Metalinear Cinematic Narrative: Theory, Process, and Tool

by
Kevin Michael Brooks

SUBMITTED TO THE PROGRAM IN MEDIA ARTS AND SCIENCES,
SCHOOL OF ARCHITECTURE AND PLANNING,
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
JUNE 1999

© 1999 Massachusetts Institute of Technology All rights reserved.

ROTCH

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
JUN 14 1999
LIBRARIES

Signature of author: _____
Program in Media Arts and Sciences
May 1999

Certified by: _____
Glorianna Davenport
Principle Research Associate
Director of Interactive Cinema
Program in Media Arts and Sciences
Thesis Advisor

Accepted by: _____
Stephen A. Benton
Chairman
Department Committee on Graduate Students
Programing Media Arts and Sciences

Metalinear Cinematic Narrative: Theory, Process, and Tool

by
Kevin Michael Brooks

Submitted to the Program in Media Arts and Sciences, School of Architecture and Planning, on April 30th, 1999, in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Abstract

Media entertainment technology is evolving rapidly. From radio to broadcast television to cable television, from motion picture film to the promise of digital video disks, as the media evolves, so do the stories told over these media. We already share many more stories and more types of stories from many more sources than we did a decade ago. This is due in part to the development of computer technology, the globalization of computer networks, and the emerging new medium which is an amalgam of television and the internet. The storyteller will need to invent new creative processes and work with new tools which support this new medium, this new narrative form.

This thesis proposes the name Metalinear Narrative for the new narrative form. The metalinear narrative is a collection of small related story pieces designed to be arranged in many different ways, to tell many different linear stories from different points of view, with the aid of a story engine.

Agent Stories is the software tool developed as part of this research for designing and presenting metalinear cinematic narratives. Agent Stories is comprised of a set of environments for authoring pieces of stories, authoring the relationships between the many story pieces, and for designing an abstract narrative structure for sequencing those pieces. Agent Stories also provides a set of software agents called story agents, which act as the drivers of the story engine.

My thesis is that a writing tool which offers the author knowledgeable feedback about narrative construction and context during the creative process is essential to the task of creating metalinear narratives of significant dimension.

Thesis Advisor: Glorianna Davenport
Principal Research Associate, Director of Interactive Cinema
Program in Media Arts and Sciences

This work was supported in part by a grant from the Motorola Corporation and the Digital Life Consortium

Committee

Chairperson: _____

Glorianna Davenport
Principal Research Associate
Director of Interactive Cinema
Program in Media Arts and Sciences

Member: _____

Janet H. Murray, Ph.D.
Senior Research Scientist
Center for Educational Computing Initiatives
Massachusetts Institute of Technology

Member: _____

Brian K. Smith, Ph.D.
Assistant Professor
Explanation Architecture
Program in Media Arts and Sciences

Dedication

To my children Stephan, Cara, and Kristoff

and

to Dr. David Morgan

Acknowledgements

When a player for the National Football League makes a touch down, they very often do one of two things. Some, like Jamal Anderson of the Atlanta Falcons, jump up and down, do a dance, slap the hands of the fans in the stands, spike the ball, and leap into the arms of his teammates. Others, like Robert Edwards of the New England Patriots will simply drop to their knees and pray, thanking God for blessing him with enough strength and speed to weave in and out of ten 280 pound guys who want to introduce his face to the astroturf. Still other players after making a touchdown will do both – first pray, then celebrate. When Kevin Brooks of the MIT Media Lab finishes a dissertation, he is the same way – first give thanks, then celebrate.

First I want to thank God, who has sustained me through these, the best and toughest years of my life, and without whom my face would be deep in something much worse than astroturf. Secondly, I have a bunch of people to thank. These are the people who have been nothing less than instruments of the Divine in order get me through these years and this research. They are also the people whom I have danced with, whose hands I have slapped, and into whose arms I have leapt. I am still looking around for something safe I can spike. Thank you all.

Thanks to Stephan Brooks, my oldest son and most expert electronic gaming advisor. I thank all three of my children to whom this document is dedicated. I know it has been a burden with me in school these many years. I can tell because I hear you on the phone with your friends, "No, you can't come over. My dad's writing his thesis." Thanks go to my mom Carolyn and my sister Sharon, who once told me during a memorable cross country 3-way phone call, "What do you mean you're not going to MIT!? DO IT, Kevin. You can't buy this!" Thank God I learned to listen to the wisdom of black women.

Through the years of completing this research I have fought, talked, laughed, and thought with many friends about narrative, computers, and everything in between. So many have helped, on so many levels, that I cannot mention them all here. But if I had to name just a few, I would have to start with my advisor, Glorianna Davenport. Thank you so much – I am glad I stayed. Of course, I have the best committee members one could hope for in Janet Murray and Brian Smith. Thank you for supporting

my work and dreams. During my history at the Media Lab, I have received incredible help and support from Renya Onasick, Frank Nack, my old and new fellow grad students of the Interactive Cinema Group: Ryan Evens, Mark Halliday, Dave Kung, Dave Tames, Eddie Elliot, Scott Higgins, Gilberte Houbart, Brian Bradley, Freedom Baird, Barbara Barry, Pengkai Pan and Paul Nemorofsky. Linda Peterson, the Media Lab's academic administrator and person-of-supreme-power, has been a good friend and tremendous help to me over the long years.

