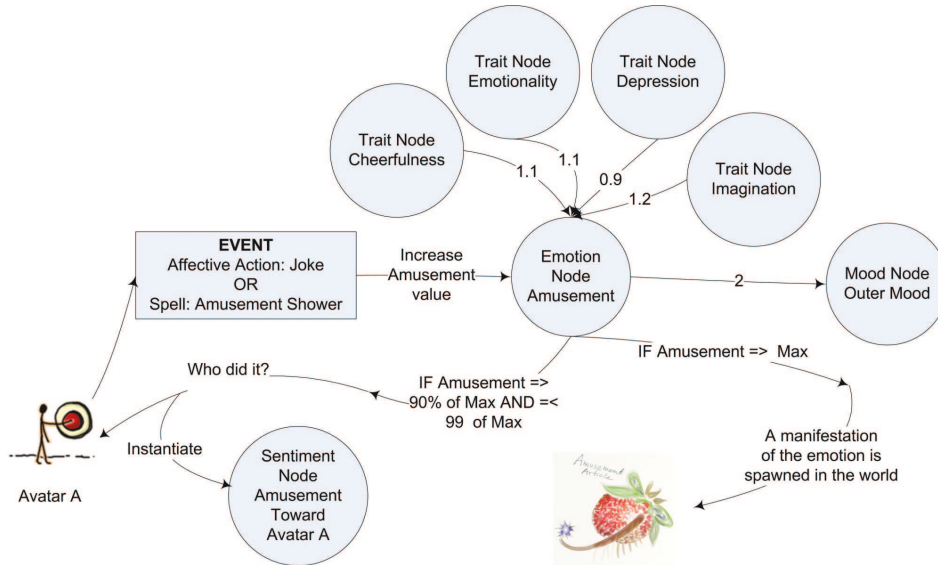


Figure 7: An example of how an amusing action is interpreted by the MM

lation of several scenarios. Players are asked to think aloud while playing the game; additionally, the test leader stops the game at several points and conducts interviews. Our approach is described in detail in [7].

Ten players individually went through five game mastered scenarios where her avatar had a mind, represented by the character sheet as shown in Figure 8.

During the five scenarios, the player was guided through using the main categories of actions in the game, including affective actions, navigation in a landscape of sentiment, and mind magic spells. Using the character sheet (Fig. 8), the test leader updated the state of mind of the avatar and NPCs, showing the player the effect of her actions in the game in terms of fluctuations in emotions, mood, mind energy and mind resistance. In order to best capture player’s problem-solving processes within the game, and to best understand potential areas for confusion, the players were given minimal explanations about how and what to do. At any point, players could access a “help system” in order to ask any question. The twenty-two interview questions focused on the player’s understanding of the relationship between values in the MM, effects of game actions, relationship between personality and availability of actions such as spells, etc.

For each playtest, the participant:

1. Filled in a short (less than ten questions) survey on demographic data and previous gaming experience.
2. Took the IPIP-NEO Personality test and emailed the results to the test leader.
3. Filled in a short survey about their experience taking the personality test and their opinions about the use of personality traits for avatar creation.
4. Participated in the playtest, which took between 1 and 1.5 hours. Each playtest session consisted of playing

five scenarios, and answering questions in two interviews, one in the middle, and one at the end of the playtest. Each session was videotaped.

5. Filled in two more short surveys, one focused on sentiment objects, and the other on general impressions of the experience.

We used the video analysis tool Transana to analyze the 15 hours of video of interviews and play sessions. We developed a coding scheme for potentially relevant phenomena and states of mind; this provided us with the initial framework for searching for patterns and regularities, as advocated by Miles and Huberman [11].

3.5.3 Players and affective actions

The scenario that was most interesting for results regarding the mood feature were where the player met the character Teresa, who was played by the game master. Teresa had an identical character sheet but with values showing that she was depressed. She introduced the player to the use of Affective Actions (AAs) by saying that she was very sad, and asking for a “hug”.

Seven of the players chose to “hug” Teresa, while three of them started the chain of AA’s in the scenario with using “Comfort”. The AA “comfort” would diminish the emotions of sadness and anguish in the targeted character. No one chose the AA “Look at target with dismay” which would have created an increase in the nodes confusion and sadness. Some AA’s were to be used in a reciprocal fashion, such as “joke” where the target could respond by either “Laugh at joke”, or “Refuse to laugh at Joke”. Using such an AA included a risk, since if the target chose (or had to) to refuse, the effect on the joker would be an increase in distress and sadness. Laughing on the other hand would give both the joker and the target an increase of amusement, plus an increase in the satisfaction node of the successful joker. However, if the target of the AA “Joke” had her mood marker in the leftmost row in the mood matrix (4) it was not possible

Figure 8: Mind Sheet used in playtest of WoM.

to use the “Laugh at Joke” reciprocal AA.

The players enjoyed monitoring the fluctuations of the mood in their own avatars and Teresa and experimenting with different AAs. This scenario, one of five, was the most popular one: the majority of the players pointed it out as their favorite part of playing the prototype. Several of the participants used the expression “make sense” when discussing the mood feature in relation to the affective actions in the interviews conducted in relation to the tests.

4. COMPARISON OF MOOD REPRESENTATION IN DPE AND MM

The two scales of the mood matrices of DPE and MM are similar despite many differences in the details in the underlying systems. Both create a spatial representation with the extremes of anger, despair, exultation, and bliss, though each organizes the underlying axes differently. MM differentiates between inner and outer mood, while DPE puts both internal and social emotions in the same mood-space. Affect in the DPE is valence-neutral; that is, it is part of positive and negative moods alike. This is somewhat analogous to the change between inner and outer mood in MM, but the analogy can easily become strained. One aspect of modeling emotions and moods that is clear in both cases, and which was pervasive in our discussions, is the lack of clear terminology for referring to qualitative emotion and mood states. This hinders literature comprehension, design, and comparison between models.

5. CONCLUSIONS

We have presented two systems that simulate the minds of virtual characters where their moods are displayed as the aggregation of multiple underlying emotions. Unlike personality traits the mood depends on the context, just as emotions, but the mood lingers, bringing the emotional memory of recent experiences into the contexts, thus enriching an en-

vironment where characters appear more plausible than in the virtual game worlds to date. Players may use this information about their own avatar and other characters in the game in order to interpret the internal state of that character, what kind of actions that can be performed, or interpret what interactions would be appropriate in a given context. Guided play tests show that despite issues of naming moods, users find their graphical and textual display useful in game play situations that use metaphors of social interaction.

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Semi-Autonomous Avatars in World of Minds

A Case Study of AI-based Game Design

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ABSTRACT

In this paper we describe the Mind Module (MM), a technical framework for modeling personality and emotion for both player and non-player characters, and describe the World of Minds (WoM), an MMORPG that employs an AI-based game mechanic designed around the MM. Where most research on character AI has focused on autonomous characters, the focus of this work is on a semi-autonomous agent architecture built to be used in a multiplayer environment as part of the player's avatar. The MM models personality using the Five Factor Model from personality psychology, and maintains emotional state as a function of the personality and the avatar's interactions with people and objects in the world. WoM is a prototype MMORPG where the personalities of the player characters are the base for the game mechanics. In this paper, we provide a case-study of AI-based game design, describing the Mind Module, the game mechanic designed around the Mind Module, and lessons learned for both the AI and the game design from a playtest of a paper prototype of the game.

1. INTRODUCTION

Deep, round characters are necessary for creating engaging storytelling experiences. In Forster's terms a round character is complex and capable of contradiction, surprise and change. Round characters have a multitude of contradictory traits, while flat characters consist of only a few traits and usually have a single, static aim, transparent to the audience [10]. As Chatman puts it, "the behavior of the flat character is highly predictable. Round characters, on the contrary, possess a variety of traits, some of them conflicting or even contradictory [...] We remember them as real people. They seem strangely familiar. Like real-life friends and enemies it is hard to describe what they are exactly like." [5]

Much effort has gone into the creation of rich autonomous characters for games and other interactive experiences, often

focusing on single player games such as computer roleplaying games (CRPGs), and emerging genres such as interactive drama, sometimes referred to as 'lifelike' or 'believable' [3]. However, for massively multiplayer role playing games (MMORPGs), the focus is on player-to-player social interaction rather than interaction with non-player characters (NPCs); while round NPCs could be used to create a richer world, they wouldn't address the core interaction in such games. However, despite this focus on player-to-player interaction, current MMORPG designs fail to provide explicit support for helping players to roleplay and fail to incorporate such social interaction and roleplay into the game mechanics themselves. A goal of our work is to develop an AI-based game mechanic that brings round characters into massively multiplayer role playing games (MMORPGs) to support the player in roleplaying through their avatar. This is accomplished by building a personality-trait-based emotion modeling system, called the Mind Module (MM), which is employed by players' avatars as well as by NPCs, and creating a game design that explicitly leverages the state maintenance performed by the MM.

To understand the requirements for such a system, it is important to understand the gameplay dynamics of MMORPG worlds and how storytelling takes place in such worlds. Most characters in virtual game worlds are the player characters, not driven by artificial intelligence but by the real intelligence of the player. An MMORPG world is not a story, it is a place. As Bartle put it, you can tell stories about what happens in New York, but New York itself is not a story [2]. While the backstory of the world and the NPCs in it unfolds during playing, the most significant events are between player characters: guilds form, friendships deepen, enmities grow, wars are fought, and love stories and love triangles emerge; the personality traits of the player characters develop through these interactions. Any AI-based game mechanic that builds on player-to-player interaction must respect and support these processes by which a player characterizes their avatar both for themselves and in how they present or stage themselves with respect to other players.

The NPCs in MMORPGs are in most cases what we would call flat characters. Here it is important to note that, as Forster also stressed, flat characters do have their place and use in narratives. These are usually supporting roles to the main characters in the story. This is also the case in persis-

tent game worlds where the truly rounded characters are the player characters. The characters that Chatman describes as round (complex as "real-life friends") doesn't only *seem* to be real in MMORPGs: they *are* real.

In CRPGs the player character, or avatar, is the focalization point for all functionality in the game, the avatar becoming the object that contains and expresses the affordances of a particular player's possible range of action in the game world. In most CRPGs and MMORPGs the specifics of an avatar's affordances is mainly decided by the player's choice of class. Thus it is desirable that the affordances of the avatar reflect its qualities, such as personality traits, in order for them to be useful and meaningful in the world that the avatar inhabits. The underlying goal with the development of the MM and implementations built in junction to it is to find ways to utilize the richness of the present human intelligence in virtual game worlds and via, the right triggers, enrich the game experience in terms of character-driven drama woven into the virtual world through its rule system.

One of the most exciting possibilities in game AI research is for AI to open up new game design possibilities. In the process of AI-centric game design, new AI will suggest new design possibilities while design will push back on AI requirements. In this paper we provide a concrete case study of AI-centric game design, specifically describing how AI can be powerfully and effectively used in an MMORPG design. In this paper we present the Mind Module, a technical framework for modeling personality and emotion for both player and non-player characters, describe the World of Minds (WoM), an MMORPG that employs an AI-based game mechanic designed around the MM, and close the design loop by describing lessons learned from a paper prototype playtest of the novel mechanic.

1.1 Related Work

The MM employs a trait-based theory of personality. In analyses of rich and complex characters in novels and movies, scholars have argued for the usefulness of defining character personalities via traits. Chatman, for example, argues for a "conception of character as a paradigm of traits", where a 'trait' is a "relatively stable or abiding personal quality", noting that in the course of a story, a trait of a character may unfold or change. [5]. Complex trait descriptions make the difference between flat and round characters: "the behavior of the flat character is highly predictable. Round characters, on the contrary, possess a variety of traits, some of them conflicting or even contradictory [...] We remember them as real people. They seem strangely familiar. Like real-life friends and enemies it is hard to describe what they are exactly like." (ibid)

In psychology, trait theory has been developed to describe personality. Trait theory, pioneered by Allport in the 1930s [1], is one of several major branches of theories of personality, where the other branches roughly can be categorized as type theories, psychoanalytic theories, behaviorist theories, cognitive theories, humanistic theories and biopsychological theories. Trait theory mined English language dictionaries for all the adjectives that describe personality. Over the years, an initial list of 17,953 adjectives was eventually dis-

tilled into 45 personality traits. Personality tests were developed to rate people along these 45 traits; through factor analysis, five high-level factors organizing the traits were identified [4], [22]. This Five Factor Model (FFM) is now the standard personality trait model in psychology; the clustering of traits via factor analysis into five factors has been repeatedly empirically validated. The most prominent assessment test for the FFM is the NEO PI-R questionnaire, which uses 30 traits (see Table 1) [16]. The five factors are:

- Openness - appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity.
- Conscientiousness - a tendency to show self-discipline, act dutifully, and aim for achievement.
- Extraversion - energy, positive emotions, and the tendency to seek stimulation and the company of others.
- Agreeableness - a tendency to be compassionate and cooperative rather than suspicious and antagonistic.
- Neuroticism - a tendency to experience unpleasant emotions easily, such as anger, anxiety, depression.

While the FFM was originally developed to describe the personality of individuals in real life, it has been applied to a number of autonomous characters and conversational agents [6], [8], [15]. Like the MM, many of these implementations build upon the FFM, and take inspiration from the OCC Model [20] and affect theory [21]. The distinguishing feature of the MM is that it is specially designed for use with player characters in role playing games, supporting sentiments, described below, that can be used to create preferred individual responses for characters depending on immediate circumstances in a game world.

It is important to acknowledge that we by choosing what model of personality we use as the base for our agents make an implicit statement to the users of the systems about what a personality is. While the extensive use of the FFM may result in an unfortunate uniformity, it is beneficial that it is easier to compare the result of the work conducted in the field than if each researcher used a different theory of personality as inspiration for the architecture of personality.

Anders Tychsen and his colleagues used the game engine of Never Winter Nights to experiment with combining the FFM with a traditional D&D system [23]. This empirical study supports that the player's engagement in the player character is key for enjoyment in a multiplayer role playing game, that highly complex player characters are not a problem for the player, and that players in fact, despite complexity, tend to use all features of the player character. Furthermore, the results of their study indicate that likeness between the player's own personality and the avatars doesn't have an impact on the experience: avatars both very alike and very different from the players themselves were fun to play. This was encouraging for us, since it indicates that the same avatar system might be enjoyable for players whether they prefer to play as themselves or play an invented character different from themselves.

The first iteration of the MM was developed in parallel, but separately, from the first game world in which it was used. Though this first iteration got an enthusiastic reception from test players [14], the user tests showed that a tighter connection was needed between avatar affordances given by the MM and the game mechanics. The WoM prototype described in this paper is specifically designed to explore the tight coupling between the AI and the game design.

2. THE MIND MODULE

The Mind Module (MM) is a semi-autonomous agent architecture built to be used in a multiplayer environment as a part of the player’s avatar. It can also be used with autonomous characters, but here we focus on its application to player characters. The MM models the avatar’s personality as a collection of traits inspired by the FFM, maintains dynamic emotional state as a function of interactions with objects in the environment and trait values, and summarizes the avatar’s current emotional state as inner and outer moods.

2.1 Affect Nodes

The current iteration of the MM consists of a weighted network of interconnected nodes of four types: traits, emotions, sentiments and moods, as shown in Figure 1.

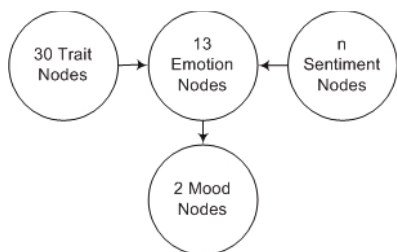


Figure 1: Affect Node Types

Emotions can be regarded as brief and focused disposition (ie. directed at an intentional object), while sentiments can be distinguished as a permanent and focused disposition [18]. Similarly, mood can be regarded as a brief and global disposition, while personality can be regarded as a permanent and global disposition. Hence emotion, mood, sentiment and personality are regions of a two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other as illustrated in Figure 2. A value of a node with a fast decay rate is non-zero for only a short period of time after the stimulus that causes the value of the node to change, and thus affects the value of other nodes in the network for only a short period of time.

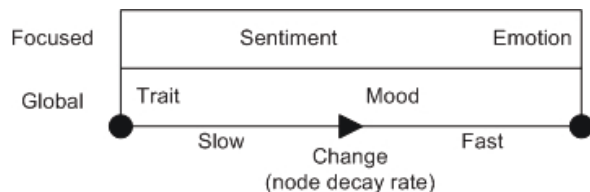


Figure 2: Two-dimensional affect plane

2.2 Personality and Emotions

The personality of a character defines the nature and strength of the emotions a character “feels” in different situations. The MM gives each avatar 30 trait nodes, inspired by the FFM, as shown in Table 1. The traits are grouped into five factors, with the value of a factor being a weighted linear combination of the values of the traits.