Special thanks go to Carol Strohecker, from whom I have learned invaluable lessons about thinking and learning, and with whom I have raised just a little bit of research project hell in the most enjoyable way possible. Thanks go to one of the most creative people I know, Arjan Schütte, who came up with the term "metalinear narrative" during a group brain storming session. I have also had great conversations about narrative and technology with Heidi Gitelman. Thanks also go to Heidi for pointing me to Anthony Young-Garner, one of my undergraduate programmers whom I also thank later.

In the last three years of this research, my life has been tremendously influenced by my adopted storytelling family in the Boston, Massachusetts area, and most especially by one Dr. Hugh Morgan-Hill, better known as Brother Blue. Because of him and my adopted family, I now know why I write, why I tell, why I share my life and research, "As storytellers, we are called to change the world."

Every MIT Media Lab thesis acknowledgments section includes a definition of a very important acronym: UROP - Undergraduate Research Opportunities Program. These are undergrads who offer research assistance to graduate students and professors. It is said that no code would be written at the Media Lab were it not for UROPs. I can truthfully say that my code would not have been written without my fine UROPs. I would like to thank Cecil Esquivel, my first UROP, who wrote code for me during a time when the project was so new that the whole thing could fit on a floppy; Eric King who did an enormous amount of early Prograph programming for me, but who still refused to work *for* me; Justin Kent, who designed the database and was the first UROP to dive bravely and expertly into mTropolis; Kunal K. Surana who (hopefully) learned something about life; Anthony Young-Garner, who wrote more working code than I have ever seen in my life; and Daniel Vlasic, the undisputed champion bug eradicator.

If my software looks good, it is only because of the talent of Angela Perkins, my friend and expert graphic designer. I will always cherish our conversations together when red was never just red and any old graphic object was never just functional. Thank you. If this document looks good, it is only because of the editing efforts of Laura Packer and the sharp eyes and tireless efforts of Meredith Lesly, my dissertation production manager and talented Mac-neighbor.

This intellectual endeavor has received enormous emotional support from my lab sister Paula Hooper, from Betsy Brown, my oldest and dearest friend at the Media Lab, Joey Talbert, my friend and personal cheerleader, and Laura Packer, from whom I have learned to relax and breath the life of a storyteller. Thank you all.

The Agent Stories software has benefited greatly from the testing efforts of a number of people. Early interface testers Meredith Lesly and Charlotte Burgess helped me distinguish between bugs and features. Later testers/writers who responded to my call for help and who generously contributed their time and creative process were Glorianna Davenport, Teresa Castro, Raelinda Woad, Ian Thal, John Bowker, and Laura Packer.

Thanks also are due to the Motorola Corporation for supporting this research and accepting this researcher as a Motorola Fellow for two years.

I would like to thank the people responsible for the cab voucher program at the Media Lab. It has benefited me countless times, allowing me to work the hours I needed to while balancing family and grad school. I would also like to thank the many cab drivers who have taken me home in the wee small hours, like: the guy who drove me home one week before my general exams and told me that he had left MIT during his general exams and now drives a cab; like the guy who felt compelled to tell me about his struggle with narcolepsy while driving 50 miles an hour on Memorial Drive; and the many drivers who taught me that the white and yellow dashed lane markers in the middle of the road are merely a driving suggestion, not a mandate.

Finally, I deeply regret that Dr. David Morgan of Motorola is not here to see this document. What is printed on these pages bears the mark of his dreams and genius. No words could express how much I miss him. Just when I thought running was the best I could do, Dave taught me to fly. This document is dedicated to him.

Contents

1 Introduction 19

1.1 Thesis Statement 19

1.2 Summaries 20

1.2.1 Context Summary 20
1.2.2 Problem Summary 21
1.2.3 Solution Summary 22
1.2.4 Overview of the Dissertation 26

2 Background and Context 29

2.1 What are Metalinear/Multiform Stories? 29

2.1.1 Defining the Terms 30
2.1.2 Oral Storytelling 34
2.1.3 Traditional Literary Examples 37
2.1.4 Hypertext 41
2.1.5 Cinema 45
2.1.6 Granularity 48
2.1.7 Assembly in Multiple Ways 51

3 The Problem 59

3.1 The Problem Addressed by the Thesis 59
3.1.1 The Thesis 59
3.1.2 Overview of the Problems 60
3.2 Problem Examples 64
3.2.1 The Knowledge-based Approach 64
3.2.2 The Simple-Link Approach 67
3.2.3 The Multiple Character Approach 70
3.2.4 The Puzzle Approach 74
3.2.5 The Traffic Circle Approach 75
3.2.6 The Single-Stream Cinematic Sequence Approach 78
3.2.7 The Folded Approach 80
3.3 Metalinear Story Coherence–The Art Form 83
3.3.1 Is There an Art Form? 83
3.3.2 What the Metalinear Art Form Is Not 85
3.3.3 What the Metalinear Art Form Is 89
3.4 The Need 93

4 The Agent Stories System 95

4.1 Overview 95
- 4.1.1 Navigation 96
- 4.1.2 Story Structure 97
- 4.1.3 Story Connections 97
- 4.1.4 The Interactive Process 98
- 4.1.5 Presentation 99
- 4.1.6 Agent Scripting 99
- 4.1.7 Development Platform 99