Factor	Trait
Openness	Imagination, Artistic Interests, Emotionality, Adventurousness, Intellect, Liberalism
Continuousness	Self-Efficacy, Orderliness, Dutifulness, Achievement-striving, Self-Discipline, Cautiousness
Extraversion	Friendliness, Gregariousness, Assertiveness, Activity-Level, Excitement-Seeking, Cheerfulness
Agreeableness	Trust, Morality, Altruism, Cooperation, Modesty, Sympathy
Neuroticism	Anxiety, Anger, Depression, Self-Continuousness, Immoderation, Vulnerability

Table 1: Traits from IPIP-NEO used by mind module.

The choice of the 13 emotions (listed in the Mood section below) used by the MM emotions is based on research into affects and affect theory by Tomkins [21], Ekman [7] and Nathansson [19].

Through a mapping of weightings between emotion nodes and trait nodes, the MM defines how much the value of an emotion node fluctuates for each avatar. For example, the emotion node Amusement is connected to four trait nodes with the following weightings: Cheerfulness: 1.1, Depression: 0.9, Imagination: 1.2 and Emotionality: 1.1. Thus, stimuli that would lead to Amusement will lead to more Amusement the higher the trait values for Cheerfulness, Imagination, and Emotionality, and less Amusement the higher the trait value for Depression. Systematic information about effects of personality on emotion applicable for the MM is scarce. The current weightings between traits and emotion is experimental and is evaluated with the goal to create interesting game play experiences rather than simulating a set of beliefs of about the workings of the human mind.

2.3 Mood

The mood is a processed summary of the current state of a character’s mind. The mood of a character is measured on two scales that are independent of each other, an inner (introvert) and an outer (expressive). Each scale ranges from -50 to 50; this corresponds to Depressed to Bliss on the inner scale, Angry to Exultant on the outer scale, as shown in Figure 3.

The inner mood is the private sense of harmony that can be present even if the character is in an environment where events lead to a parallel mood of annoyance. Reversely, a character in a gloomy mood can still be in a cheerful mood space if events in the context give that result. The nature

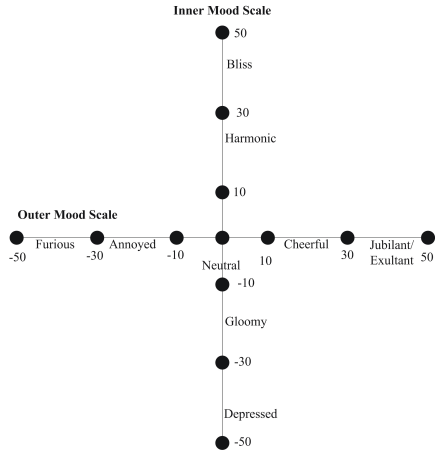


Figure 3: Mood matrix

of the outer mood is social, and as such is tied to emotions that are typically not only directed towards another entity but also often expressed toward an entity, such as anger or amusement. The two scales for the mood nodes open up the possibility of more complex states of mind than a single binary axis of moods that cancel each other out. The weightings between the mood nodes and the emotion nodes are shown in table 2.

Emotion	Weight to Inner Mood	Weight to Outer Mood
Amusement		+2
Interest - excitement		+1.5
Enjoyment - Joy	+2	+2
Relief	+1.5	+1.5
Satisfaction	+2	
Surprise - Startle	+1.5	
Confusion	-1.5	
Distress - Anguish	-2	-1.5
Fear - Terror		-2
Anger - Rage		-2
Shame - Humiliation		-1.5
Sadness	-2	
Guilt	-1.5	

Table 2: How the mood scales are affected by emotions.

The weightings in table 2 are those tested in the prototype described in this paper and are subject to change. Just as with the mapping between traits and emotion, there are few sources in psychology to draw upon for these details, and since the purpose of the implementation is to facilitate game play experiences rather than a true simulation of the human mind, the iterations of this aspect of the MM are tested and reiterated accordingly.

The real-time, or current, mood of the character is dependent on the nature and strength of the emotions the character has experienced recently. The strength of the emotions is different for different characters depending on their personality traits. The nature of the emotions differs depending

on what sentiment nodes the characters have toward other entities in the context. Hence two characters going through a similar series of events potentially have different emotional experiences and therefore end up in different mood spaces.

2.4 Sentiments - Emotional attachments

A player character can have emotions associated with game objects. For example, a character with arachnophobia would have the emotion Fear associated with objects of type Spider. Such associated emotions are called sentiments. These are represented in the MM via sentiment nodes that link emotion nodes to specific objects or object types. Thus, if the player’s avatar has a sentiment of Fear towards Spiders, and a Spider comes within perceptual range, there will be an immediate change in the value of the Fear node; the exact value of the change will be a function of the strength of the sentiment as well as the values of the traits that modulate the value of Fear.

The sentiment nodes of the MM allows several sentiments, i.e. of different emotions, to be attached toward another entity, thus creating a compound set of sentiments. Sentiments can, in a game world context, be created in several ways. The *emergent sentiments* originate from interactions with other entities in the world, thus creating emotional memories. The *authored sentiment sets* have certain pre-set combinations. For example “infatuation” is a combination of interest, amusement and joy toward another character. The authored sets of sentiments have a longer decay rate than the ones emerging from interaction.

The MM thus provides the player with information about the avatar’s feelings toward other entities in the world. Proximity to objects or characters affect the emotions, and thus the mood of an avatar, functioning as information the player can use to form an agenda for game play.

3. THE WORLD OF MINDS

A problem with doing applied design research on top of existing dominant MMO game mechanics [9] is that the researcher risks ending up “skinning” already existing game play paradigms. By borrowing a trait system from psychology, and building the MM to perform state maintenance as a function of those traits we have created a base on which we can experiment with genuinely novel MMO mechanics.

World of Minds (WoM) is a prototype game world where the personalities of the inhabitants are the base for the game mechanics. When interacting with other characters, the potential emotional reactions depend upon the player character’s current mood and personality. We are building WoM using the Torque Engine and Praise Games’ open source MMOKit. The Mind Module, which is written in C++, is wrapped with SWIG so that it is accessible via Python, the scripting language of the MMOKit.

The basic game play of WoM is simple: Players need to defeat physical manifestations of negative mental states. In order to do so, they can cast spells on them, but the spells available are constrained by the avatar’s personality, her current mood, and how far the avatar has progressed in learning new spells. Each avatar has mind energy (mana) and mind resistance (hit points). Each spell costs mind energy to use,

and attacks reduce mind resistance. The experience of the character defines how large the possible pool of energy and resistance is at a given moment. The regeneration rate of resistance depends on the inner mood while the regeneration rate of the energy depends on the outer mood, as shown in Figure 4.

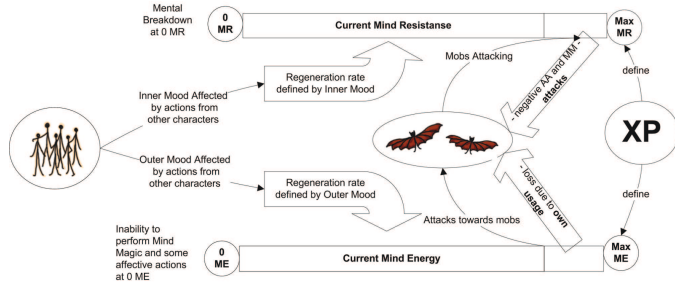


Figure 4: Fluctuations of Mind Energy and Mind Resistance

Players can affect each others' moods by using affective actions (AAs), thus controlling the selection of spells available. AAs are actively chosen by the players; they are not effects of other social actions. If a player targets another avatar, she can choose from a selection of AAs. For example the AA "Comfort" can be used successfully on targets that have an active emotion node of Sadness, but only if the player's own avatar is not in the area of Furious on the mood matrix. If the AA Comfort is used successfully, the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character.

Sentiments for avatars in WoM are generally instantiated as a result of a player character's action or of a result a player's choice. In the current implementation, sentiments are instantiated when an emotion node reaches a threshold value, in most cases set as 90% of its maximum. Figure 5 is an illustration of how either a spell or an affective action causing amusement is interpreted by the MM. The values on the arrows between the nodes are weights.