4.2 Story Structure 101
- 4.2.1 The Structural Environment 101
- 4.2.2 Writing Structure 106

4.3 Story Clips and Connections 108
- 4.3.1 The Representational Environment 108
- 4.3.2 Underlying Database 117
- 4.3.3 Writing Representation 117

4.4 The Iterative Process 120
- 4.4.1 The Writer Feedback Environment 121
- 4.4.2 Feedback 128
- 4.4.3 How to Interpret Feedback 129

4.5 Presentation 135
- 4.5.1 Screen composition 136

4.6 Agent Behavior and Logic Scripting 137
- 4.6.1 The Agent Scripting Environment 137
- 4.6.2 The Agent Scripting Language 139

5 Authoring and Evaluation 147

5.1 The Authoring Process with Agent Stories 147
5.1.1 Case Studies Overview 147
5.1.2 The Cases 149
5.2 Evaluation of the Process 153
5.2.1 Author Evaluation 153
5.2.2 Evaluation of the Work 159
5.2.3 Designer Evaluation 161

6 Stories 163

6.1 Crossing the Street 163
6.1.1 Introduction 163
6.1.2 Michael 165
6.1.3 Anne 168
6.1.4 The Cab Driver 171
6.1.5 The Waitress 172
6.1.6 The Little Girl 173
6.2 Case Study Stories 175
6.2.1 Introduction 175
6.2.2 Glorianna 175
6.2.3 Raelinda 177
6.2.4 John 181
6.2.5 Teresa 190
6.2.6 Ian 196

7 Conclusions 201
7.1 Thesis Statement 201
7.2 What Was Done 202
7.3 How the Thesis was Proven 204

Bibliography 207

1 Introduction

God created man because He loves stories.
- Elie Wiesel, from SOULS ON FIRE: PORTRAITS OF HASIDIC MASTERS

1.1 Thesis Statement

Media entertainment technology is rapidly evolving. From radio to broadcast television to cable television, from photographs to motion picture film to digital video disks, as the media evolves, so do the stories told through the media. We already share many more stories and more types of stories from many more sources than we did a decade ago. This is due in part to the development of computer technology, the globalization of computer networks, and the emerging new medium which is an amalgam of television and the internet. The storyteller will need to invent new creative processes and work with new tools which support this new medium, this new narrative form. I propose a name for this new narrative form—the *metalinear narrative.* The metalinear narrative is a collection of small related story pieces designed to be arranged in many different ways, to tell many different linear stories from different points of view, with the aid of a story engine which sequences the story pieces. My thesis is that a writing tool which offers the author knowledgeable feedback about narrative construction and context during the creative process is essential to the task of creating metalinear narratives of significant dimension.

1.2 Summaries

1.2.1 Context Summary

One of the challenges of writing stories in the last years of the twentieth century is the writer's awareness of the ever-widening diversity of characters and viewpoints which reflect our increasingly global perspective. The effort to include these multiple perspectives makes it very hard to maintain story coherency. The challenge becomes more difficult as we proceed through an information age where we know more intimate details than ever before about the cities, towns, and countries of our planet through the nearly ubiquitous media.

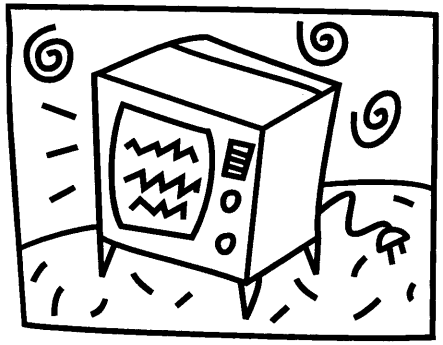


Fig. 1 Through television and a variety of other media, we now see more of the world than we ever have.

In the 1980's, significant historical events in China and Germany appeared in North American living rooms. During the Gulf War in 1991, events in New York, Washington DC, and the allied base in Saudi Arabia were shown by CNN in Baghdad. While the bombs fell in Baghdad, the world tuned in and watched. Perhaps for the first time in history, a military commander could gain valuable political if not military strategic information simply by watching TV.

The growth of the internet has accelerated our awareness of multiple cultures and made it easier for us to come into contact with one another. During the 1995 succession referendum vote in Quebec, Canada, anyone using a web browser could view an up-to-the minute tally of an extremely close political race upon which the future of a nation depended. Using personal computers and the internet, millions of people worldwide place themselves in countless special interest e-mail groups and share their personal narratives through tens of thousands of newsgroup bulletin boards. We can electronically label and

identify ourselves as having important similarities with people who are geographically and culturally distant. We are more aware of who we are globally and, therefore, simultaneously see ourselves as parts of our local subcultures and also as parts of larger global units. We are not as easily represented by a single leader's voice anymore, but instead recognize the multitude of our individual voices.

Fig. 2 Our writing needs a way of including more of the diversity of voices around us.

1.2.2 Problem Summary

Though we now see and experience the world as a much more diverse place, this worldview is difficult to represent in narrative. While there is more to know and more things possible to include, writing a traditional linear story is largely an exercise in editing out. In a world with so many different faces, how can the writing process and writing product include more voices?

While the computer can accommodate many voices through its massive digital storage and search capabilities, it cannot automatically make sense of those voices. This is the job of the author. Yet how does the author, trained to see uni-linear stories, shape these many narratives elements into a coherent form? Through the use of intelligent tools. There are already people using computers to author multimedia stories which incorporate multiple points of view. Projects from the Interactive Cinema Group such as It was a Knowledge War (Houbart, 1994), as well as the Apple Computer's Guides project (Oren, Salomon, Kreitman, & Don, 1990), are examples of multimedia projects which, among other things, incorporate multiple points of view around central issues. Other developers use what could be called a plot-based approach to authoring multimedia stories. Instead of focusing on characters and point of view, the author focuses on plot, and structures the story as an interconnected branching network of plot lines. The interactive laserdisc nar-

ratives of the 1980's used this method. But while these projects concentrate on the end-user experience, they do not recognize or facilitate the author's task. In the case of the plot-based approach, how does the author overcome the seemingly intractable problem of exploding combinatorics? (Bruckman, 1990 #23) And how is the author to make sense of a multitude of viewpoints? By not creating a single linear narrative, but by creating a metalinear narrative.

1.2.3 Solution Summary

The *metalinear narrative* is a narrative form which addresses the problem of authoring and presenting multiple stories from multiple points of view. It provides the author with a web-like structure for storing story parts, from which many linear stories can be constructed. The metalinear narrative form is a collection of small story pieces stored in a semantic network and designed to be sequenced and arranged in many different ways, to tell many different linear stories.

The prefix *meta* comes from the Greek, meaning *above, beyond, transcending*—a higher state of development. Metalinear narrative, therefore, defines a form which transcends the typically linear sequential form of narrative in favor of an interconnected structure of small narrative pieces that can take on many different linear forms. To attain the multiple linear forms, metalinear narrative includes an integration of structural tools used in the linear construction process. These tools include an abstract story framework which describes a general linear form without specifying story content and a set of links for connecting story pieces together such that they are each defined through their similarity to other story pieces. An æsthetic choice for metalinear narrative is the narrative style of multiple first-person points of view. There is a strong fit between this style of relaying a set

of events through the eyes of many characters in the first-person and the technical structures of linking story pieces together in different ways. While there is no doubt that there are other narrative styles which work with metalinear narrative, the multiple point of view style is an obvious fit. An example will clarify this.

The fairy tale LITTLE RED RIDING HOOD spans at least three centuries and is a common folktale told throughout European cultures. One of this tale's best known published versions is that by the Brothers Grimm (Zipes, 1987). In the Grimm's version<sidenumber>1, Little Red Riding Hood is a young innocent girl sent by her mother on an errand of mercy through the woods to bring food to her grandmother. She is instructed not to deviate from the path because the woods are a dangerous place full of nefarious wolves. When Little Red does leave the path, she catches the attention of the Big Bad Wolf, he ascertains her destination, runs ahead of her by taking a shortcut through the woods, beats her to Grandmother's cottage, eats the grandmother, lures Red into her grandmother's bed with him and eventually eats Red as well.

A metalinear version of this tale would first take into account the many possible character points of view: the mother who no longer wants to deal with her own aging, annoying mother and so decides to send her young daughter on a journey she herself should probably take; the wolf who is simply hungry and will do whatever it takes to survive; the grandmother who would like a visit from her estranged daughter but will instead take a visit from just about anybody; and the little girl who knows that the most important things in life are to be polite and to mind one's elders. It is not just the animate objects that can have a voice, but the inanimate objects as well. The forest which houses the wolf, watches the little girl walk off its path and separates the mother from the grandmother

1 There is evidence of the Little Red Riding Hood story existing in the oral tradition as far back as the 11th century. In the 17th century, the French writer and folklorist Charles Perrault published the popular folk tale as "Little Red Riding Hood". The Grimm's version of this story, published in the early 19th century, is actually entitled "Little Red Cap." Through the centuries it was Perrault's title that stuck.
(Bettelheim, 1976)

can also have a point of view. To the forest, predator and prey are a way of life, and little girls who wander off paths and talk to strangers become prey. The basket of goodies, which was woven in the traditional style and passed down from matriarch to matriarch for many generations, can have a voice which expresses its disgust over the familial rift. The red riding hood itself, a garment made by the grandmother's own hands, can whisper into the little girl's ear—the soft voice of conscience ultimately ignored. The parade of possible character points of view can be quite long and exciting to work with. Each of the characters would express their own view of the story events. By grouping their expressions into small granules and tying those granules together through links which define them in pairs of agreeing, disagreeing, preceding, and imperative to one another, a network of story stepping stones is formed. The previous links give guidance as to which one would be appropriate to go to next.

Fig. 3 Little Red Riding Hood in bed with the wolf, by Gustave Doré.

Another powerful part of metalinear narrative is that many different versions of a character's point of view can be included in the same metalinear structure. A metalinear Little Red Riding Hood could include Little Red introducing herself in very different ways:

1) I live on the edge of a large dark wood in a small cottage with my mother.
2) My mother and I live alone a long way from my grandmother whom I never get to see anymore.
3) All I get to do is play in my front yard behind the gate. I never get to do anything exciting.
4) Today I turned thirteen years old. Why am I wasting my life away in this stupid cottage with my snippy mother? I'm all grown up now and I can do what I want.