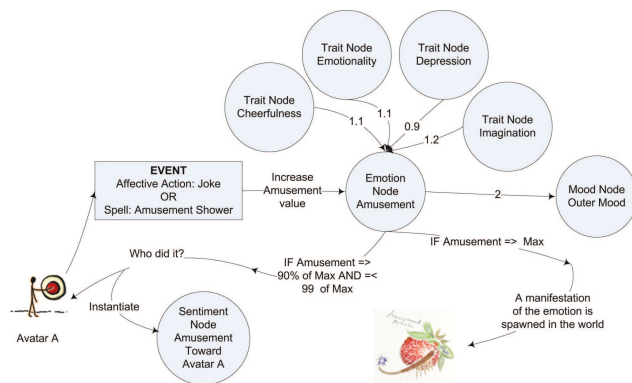


Figure 5: An example of how an amusing action is interpreted by the MM

4. GUIDED PAPER PROTOTYPE PLAYTEST OF WOM

4.1 Playtest Research Questions

The playtest was designed to elicit design feedback from players on three different questions: 1) During gameplay, are players able to "reverse engineer" the MM to build a mental model of how to manipulate emotional state to achieve gameplay goals? For any successful game design, players must be able to build a model of the mechanics that allow them to successfully interact with the game. 2) Understand the player's theory of how traits relate to MM state and gameplay in order to gather new design ideas for how traits might influence emotional state and gameplay. 3) How do the players perceive the relationship between the emotional state maintained by the MM and the game mechanics and interaction options that depend on that state?

In this section we describe our playtest process. Given our research questions, we decided to focus the playtest on the initial portion of the game, in which the player is first learning the game mechanics.

4.2 The Playtest

Our approach for evaluating the game design via a paper prototype draws on User-Centered Design, where the user's experience is a main driver for design, as well as from rapid prototype and playtesting approaches that are becoming more common in game design [11]. During the playtests, the test leader walks individual players through a paper simulation of several scenarios. Players are asked to think aloud while playing the game; additionally, the test leader stops the game at several points and conducts interviews. Our approach is described in detail in [14].

During five scenarios, the player was guided through using the main categories of actions in the game, including affective actions, navigation in a landscape of sentiment, and mind magic spells. Using the game interface seen in figure 6, the test leader updated the state of mind of the avatar and NPCs, showing the player the effect of her actions in the game in terms of fluctuations in emotions, mood, mind energy and mind resistance. In order to best capture the players' problem-solving processes within the game, and to best understand potential areas for confusion, the players were given minimal explanations about how and what to do. At any point, players could access a "help system" in order to ask any question. The twenty-two interview questions focused on the player's understanding of the relationship between values in the MM, effects of game actions, relationship between personality and availability of actions such as spells, etc.

We conducted ten paper prototype playtests. For each playtest, the participant:

1. Filled in a short (fewer than ten questions) survey on demographic data and previous gaming experience.
2. Took the IPIP-NEO Personality test and emailed the results to the test leader.
3. Filled in a short survey about their experience taking the personality test and their opinions about the use of personality traits for avatar creation.

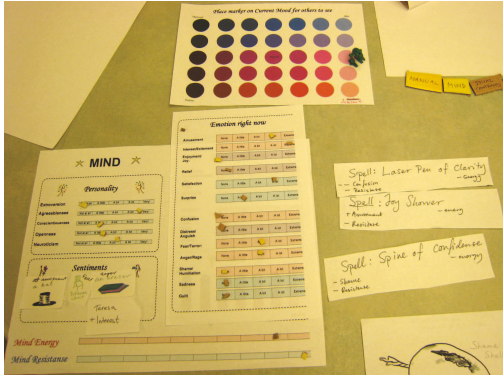


Figure 8: State of mind in the end of a play session

the strength and/or the nature of emotional responses. Two players thought that personality affected the amount of mind energy and mind resistance. Three players thought that the effect of AAs on themselves and others depended on personality. One player thought there were personality-specific effects on mood values, hypothesizing a mapping between traits, emotions and mood. All of these effects are indeed part of the mechanics. All players demonstrated enough understanding of the system to be able to act in the world in such a way as to reach an emotional state they found desirable. At the end of the test, the mood of all ten avatars was in the range between jubilant/exultant and bliss.

5.2 Effects of Personality Factors

Regarding the detailed mapping between factors and their effects, there was a strong trend towards building models about extraversion. Eight of the ten players theorized about the Extraversion factor, though they had different theories of exactly how the level of Extraversion would affect their avatar. For example, Eric the Red's player hypothesized that "Depending on how extroverted you are, sadness and guilt would probably move more or less as you are affected by them." Kita's player theorized "So, like, if you are an extrovert you might get interested and excited more easily, but you also might get distressed or anguished more easily, so each one kind of ... you know ... had an effect on your emotions." There was a trend in the emotions that players chose to discuss in relation to extraversion: Amusement, anger, excitement and sadness were discussed by three players each, while the other eight emotions were only discussed by two players or fewer.

The factor Agreeableness was accessible or interesting enough for six of the players to mention it and for three players to discuss it in more depth. The factor Conscientiousness was the most difficult for players to relate to. The only statement about it comes from Dante's player: "If you are not conscientious at all [...], other people pick up on that, how [...] are they going to ask you to do anything for them?" These results indicate that players are able to successfully leverage their everyday theories of mind and personality to apply them to the personality-based game mechanics in WoM. However, future design work may be needed to make some of the factors, such as conscientiousness, more accessible to players.

5.3 Extraversion and the design risks of FFM

It is no surprise that the factor of extraversion was perceived as the most accessible. Even in ancient Greek philosophy, extraversion is included as a central dimension of human personality. Recent research where the FFM is used in the context of synthetic humans and conversational agents also favors the extraversion factor before the others [15], [12]. From a design perspective, the results of our playtest indicate that it would be beneficial to introduce the player to the mechanics of WoM by focusing on the factor of extraversion in the early stage of the game.

However, as a character trait in an RPG, the dominance of extraversion carries a design risk. Our players expressed worries about how their avatars would perform in social situations if their level of extraversion is low, relating to real world social situations where introverted persons have difficulties. If a game world heavily relies on game mechanics derived from metaphors of social interactions, such as AAs in WoM, it would be easy to perceive an introverted avatar as "gimped", i.e. the avatar has properties that make it difficult or impossible for its player to progress in the game. The design goal of WoM is for personality traits to be non-normative: we want a game design in which each possible combination of personality traits allows a player to successfully progress in the game. The current design of the Mind Module does weight connections between trait and emotion nodes such that it may be more difficult for an introverted avatar to perform certain social actions. However, this is balanced by having some mind magic spells only be available when the avatar is in specific mood ranges. Thus, certain spells are only available if the avatar is in a "bad" mood. In this way, characters that easily move into "depressed" and "furious" states will be of value for situations where these moods are prerequisites for certain actions.

5.4 Personality-based Spells

In the final scenario, each player was given two spells by the Gate Keeper, based on their personality traits. One spell is based on the highest trait value in the factor Neuroticism, while the other is based on the highest factor value (except if that factor is neuroticism, in which case it is ignored.) Seven of the ten players had positive comments about receiving avatar capabilities based on traits. The other three raised the issue that the spells were not of their own choice. The three players who had reservations are avid players of single player RPGs, and thus have deep knowledge of many varieties of character class systems. As Solemni's player put it in the post-test survey: "Getting spells from personality is a different method of choosing how your avatar interacts with the world - like a class. Not having direct control over your class may be a difficult pill to swallow."

This highlights an important difference between a trait-based and class-based character system. In traditional RPGs, the character class defines which abilities become available to the player during the progression of their avatar in the game world. In contrast, instead of "rolling" a new character as in a traditional RPG or MMORPG, the WoM player who would like to try another play style will instead create a character with a different personality. Since personality-based capabilities (such as mind magic spells) are not organized under classes, but instead rely on relationships between the

different traits, the combination space of the possible actions for an individual avatar is larger than in a traditional class-based RPG. A player will have to actively experiment with multiple characters to begin to gain a sense of the strengths and weaknesses of different trait combinations. Experienced players of class-based RPGs may find this system confusing, and may need extra support to become comfortable with it.

5.5 Emergent Game Play

The scenarios in the prototype are purposefully tightly scripted, since a primary purpose of the prototype is to explore the player's understanding of the MM in the context of WoM, rather than test the game mechanics themselves. Nevertheless, players leveraged the MM-based game mechanics to discover alternative strategies for completing the scenarios that had not been foreseen by the designers. A clear example of this appears in the fourth scenario, when the player helps Teresa battle the Colossus of Confusion (CoC). The only other object in the environment is the Laser Pen of Clarity (LPC), which the player can pick up to learn the spell of the same name. This spell reduces confusion and mental resistance; as designers, we had assumed that players would use only this spell to help Teresa. However, 70% of the players combined the use of AAs on Teresa with the use of their (only) spell on the CoC. Players hoped to improve Teresa's emotional state through the AAs, and thus increase her effectiveness at battling the CoC. 30% of the players used their LPC on Teresa, which decreases her confusion and again makes her more efficient against the CoC. 20% percent of the players used AAs instead of the LPC on the CoC, damaging the CoC with a lesser decrease in their mind energy than using the LPC. The fact that players discovered interesting, alternative strategies even in very constrained and simple scenarios validates the potential for rich and emergent gameplay in MM-based game mechanics. In the same way that physics systems have created opportunities for emergent gameplay in open-world games, the "mental physics" of the MM creates emergent gameplay opportunities for MMORPGs.