By intelligently weaving together an array of character worldviews and accounts, different linear stories can be constructed. The intelligence comes partly from the man-

ner in which the writer links story granules, as well as from an abstract narrative structure. For example, one way to tell the above metalinear fairy tale is to have characters introduce themselves, talk a bit about the world they live in (the domicile, their neighborhood, etc.), have them describe a problem in their life, then have them talk about that problem's solution. The wolf could politely introduce himself, tell us about his struggles for survival in the cold and dark woods, how he was recently very hungry, but then how he eventually solved that problem. On the other hand, the mother could introduce herself, talk about eking out a life in a drafty cottage in dire need of repair, having to find some way of supporting her daughter while also supporting her own ungrateful mother who lives far away, and then talking about a very recent solution she realized would work well now that her daughter is maturing. The same structure could also be applied to a story which tells the parallel tales of the wolf and the mother together – two tales of survival which oddly agree with one another.

The rearrangement of the story pieces, such as those above, in a metalinear narrative is done with the aid of a story engine. A story engine is a set of software algorithms designed to make appropriate decisions regarding the sequencing of story pieces for a computer-based story. My project demonstrating this metalinear solution is called *Agent Stories.*

Agent Stories is a software tool consisting of a set of environments for authoring pieces of stories, authoring the relationships between the many story pieces, and for designing an abstract narrative structure for sequencing those pieces. Agent Stories also provides a set of software agents called *story agents,* which act as the drivers of the story engine. While not story engines themselves, a story agent's unique parameter values determine how the

story engine operates. Story agents select and sequence the story pieces, according to (a) a user specified abstract narrative structure, (b) the relationships between the story pieces, and (c) the unique parameter values of the story agents. The system supports the writer thinking about and structuring a metalinear story by assembling simple narrative constructs during the rewrite process. Agent Stories is primarily intended for an author's use in the creation of metalinear multiple point of view textual stories, before the stories are realized as multimedia presentations using video, audio, and still pictures.

It is difficult to write a metalinear narrative, largely because it is difficult to break the deeply learned habits of linear narrative thinking. While the human brain is the most versatile tool for the job, it is difficult enough keeping all the narrative structures and details in one's head when the narrative is small and simple. When the narrative is large, I maintain that the task is nearly impossible to accomplish without external tools. This is why a writing tool which can store the story details in a meaningful way and which offers knowledgeable feedback about narrative construction and context during the creative process is essential to the task of creating metalinear narratives of significant dimension. My hypothesis is that with the appropriate tool, writers can successfully write in a form which departs from the strict single linear narrative, in favor of a form which will allow multiple reconstruction into many different linear narratives. This hypothesis will be proven through the use of the software tool Agent Stories and an analysis of metalinear stories created with this tool by selected writers.

1.2.4 Overview of the Dissertation

The remainder of this dissertation will proceed as follows:

Chapter 2 defines the term metalinear in more detail, discusses various story forms, and the notion of building different whole stories from parts. Included will be examples from traditional media like books and movies, a section on narrative granularity, and a section on story structures used to construct narrative granules into whole stories.

Chapter 3 includes a more detailed discussion of the Agent Stories problem domain through examples of work done by others. The domain involves problems relating to the representation of story knowledge, character and agent focused approaches, the puzzle approach and others. The chapter includes a discussion of where these approaches fall short, and where metalinear story systems and the Agent Stories software contribute to the field.

Chapter 4 is the complete discussion of the Agent Stories software, all of its parts and how they each work.

Chapter 5 describes the authoring process with Agent Stories. The bulk of this chapter is comprised of case studies of writers who have worked with Agent Stories. The case studies include a qualitative evaluation of their writing process and how the Agent Stories system helped or hindered their work.

Chapter 6 is a comparison of two sets of stories written for Agent Stories and why these two sets differ. The first set was written by myself for the Agent Stories prototype, while the second set was written by the evaluating writers.

Chapter 7 are the conclusions, including what I wanted to accomplish, what was done, and to what extent I accomplished what I set out to do.

2 Background and Context

But all stories have this in common: they beckon us out of the visible, providing alternative lives, modes of possibility.
- Paul Zweig, from THE ADVENTURER, 1974.

Sometimes one is obliged to take time out of time and to redefine, to set the time at another time. Or take things out of consequence, out of sequence. They become more consequential when you have the liberty to take them out of sequence.
- Maya Angelou, from WRITER'S DREAMING, Epel, Naomi (Ed.), 1993.

2.1 What are Metalinear/Multiform Stories?

Traditionally, writers construct stories such that a specific audience may experience their story in a single fixed linear form. The classic example of such a linear form is the printed word. Books, for example, are a time honored medium for publishing linear stories. Even the term "t*o write*" has a traditional connotation that the end result will be some form of printed work. Books are well suited for the linear story experiences, i.e. this happens, then that happens, then this happens. While it is possible for a reader to jump around through a book nonsequentially, still the pages of a book are numbered sequentially, with sentences and paragraphs left unfinished at the end of one page typically taken up at the beginning of the next. These physical attributes of books tend to inspire a linear progres-

Fig. 4 Books have a linear structure to their text, and thereby inspire a linear approach to writing new content.

sion through them. When computers are added to the writing process, the linear structure of narrative can be significantly altered, if not completely blown apart, by introducing mechanisms for creating many more kinds of narrative structures. From Vannevar Bush's proposed Memex system in the 1940's (Bush, 1945), to interactive videodisc projects of the 1970's and 1980's (Perlmutter, 1983), to digital video stories delivered over the internet, computational power has given us the tools to reshape the traditional linear narrative model and deliver narratives with increasing flexibility and diversity.

2.1.1 Defining the Terms

Fig. 5 African stories about Anansi the spider and other characters entertain while expressing cultural and moral values.

Story and storytelling are largely about two things: culture and structure. It is impossible to have story without a least a small amount of both culture and structure: two complex and intertwined elements. As storytellers and authors Norma Livo and Sandra Rietz put it, "Story structure is not an accidental or idle invention, but the profound product of a culture's evolved perceptions of the way the universe works." (Livo & Rietz, 1986, p.28)

For instance, many traditional sub-Saharan African stories are used as morality teaching tools. In their depiction of characters and events, they inspire thought about community citizenship, prosperity, selfishness, friendship and so on. What many of these stories do not do is end in manner familiar to Western audiences. Often the main character of a traditional African story will face a conflict, respond to that conflict in some way which is not fully resolving, and then the story ends. (Berry 1991) There is often no neat summaries of events where everyone lives happily ever after. Stories are used as tools for inspiring thought about life in a set of cultures where individual survival is tightly linked to community survival. These stories have a purpose other than simple entertainment and this facet of their story structure reflects that. For this research I have used the term *story struc-*

ture to refer to a story's form, an abstract skeletal description of what happens in the story and what kind of events take place.

The term *metalinear narrative* is used here to define a method for creating and developing multiple linear narratives from a highly structured collection of small narrative pieces, thus creating a new story form. These narrative pieces on their own do not constitute a single narrative path or plotline, such as a chronological spine, but instead act as building blocks for constructing many different narratives. This new type of story defines a form which transcends linear in the sense that it is a form from which many linear stories can be made, therefore metalinear. While the viewable product of a metalinear narrative system can include several media types (such as movies, still pictures, audio, etc.) the original representation for these elements (that is, the original medium of authoring) will most frequently be the written word. This is because from an early age children are taught to express and manipulate ideas through written and spoken language more than through other forms of expression, like music, photography, or video. We are more adept at manipulating words on the page, therefore, this is typically the first form a narrative will take. The task of weaving multiple narratives using multiple media types is first a writer's task, though photographers, filmmakers and sound recordists may eventually get involved.

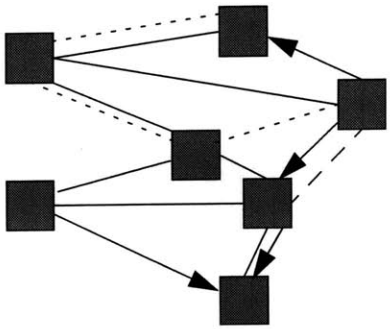


Fig. 6 A representation of the metalinear narrative structure as a network of differently connected nodes.

In the past, many terms have been used by writers and narrative researchers to describe stories which veer from a strict singular path. Massachusetts Institute of Technology research scientist and author Janet Murray defines multiform story as "... a written or dramatic narrative that presents a single situation or plotline in multiple versions, versions that would be mutually exclusive in our ordinary experience." (Murray, 1997, p.30) Indeed this definition goes far to define a narrative form which in essence is linear, yet

with many different instances of its linearity. The metalinear narrative theories of this research are built upon many of Murray's ideas, as well as those of other researchers such as J. David Bolter, Stewart Moulthrop, and Seymore Chatman.

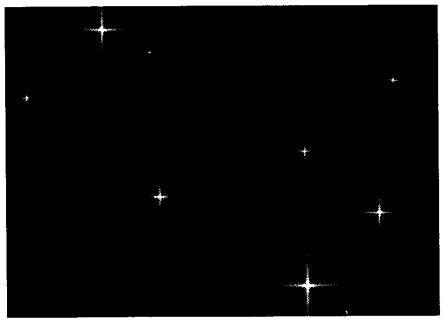


Fig. 7 Humans have looked up at the stars since before recorded history. Ancient astronomers saw drawings in the heavens composed of stars and the spaces between them. Those drawings became characters, and those characters became stories.

Because metalinear narrative defines a volume of interconnected story pieces much like star constellations in space, it requires a particularly spatial form of thinking. Thinking about relationships between characters such as mother–son, manager–employee, teacher–student does not require complex imagery. Thinking about the relationships between things that characters say such as "Hello Grandmother" and "Child, take off your cloak and put it in the fire, then come into bed with me where you'll be warm," is much more complex. What is said can have many layers of meaning and can mean different things in different contexts. When there is a community of characters all related one way or another, all speaking and all changing, the task of representing this universe of meaning becomes even more complex. Thinking about this universe in spatial terms helps to simplify the task of writing.