5.6 Conclusion

We have described the Mind Module, a semi-autonomous agent architecture, as well as an experimental MMORPG, World of Minds, in which the game mechanics build upon the Mind Module's model of personality and emotion. In a case study of AI-based game design, we have shared lessons learned from a test of a paper prototype. The players were able to form and communicate mental models of the mind module and game mechanics, validating the design and giving valuable feedback for the future development of the project. Despite the constrained scenarios presented to test players, they discovered interesting, alternative strategies, indicating that the "mental physics" of the Mind Module may open up new game design possibilities.

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Emotional Attachments for Story Construction in Virtual Game Worlds

Sentiments of the Mind Module

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ABSTRACT

In the virtual game world prototype World of Minds that uses the Mind Module, a semi-autonomous agent architecture, the notion of sentiments, or emotional attachments between objects, is what constitutes the deep structure in the game world. In this paper a play test is presented where sentiments are instantiated in three different ways; randomly, by choice of the player and through interaction. The test indicates that the sentiments that are instantiated through interaction between entities in the world are those that create meaning for they players of a quality that would be useful for the co-creation of narrative potential in virtual game worlds.

Keywords

Story Construction, Virtual Worlds, Experimental Methods, MMORPG, OCC, Emotion Modelling, Expressive AI

1. INTRODUCTION

Even if all games do not contain a story, just as films, plays and novels, they all contain a deep structure. Games like chess and solitaire contain deep structures; there are driving forces and constraining rules for achieving the goal which in most cases are the winning condition. In these games the goals that drive the mechanics of game play are part of the predefined conception of the game. This is not always the case in virtual game worlds (VGWs) where the players may define their own goals that are not always be foreseen by the designers. VGWs, sometimes called massively multiplayer role-playing games (MMORPGs), are realised by networked computers that simulate environments. In these worlds players have graphical representations, playable characters, often called avatars, that represent them in the world. All interaction with the world and with other players is done through the avatar.

This paper concerns the deep structure of elements that can construct narrative potential in VGWs.

The concepts of *deep structure* and *surface structure* are used by Greimas [21], summarised by Rimmon-Kenan [46]: 'Whereas the surface structure of the story is syntagmatic, i.e. governed by temporal and causal principles, the deep structure is paradigmatic, based on static logical relations among the elements'. Greimas' actantial model describe re-

lations among Actants. Actants are entities that accomplish or submit to an act. The number of actants is six in Greimas' model as shown in Figure 1.

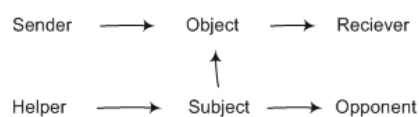


Figure 1: Greimas' Actantial Model

VGWs are places rather than narratives, where the world is actual and has materiality rather than possible as it is in novels which often are analysed using Greimas' actantial model. In VGWs there are elements in the world that give *narrative potential*, a term used by Laurel [32] and described by Fencott [18] as the integration of agency and narrative. Fencott elaborates on narrative potential in [19] as the "accumulation of meaningful experience as a result of agency - allows participants to construct their own appropriate narratives. Narrative potential thus arises from agency but is not determined by it." The term *agency* was defined by Murray [39] as "the satisfying power to take meaningful action and see the results of our decisions and choices". All entities in VGWs, such as avatars, non player characters (NPCs) and other dynamic entities, as well as inanimate objects are elements which hold narrative potential. Avatars realize the existing narrative potential, and create new narrative potential by acting in the VGW. It is the relationships between the elements in the VGWs which constitute the deep structure. These relationships are partly governed by the rule-systems of VGWs and partly by goals, desires and motivations of players controlling avatars.

The work presented in this paper builds upon a framework where relationships between elements from a systemic point of view are based on a rule-set including emotions. In this respect the work have a strong kinship with the OCC model[41], witch is further expanded upon in the text.

The Mind Module(MM) is a semi-autonomous agent architecture built to be used in a VGW as a part of the avatar. It gives avatars personalities based on the Five Factor Model (FFM)[37], and a set of emotions that are tied to objects in

the environment by attaching emotional values to these objects, called sentiments. The strength and nature of an avatar’s current emotion(s) depends on the personality of the avatar and is summarized by a mood. The term *semi-autonomy* is used because the agent structure is designed to be used by an avatar, and is thus partly controlled by the system and partly by the player. The overall aim of the development of the MM is to, through experimental applications, explore techniques for creation of character driven story construction and drama for persistent VGWs. Part of this experimental work is to explore the possibilities of combining the art and craft of characterization, which has its home in the arts, with the knowledge we find in the field of psychology.

The first iteration of the MM was developed in parallel, but separately, from the game world it was planned to be used in. Though this first iteration got an enthusiastic reception from the test players [28] the user tests showed that the affordances given by the MM as part of the avatar needed a tighter connection to the game mechanics of the world. For this purpose the VGW prototype World of Minds (WoM) was designed where the game mechanics and the rule-set are entirely derived from the MM. During the design and implementation of the WoM prototype several questions regarding the game design in relation to the development of the AI have arisen.

This paper concentrates on the practical use of sentiment objects in WoM. Three different ways of instantiation of the sentiment objects are evaluated through data gathered through analysis of videotaped play tests. Also the different ways of interacting with the sentiment objects are discussed. Previous publications focus on the mood aspect [15] in the same context, and on the use of personality traits [14].

The content of this paper is structured in the following way: Related work, The Mind Module, and the design of World of Minds are described to give a background. In the Mind Module section the approach to sentiments is compared to the approach of the OCC model. Then the paper prototype is described as well as the test scenarios the players went through. The results of the play-test are summarized. The final discussion concerns implications for the use of emotional attachments as connections between entities in the deep structure that make up the basis for story construction in VGWs.

2. RELATED WORK

Related work from a theoretical angle tend to lean on different basic theories depending on in which field the work has its origin. In the area of games, there have been classification spaces offered, comparisons presenting similarities to other media, and differences have been pointed out (e.g. analyses of interactive from a cultural studies perspective including Aarseth [1], Murray [39], Juul [26], and Ryan [47]). Publications by authors with backgrounds in screenwriting and filmmaking usually refer to the Hero’s Journey [8, 52] and the restorative three-act structure of drama [11]; papers and books published by game designers usually refer to the Koster-Vogel Cube [29], while publications in more technical venues on the issue of narrative often refer to The Oz Project [4] and to the Facade Project [36]. Prominent

traditions of narrative analysis include the structuralist perspective beginning with Propp’s morphology of the folk tale [43] and including Greimas’ actantial model [21], as well as the tradition of hypertext theory [6, 31, 22], i.e. systems for causal (interactive) relationships between story elements in multi linear stories.

Practical related work include the work by Brisson and Paiva [7] who’s system I-Shadows use affective characters to through interactions inspired by improvisation theory explore the natural conflict between the participants freedom of interaction and the system’s control as the participants collaboratively develop a story. Another related project is Scheherazade [17] that, as it draws upon theoretical work on the morphology of the narrative, models semantics such as timelines, states, events, characters and goals. The system can detect thematic patterns in both the deep structure of the story as well as in the manner of the story’s telling. However, maybe the most related work right now is that of Ian Horswill who argues, from a hypothetical perspective, that AI Characters should be ‘just as screwed-up as we are’ [24], thus tying in the notion of believable agents [3], and ways of building these [35, 27, 48, 44]. Also the work conducted by Marsella et al [34, 45], as well as the work done at Miralab [30, 33] on the subject of virtual humans has been an important source of inspiration.

3. THE MIND MODULE

According to Moffat emotion can be regarded as a brief and focused (ie. directed at an object in the context) disposition, while sentiment can be distinguished as a permanent and focused disposition [38]. Mood can be regarded as a brief and global disposition, while personality can be regarded as a global and permanent disposition. Hence emotion, mood, sentiment and personality are regions of a two-dimensional affect plane, with focus (focused to global) along one dimension and duration (brief to permanent) along the other.