Fortunately, this way of thinking for the writer is nothing new. In his book WRITING SPACE, J. David Bolter of the Georgia Institute of Technology investigates the connection between technology, particularly computer technology, and the spatial characteristics which have always been a part of writing. (Bolter 1991) Bolter claims the act of writing requires the writer to enter into a reflective and reflexive relationship with the page (or the screen), thus it becomes di¢cult to say where the thinking ends and the writing begins, where the mind ends and the writing space begins. The writing space is where thinking about narrative happens. It is where the writer travels along the relationships drawn from node to node, considering narrative paths and patterns. Metalinear narrative encompasses

this space, representing the relationships between an entirety of what happens and what is said in between characters in the narrative. Metalinear narrative focuses on the 3-dimensional writing space from which many 1-dimensional or linear narratives are born.

Nonlinear is probably the most popular term used to describe narratives of indeterminate path. With its frequent use however, some researchers have turned away from using the term nonlinear because in their opinion it does not adequately describe the narrative material. Applying the term "*nonlinear*" to narrative material describes more what that material is not, rather than what that material is. This issue is echoed in Espen Aarseth's research on cybertext, a multiform textual narrative.

> *In my campaign for the study of cybertexuality I soon realized that my terminology was a potential source of confusion. Particularly problematic was the word nonlinear. For some it was a common literary concept used to describe narratives that lacked or subverted a straightforward story line; for others, paradoxically, the word could not describe my material, since the act of reading must take place sequentially, word for word. (Aarseth, 1997, pg. 2)*

Aarseth, a researcher and professor from the University of Bergen in Norway, chose not to use the term "*nonlinear*" because he saw the process of reading as a linear one. If the act of reading is linear, he argues, how could a form of literature be nonlinear? The same question could be asked of cinematic narrative. If viewing the narrative experience is linear, how can the art form be anything but linear as well? Metalinear narrative addresses these problems ffirst by being a term which describes a potential. The metalinear form resolves to many potential linear narratives. It is a form of writing which, from the start, acknowledges and embraces many worldviews without invalidating or necessarily editing any

out. Aarseth uses the term *ergodic* to describe a type of literature where nontrivial effort is required to allow the reader to traverse the text. This effort is executed with the help of a computer in the form of hypertext, which will be discussed later in this chapter. The thesis of this research is that metalinear narrative necessitates a computational system for storing, representing and presenting the potential linear forms. The details of this computational system are discussed in chapter 4.

Long before the computer, long before written language, oral storytellers defined the art form of crafting story. Later, story writers added and continue adding craft and creativity of form and content to the art. Within each mode of expression, authors have pushed the bounds of their art form in a metalinear direction. What follows is a discussion of four expressive modes of the storytelling art form and some examples of how certain artists have stretched the definition of linearity.

2.1.2 Oral Storytelling

Many audiences for oral storytelling just sit and listen to a story presented to them in a linear way. It appears to them that the storyteller begins the story, recounts the events, embodies the characters, and then simply ends the story in a meaningful fashion. Actually, from the storyteller's point of view, oral storytelling is a much more fluid and flexible process, suggestive of a metalinear structure. As the storyteller begins, and often even before they begin, they must tune–in to the audience's attitude and responses, what many storytellers refer to as the audience's energy. Based on this energy, the storyteller will adjust their timing, their posture, their characterizations, and sometimes even the events of the story.[2] There is a dialog between audience and storyteller. Oral storytelling involves a shared task, different from the physically separated tasks of the writer and

[2] As a professional oral storyteller, there are a number of stories I perform which have no written endings. The ending, as well as some middle parts, are totally dependent on the energy I get back from the audience, my feelings at the time, etc. There are many other professional storytellers who go even further by not writing down any of their stories. They perform them not by memorizing words, but memorizing the structure and key points of their stories. The words, the intonations, and the physical postures used in characterizations are all products of surfing the audience's energy.

reader of the printed story. The audience and teller negotiate a story into being in a highly dynamic interactive process. (Livo, 1986) As noted storyteller Rafe Martin puts it, there is a connection made with the audience through the teller's words and the rhythms of their voice and body. (Martin, 1996) The storyteller maintains that connection throughout the telling, modulating it according to their sense of the audience's energy.

One example of this "interactive" connection between audience and storyteller exists in African folk tales. In Western Africa for example, as well as in many parts of the Caribbean, storytellers create a connection with the audience through call and response. As African story collector and professor Jack Berry of Northwestern University said it:

> *Listeners may be asked and reply directly to questions from the storyteller or, on their own initiative, interject exclamations of assent and approval by way of encouragement. So important to narrative tempo are these interpolated interjections that, if too long delayed, the narrator will frequently substitute his own exclamations of "Good" and the like.*
> *(Berry, 1991, pg. xviii)*

This example demonstrates how the storyteller is fueled by and interacts with the energy of the audience through the story they tell. The audience's energy is also fueled in part by their expectations. When they sit down for a story, the audience expects to be taken away and taken up into a reverie of characters and events, of emotion and adventure. Their expectation is presented to the teller with outstretched open hands, for the teller to do with what he or she pleases. The storyteller's act of surfing the audience is thus begun by the teller answering the question: What do I do with their expectation? Do I satisfy it, violate it, or both?

Much of the audience's expectation comes in the form of narrative structure. From an early age, humans are taught to expect certain kinds of things to happen in a story in particular sequences. For instance, in his book HERO WITH A THOUSAND FACES, author Joseph Campbell talked about the universality of the hero character. The hero appears in similar forms and the hero story is told in similar ways in a great many cultures around the world.(Campbell 1949) The audience expects these similarities and when the teller satisfies their expectation, the story seems "right." When the audience's expectation is violated, the storyteller risks confusing or even alienating the audience.