The Mind Module (MM) consists of a weighted network of interconnected affect nodes of four types; traits, emotions, sentiments and moods. While the traits are static, the intensity of each of the other nodes decays over time. In this respect the MM is built similarly to a spreading activation network [10]. Figure 2 summarizes the decay rates of the four node types.

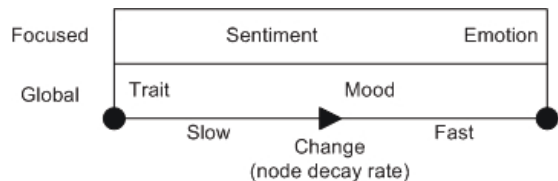


Figure 2: Two-dimensional affect plane

That a node has a fast decay rate means that the node is active only for a short time. This is the case with the emotion nodes - they affect the rest of the network only for the time when they are active. That the emotion and sentiment nodes are focused means in the context of the MM that their activation is dependent on a relation to or an interaction with another entity (for example, A ‘feels anger’ toward

B), as opposed to the trait nodes which are independent of entities situated in the context.

The role of the MM is to provide the system with emotional output from the individual avatar and to process the events and objects in the avatar’s surroundings in emotional terms. The MM performs computational operations on the input values, which come from virtual sensors and outputs in the form of emotional fluctuations and/or potential emotional reactions that in turn become inputs to the sensors of the MMs of receptive entities.

The *personality* of a character defines the nature and strength of the emotions a character ‘feels’ in different situations. The MM gives each avatar 30 trait nodes, inspired by the Five Factor Model (FFM)[37], where the 30 trait facets are organized into five factors; Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism.

The choice of *emotions* is based on research into affects and affect theory by Tomkins[49], Ekman[13] and Nathanson[40] where expression of emotion is studied. The MM gives each avatar 13 emotion nodes; Amusement, Interest, Joy, Relief, Satisfaction, Confusion, Surprise, Distress, Fear, Anger, Shame, Sadness and Guilt.

The *mood* is a processed summary of current state of a character’s mind. The mood of a character is measured on two scales that are independent of each other, an inner (introvert) and an outer (extrovert). Hence it is possible to feel harmonic and annoyed at the same time, or gloomy and cheerful. Having two scales for nodes opens up the possibility of more complex states of mind than a single binary axis of moods that cancel each other out. To the player this can be conveyed by for example a fine grained coordinate system of the two axes showing the avatar’s mood as a position.

Sentiments are nodes which couples an emotion with another entity in the environment. If the avatar is in proximity of the other entity the sentiment node activates the coupled emotion node.

The affect nodes are interconnected by weighted relationships. The values of the personality trait nodes governs the individual avatar’s state of mind through these weighted relationships, ideally resulting in values characterizing for the avatars personality.

More detailed descriptions of the emotion, personality, and mood nodes can be found in [15] and [14].

3.1 Sentiments - Emotional attachments

An avatar can have an emotion associated with an object or a certain type of objects in the world. The emotion *Fear* tied to objects of type spiders would create a sentiment that simulates arachnophobia. In the MM a sentiment node is an association between an emotion and either a certain individual object or a certain type of objects. When the character who owns the sentiment perceives either of these objects within perceptual/influential range, there is an immediate change in the value of the emotion node Fear. Let us picture a scenario where avatar A performs an action toward avatar B that her MM interprets as very amusing. The level of amusement in the emotion node Amusement will be high, for a brief period, i.e. the decay rate is fast. The mood node ‘Outer mood’ of B will get a higher value, but decrease slower than the emotion node. B might get a sentiment, towards A, that will decay at a very slow rate, but eventually disappear. While the sentiment of Amusement toward A lives, B would

get a slight increase in her Amusement node if A came in proximity. The amount of the increase in the Amusement node is defined by the intensity of A’s trait nodes Emotionality, Cheerfulness, Depression and Imagination, which are the trait nodes that are weighted to the emotion node Amusement. This example instantiation is illustrated in Figure 4 in Section 4 where it also is tied to some of the game play mechanics of WoM.

3.2 MM compared to the OCC model

Emotion modeling have during the past decades emerged as a field of study, where the theory presented by Ortony et al in *The Cognitive Structure of Emotion* in 1988[41] proved to be an important landmark, now often referred to as the OCC model. The OCC model is purely theoretical, written in the field of psychology, but several applications in the fields of AI and cognitive science have used it as an inspiration for frameworks for autonomous agents that simulate human emotion, among them [51, 23, 16]. In this section the features of the MM are compared with the framework of the OCC model in order to clarify the presented approach to emotion processing.

Ortony et al argued that the notion of ‘basic emotions’ was vague. They presented 14 theories of basic emotion that all list *different* emotions as basic, each theory with different bases for selection. Some of these theories use the concept of having mixed states [42] or compounds [2]. Ekman opposed the notion of the definitions of basic emotions being ‘vague’ in 1990 [12] and successfully defended his standpoint of defining certain emotions as ‘basic’. When discussing emotion modelling it is however important to bear in mind that what is referred to as emotions and sets of emotions are based on the *expression of emotion*.

Ortony et al proposed a hierarchical structure of emotion where the top level is a distinction of positive/negative and where the in total 22 emotions are valenced toward either an event, an action committed by self or another agent, or toward an object. The emotions vary in intensity depending on different factors, among them the sense of reality, proximity, unexpectedness and arousal. The appraisal of objects, events and actions are done in terms of desirability, praiseworthiness and appealingness. Desirability depends on the goals of the actor.

The sentiment nodes of the MM uses a mixed approach, allowing for several sentiments, that is, of different emotions to be attached toward another entity, thus creating a compound set of sentiment. Though valenced in this way, as directed toward another character or object in the world, the sentiment set does not make a difference between types of entities in the world. The same type of sentiments can be set toward objects as it can be to characters or towards abstract principles.

Sentiments in WoM are created in two ways. Some emerge from interactions with other entities in the world, thus creating emotional memories of the entity, whose nature is an *emergent compound set of sentiments* that depend on what has happened in the interaction between the entities. The other type is *authored sets of sentiments*, that are similar to the valenced emotions in the OCC model since they contain constraints on the type of object they can be set toward, and have certain combinations. For example the authored sentiment set ‘Infatuation’ is a combination of Interest, Amusement and Joy toward another character.

The intensity of the sentiment is in the MM different for each avatar depending on the context since the intensity is defined not only by the context in form of sentiment objects in proximity but also via weightings between personality trait nodes and emotion. Thus the intensity of an emotion depends upon the avatar’s personality, and the nature of the emotion is defined partly by events, objects and agents in the game world and partly by the individual avatar’s interpretation of her environment in term of sentiments.

4. THE WORLD OF MINDS

World of Minds (WoM) is a prototype VGW where the personalities of the inhabitants are the base for the game mechanics. When interacting with other characters, the reactions depend upon the character’s current mood and personality. It is the player’s choice whether the avatar is a reflection of herself.

The basic game play of the current prototype of WoM is fairly straight-forward: Players need to defeat physical manifestations of negative mental states. In order to do so, they can cast spells on them, but the spells available are constrained by the avatar’s personality, her current mood, and how far the avatar has progressed in learning new spells. Each avatar has mind energy (mana) and mind resistance (hit points). Each spell costs mind energy to use, and attacks reduce mind resistance. The experience of the character defines how large the possible pool of energy and resistance is at a given moment. The regeneration rate of resistance depends on the inner mood while the regeneration rate of the energy depends on the outer mood, as shown in Figure 3.

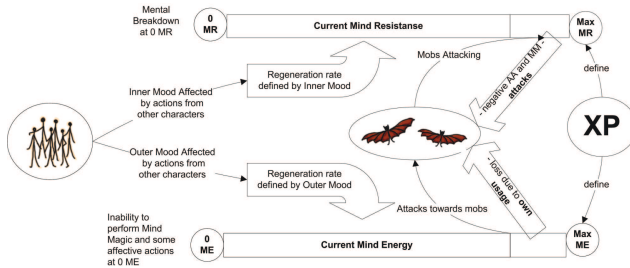


Figure 3: Fluctuations of Mind Energy and Mind Resistance

Players can affect each others’ moods by using affective actions (AAs), thus controlling the selection of spells available. AAs are actively chosen by the players; they are not effects of other social actions. If a player targets another avatar, she can choose from a selection of AAs. For example the AA ‘Comfort’ can be used successfully on targets that have an active emotion node of Sadness, but only if the player’s own avatar is not in the area of Furious in the mood coordinate system. If the AA Comfort is used successfully, the values of the emotion nodes Sadness and Anguish of the target are diminished, which in turn affects the mood of the character. AAs can be compared to emotes in other virtual environments, being social actions, but in WoM these have direct effects on the mental states of those interacting. Player character’s cannot cast mind magic spells on each other that affect the emotion nodes, this in order to not make it too easy to affect the mental states. The aim is to use the AA’s as a

system reminding of ‘real’ situations of interaction between players that can affect the mood, where the use of spells in interaction with computer controlled characters adds a more game-like experience, but where the systems are intertwined.

Sentiments for avatars in WoM are generally instantiated as a result of a player character’s action or of a result a player’s choice. In the current implementation, sentiments are instantiated when an emotion node reaches a threshold value, in most cases set as 90% of its maximum. Figure 4 is an illustration of how either a spell or an AA causing amusement is interpreted by the MM. The values on the arrows between the nodes are weights.

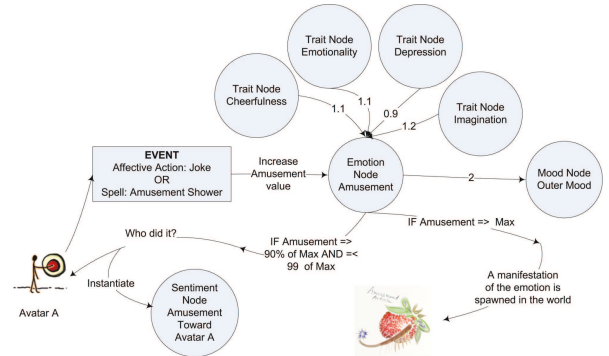


Figure 4: An example of how an amusing action is interpreted by the MM

5. GUIDED PAPER PROTOTYPE PLAY TEST

The correlation between the results of a test of a paper prototype and a computational system cannot be taken for granted. Experimental research and evaluations of rules and game mechanics in VGWs are rare in the academic sphere due to the enormous work effort required for the implementations. Researchers are generally constrained to studying existing VGWs or using (e.g.[50], and [9]) existing systems, such as the Aurora scripting system of Neverwinter Nights [5], that through their architecture enforces very traditional computer role playing game mechanics. When building new game mechanics from scratch where the system need to support a large number of simultaneous players it is necessary, unless the research funds are unlimited, to find alternative evaluation methods, such as paper prototyping. The test presented in this section was conducted in order to get pointers relevant for the construction of a limited digital prototype, which is part of the next stage of this research.

My approach for evaluating the game design via a paper prototype combines features from several approaches of User-Centered Design where the users experience is the main driver for the design, as well as from rapid prototyping and play testing approaches that are becoming more common in game design [20]. In the test of the WoM prototype I used scenarios and role taking, using the Wizard of Oz method to simulate user-interaction. When conducting my tests I had real players playing the game individually. I used scenarios and a game master/test leader, who simulated the game events. The approach is described in detail in [28].

Prior to the guiding the players were asked to think aloud as they were playing. In the scenarios the player is guided

through using the main categories of actions in the game, AAs, navigation in a landscape of sentiment and mind magic spells. In these scenarios the test leader and the player was continuously updating the state of mind of the avatar and the NPC she meet, showing the player the effect on her actions in the game in terms of fluctuations in emotions, mood, mind energy and mind resistance.

Ten guided paper prototype play tests were conducted. The course of action for each participant contained the following steps, where the participant:

1. filled in a short (less than ten questions) survey about demographical data and previous play experience;
2. took the IPIP NEO Personality test and emailed the results to the test leader;
3. filled in a short survey about their opinions about using personality traits for avatar creation;
4. went through the guided play test (Each test was video taped and took between one and one and half hours. The player was guided through three scenarios. After that the participant was interviewed, 14 questions were asked. Then the player was guided through the remaining two scenarios. The test was concluded with an interview with nine questions.);
5. filled in two more short surveys, one on the subjects of sentiment objects, the other about general impressions of the experience.

The video analysis tool Transana was used to analyze the 15 hours of video of interviews and play sessions. For character creation WoM uses a short version of the International Personality Item Pool Representation of the NEO PI-R (IPIP-NEO) as constructed by Johnson, a method for evaluating personality traits using a survey with 120 items that the user rates on binary scale [25]. The full IPIP contains 1,699 items assembled by Dr. Lewis R. Goldberg. For the purposes of WoM the short version was considered sufficient. Prior to taking the test the players were advised to decide whether they wanted to play as being themselves or if they wanted to role play a character that they design the personality for in the IPIP-NEO. The players emailed their results to the test leader so that the 'system' could create an avatar for the test session.

The remainder of this section describes the scenarios in more detail. The avatar Mastaya's traversal through the scenarios is used for illustration.

Scenario 1 - Sentiments The avatar meets the character 'Gate Keeper' (GK). Via prewritten dialog script GK gives information about the game world. GK searches his bucket to give the player two random sentiment objects. The player represented by the avatar Mastaya got a sentiment of Anger toward mittens and Amusement toward socks. GK also asks the player to picture an unnerving scenario where she can choose which of three different objects would be most scary. Mastaya picked garden gnomes and got a Fear sentiment towards them. Finally, GK asks Mastaya to fetch him a glass of water from the water cooler down the corridor.

Scenario 2 - Affective Actions The avatar meets the

character Teresa who says she is too sad for explaining what affective actions (AAs) are, and asks the avatar for a hug. A selection of AAs is presented to the player. Teresa and the avatar exchange AAs until threshold values for emotions results in the generation of sentiment objects between the characters. Mastaya chose to comfort Teresa instead of hugging her. Teresa's Distress and Sadness decreased, and her mood improved. After a few exchanges of AAs a threshold value for Mastaya's emotion Interest was reached and the system generated a sentiment for Mastaya of this emotion toward Teresa.

Scenario 3 - Facing the Sentiments The player needs to guide the avatar through an environment with sentiment objects in order to reach the water cooler. The state of mind of the avatar changes according to which sentiments are encountered in proximity of the avatar. Mastaya avoided her Fears (garden gnomes) on her way to the water cooler, and then moved close to the sock in order to gain Amusement before moving on.

Scenario 4 - Using Spells and Affective Actions The player finds Teresa in distress as she is attacked by a manifestation of Confusion. The player finds a spell, Laser Pen of Clarity, which reduces Confusion and mental resistance in the target. The player is introduced to the concepts of mental energy and resistance through seeing the mind values on Teresa, the Colossus of Confusion and her own avatar. When the Colossus of Confusion is defeated a new foe enters the scene, the Sail of Sorrow. When this is defeated Teresa explains that when an emotion goes out of bounds a manifestation of that emotion is created.

Scenario 5 - Trait based spells Gate Keeper accepts the glass of water and gives the avatar two spells that he claims are based on the personality of the avatar. Mastaya learns an 'Interest/Excitement Shower', based on that her highest factor except Neuroticism is Openness. She also learns the 'Soothing Hand', which lowers Fear in the target, based on that the highest value of her traits in the Neuroticism factor is Anxiety. GK tells her that she will be particularly good at defeating manifestations of Fear, the Terror Trolls.

During the scenarios the players were presented with the interaction objects and given minimal explanations about how and what to do, in order to capture confusions, and even more importantly, implicit assumptions about the game play. At any point the users could tap the 'manual' button and ask any question, whereupon the dialog with the test leader temporarily left the think aloud protocol.

5.1 Sentiments in the play test

As shown in the recount above of the script of the play test and in the exemplification of the avatar Mastaya's performance the sentiments came into play in a number of situations: In the first scenario GK gave Mastaya two random sentiments by pulling out objects from his bucket. The natures of the objects are deliberately chosen to have little emotional charge. Pulling out a spider from the bucket would for example have the given preconception of fear towards it. The objects in the GKs bucket are as follows: a ping pong ball, a hat, an eraser, a sock, a mitten, a pencil, a pair of scissors and a sock. When the item is drawn from the bucket, one emotion is randomly picked. This combination constitutes a sentiment, i.e. for Mastaya a sock is tied to Amusement. After this GK tells Mastaya the following: *'At night you wake up by an unfamiliar touch. There is a damp*

smell. Mastaya is then asked which of three objects would be most disturbing to find in the bed: a garden gnome, an empty noodle container or a small chair. Mastaya chose the garden gnome, and received a sentiment of Fear toward garden gnomes. In the second scenario Mastaya interacted with the NPC Teresa who was puppeteered by the test leader. Mastaya chose AAs such as ‘gossip’, ‘tell small secret’ and ‘flaunt big secret’, and the test leader chose reciprocal AAs that resulted, for Mastaya’s part, in a sentiment of Interest toward Teresa. Teresa gained a sentiment of Interest toward Mastaya.

During the second scenario players chose a higher variety of differentiation in their choice of action than anticipated by the test leader. Teresa’s emotional memory in terms of sentiments may give a pointer; she has a sentiment of Amusement towards one character, Interest toward three, Joy toward three, and Satisfaction toward three characters. In the limited set of AAs available to the players it is possible to see which main types of AAs were chosen in the interactions. For instance, the three characters receiving a sentiment of Satisfaction chose to ‘hug’ Teresa several times.

During these two scenarios sentiments, or emotional attachments, was instantiated in three different ways. From the GKs bucket a *random sentiment* was instantiated (the Amusing sock), through a question a *sentiment of limited choice* was created (the Fearsome garden gnome), and finally sentiments were born as *results of interactions* (the Interesting Teresa character).

In the third scenario the player is navigating her avatar on a board. Present on the board is the goal, in form of a water cooler, and a number of objects. For each player three items were placed on the board, one that had a sentiment of Fear attached to it, one item that had a positive feeling attached to it, and one object that the avatar did not have any sentiments attached to. This scenario mainly functioned to confirm that the concept of sentiments and their effect in a spatial environment was understandable to the participants in the play test. All players successfully navigated the board toward the goal. An example transcription of one of the players reads as follows: *‘I was like whatever there is a gnome and then when I got close to it, I was like, well not that close. But then you said I was close and you started moving my things [note: the fear meeter] and I was, oh my gosh, something is happening. Then I was like, oh whatever. What can a gnome do to me? So I tried to go right to it, then you like moved it up a lot and I was like, oh crap. So then I just tried to move away from it, and now I’m trying to walk around it cause I don’t want to leave any spawns around that are bad [note: an emotion out of bounds spawn manifestations that stay in the environment until defeated, in this case Terror Trolls].*

The majority explored what effect all the different objects would have on their avatar’s states of mind, and a few committed to reach certain moods in order to experiment on what effect that would have in the coming scenario.

In the fourth scenario Teresa asked for help in defending herself against the manifestations of Confusion. The avatars had reciprocal positive sentiments toward each other, resulting in giving both the avatars and Teresa a ‘boost’ in their state of mind, different according to the individual sentiments. This boost was helpful when they together defeated the Colossus of Confusion and the Sails of Sorrow and illustrated what effect a sentiment could have on the game

mechanics.

6. SURVEY AND INTERVIEWS

A survey was conducted immediately after the play test. One of questions was whether the participants remembered the sentiment objects, and if so which ones? 100% of the participants remember the sentiment of fear they got by limited choice (garden gnome, small chair or noodle container). For the random sentiments the memory of the group was less accurate, of the total 20 random sentiment objects (2 for each participant) 15 were accurately remembered, or 75%. The players were asked to rate the three different types of sentiments objects according to their preference on a scale from Bad(1), Not so good (2), It was ok (3), Good (4), to Very good (5). There was a strong trend of preferring the instantiation of sentiment objects as results of interactions, which got the overall score of 4.58, while the sentiments given by limited choice got 4.0 and the random sentiments only 3.33. A representative comment by a player asked the survey question *‘What did you think about getting a sentiment toward the NPC Teresa when you interacted with her through using affective actions via your avatar?’* was *‘It was built through my actions and therefore made sense. I also felt a real emotional attachment to Teresa, whereas I could care less about pencils or garden gnomes.’* To the question of what sentiment object that had made most sense to the players and why, there was a strong trend to mentioning Teresa (70%), motivating it by that there was an effect of their actions that ‘made sense’. Three of the players instead mentioned the chosen sentiments: *‘because I picked it’*. When asked which sentiment object that had made least sense to them the majority of the players mentioned one of the randomly assigned sentiments: *‘Anger towards mittens. What did they ever do to me?’*

The interviews conducted in the play test gave almost the same result as the surveys. 80% of the players strongly expressed their approval of getting a sentiment toward Teresa through interaction. One player said *‘[...]even though it’s a made up NPC, it’s like just the way you are interacting, the way you are affecting her mood, it makes sense to have a lasting effect. Like I’m going to remember Teresa. [...] in this sense it was like I was on par with her so it was cool that it had a lasting effect on both of us. And it makes it feel more real because they remember me too...so I like that part a lot.’* In the interviews 50% explicitly expressed approval of the chosen sentiments, and 30% of the random sentiments, a similar result as in the survey, though in some cases some were silent on a certain subject in the interview and instead expressed themselves in the survey, and the other way around. The survey was conducted as a way to make sure that the results wouldn’t be skewed by the fact that participants in face to face situations in tests often tend to want to please the one conducting the test and thus not express views that may not be ‘pleasant’ but relevant to the outcome of test.

In both interviews and surveys players expressed that the more agency they felt in the instantiation of sentiments, the more they preferred it. One player said: *‘This one made the most sense [pointing at the sentiment toward Teresa], the satisfaction. Because with Teresa I had a history with her, whereas I did not have much of a history with these other things. I have a history with the garden gnome, but it seems just as likely it could have been any of these other objects.’*

In the think aloud parts of the tests most of the players were reasoning about each objects relevance to the rest of the context. The more impact they had had on the creation of the sentiment, the more meaning they could read into it. In the case of the sentiments toward Teresa they did not reason at all when they were ‘thinking aloud’. Teresa and the sentiment toward her was not problematized or discussed, but accepted at face value. She was explored rather than questioned. The chosen and the randomly assigned sentiments were on the other hand discussed and interpreted. The players attempted to come up with explanations for the random emotions toward the objects. For example one player said ‘*I’m angry at socks, because you always lose that one in the dryer, then you end up with mismatched socks.*’ For the chosen sentiments half of the players tried to come up with an own back-story of why the particular object would hold a certain emotion for them, and 40% of the players came up with ad hoc explanations for the randomly assigned sentiments.

7. DISCUSSION

The interview and survey results showed that sentiments instantiated as a result of interactions made most sense to the players. However, the notion of the sentiments given by choice seem promising. In my interpretation of the data, the player’s main dismay came from the reasonable standpoint that the objects didn’t make sense in the environment. The fact that many of them created their own meaning, and seemingly enjoyed doing so, and that the actual choice gave them a limited feeling of agency is still unsatisfactory. My lesson is that any such object needs to be rooted in deep structure of a story driven game world. In the case of persistent VGWs the drivers need to be the players if the chosen objects are to carry meaning. Possibly the notion of life path systems, a feature used in some table top role playing games, could be experimented with as a formalized way of creating individual back stories for the player characters, where the entities tied into the back-story have functional representations in the virtual world. A sentiment or a set of sentiments toward such an object would function as a memory as well as have an effect on avatar’s state of mind and thus give the player material that a planned course of action can be based upon.

The interactions between Teresa and the avatars in the play test were carried out in a context where several components were governing for the initial deep structure. The script of the play test gave the GK, in Greimassian terms, the role as sender when he asked for a glass of water in the first scenario. Teresa received a role where she in the first meeting functioned as a giver of information, and in the second meeting had a role of someone seeking help. The player character had, in being the subject, in the first scenario a need for information, given that she was new in the environment, and in the second one she got the role of helper to Teresa. In the third scenario the sentiment objects with negative emotions tied to them would be the opponents and the ones with positive emotions would be the helpers in the avatar’s navigation toward the water cooler. In the fourth scenario the opponents would be the Colossus of Confusion and the Sail of Sorrow, while the avatar temporarily stays acting as Teresa’s helper on her way to the Gate Keeper. As a subject the avatar could, in the last scenario, deliver the object (glass of water) to the sender (Gate Keeper).

The constitution and rules of the prototype governed the action potential of characters, which was a limited dialog, a set of AAs and a small sets of spells performing ‘mind magic’. The actions of the avatars varied, and took place in the surface structure, but resulted in that new components were added to the deep structure: the sentiments, different in nature to each player character, depending on the choices of the player.

8. CONCLUSION

What potentially can be useful to add to the body of knowledge in the area is the notion of the quality of the connections between the entities: to the idea of having goal- power- and desire-fuelled connections between entities at the level of deep structure I add the idea of using emotionally valenced connections, that either single, or in combination, can open up possibilities of modeling plots between characters in VGWs. It is my hope that this architecture can prove useful when experimenting with ways of creating narrative potential in VGWs where the players can act as main characters, and where their stories are tied into the very deep structure of the world. The sentiments of the MM can in the setting of WoM emerge and decay as the VGW is inhabited, and would, in the ideal case, have meaning for players since the sentiments are directly based on the interactions of the avatars.

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