When the audience's expectation is satisfied, but in an unexpected way, the audience typically enjoys the story even more. Their interest is piqued higher and their activity in constructing narrative detail runs at a much stronger pace. For example, a story could start out simply,

> *Once upon a time there was a sweet little girl beloved by everyone who ever looked at her. But the one who loved her most was her grandmother and she hardly knew of anything in the world that she would not have given to the child. Once she made her a gift of a hood of red velvet and, as it suited her so well so that she would not wear anything else ever afterwards, she was simply called "Little Red Riding Hood."*

We know this story. We know the setting, we know the characters, we can see the cottage in some detail, we can picture the grandmother and the little red velvet hood. Most importantly, we know what comes next – we have an expectation for the sequence of events in the rest of the story. Even if the setting and characters were totally different and they included a young urban girl named Latoya taking the subway to her grandmother's

apartment on the South side, a typical audience would have recognized the pattern and expected certain kinds of things to transpire in the story. The story continues:

> *The girl's mother asked her to set off through the forest to visit her grandmother. She brought along a basket of bread and milk. Around her head she wore the fine red hood her grandmother had made for her. Along the way she encountered a wolf. Although sinewy and fearsome, the wolf was hidden in the shadows. When he greeted the girl with a smooth voice, however, he stepped from the shadows like Harvey Keitel in The Piano, revealing the full length of his male body. Her eyes widened, and she sputtered a hello in return.*[3]

[3] This passage is inspired by the work of Robert Darnton (Darnton 1984) and by the computational storytelling work of Nick Montford. See: http://web.mit.edu/21w765j/Spring_97/StudentWork_SP97/Groundhog/nick/index.htm

A typical audience's expectations would now be slightly different. All the major elements of their expectation were satisfied, but in a way they would not have expected. The storyteller could now have the wolf say almost anything to the little girl. No matter what the wolf says at this point, the audience's sense of knowing what comes next would be in constant flux, still recognizing the story's structure, but having to work at painting all new detail, hearing all new voices and accents, feeling all new sensations for a story they have known since early childhood. The audience is active.

It is precisely this level of interactivity between audience and storyteller, and the ability of the teller to respond quickly to audience energy and expectation, that gives oral storytelling its power. It is to this level of interactivity which computational storytelling aspires.

2.1.3 Traditional Literary Examples

Writers have been pushing the linear bounds of the printed narrative for a great many years. Some of this pushing has taken the form of books written as a collection of various

first person accounts. Some literary works have played heavily with the reader's concept of time and space, such that all at once the reader is led to a perspective where time is no longer a linear path, but a set of simultaneous branching possibilities. Other forms have been narrative path–based, defining frequently bifurcating story lines leaving the reader to decide which to take. The rest of this section includes examples of these forms.

In the late 1920's, William Faulkner wrote perhaps his most famous novel, THE SOUND AND THE FURY, about events occurring around the Compson family. (Faulkner, 1956) The novel is divided into four parts, each part using a different narrator. The first three parts are from the points of view of three of the family members, with the fourth part written using an omniscient narrator. Because each section has a different point of view, the reader is placed inside the mind of the current central character. Therefore, not only is the reader privy to selected story details which that character deems most important to tell, but the reader also gets to experience the way in which each character thinks. As the novel progresses from section to section, the reader is left with the task of merging the details and opinions gleaned from earlier parts.

Jorge Luis Borges' stories such as GARDEN OF FORKING PATHS and THE CIRCULAR RUINS show time as a set of branching paths and as an infinitely cyclical journey, respectively. (Borges, 1964) (Borges, 1962) Borges' stories suggest a world where one can see dimensions far beyond the one dimensional process of reading from the two dimensional page. THE GARDEN OF FORKING PATHS is a story within a story about an ancient Chinese novel in which time is defined as an infinite set of forking paths, created by each of the decisions we make in life. When faced with a decision, we do not make a single choice, but instead make all choices simultaneously, thus splitting time into many paths of possibilities.

THE CIRCULAR RUINS is about a man who banks his canoe on a river's shore, near the circular ruins of a stone building built for worshiping an unknown god. The man falls asleep and discovers that his purpose there is to dream a new human being into creation. He dreams the human detail by detail – the heart, the skeletal system – until at last the man brings this new creature to life with the help of fire from the fire god of the temple ruin. The man teaches the new creature about the ways of the dream and the real worlds, eventually sending him on his way further down the river where there is yet another temple ruin. After this new creature, this new man departs, the first man quickly grows old and tired. The circular walls of the temple become a fiery enclosure that slowly engulfs him. As the man awaits the burning pain of death, he feels none, realizing that he, too, is merely a creation of fire, "...a mere appearance, dreamt by another."

In EINSTEIN'S DREAMS, author Alan Lightman wonders what Albert Einstein would have dreamt about while he was writing his seminal paper on relativity. (Lightman, 1993) Chapter after chapter Lightman asks questions through Einstein's character such as, "What if time was circular? What if it was linear, but ran slower at higher altitudes? What if time ran at different speeds in different geographical locations? Etc." With each 'what if' question, a resulting dream scenario is played out in the small Austrian town where Einstein lived and worked in the patent o¢ce. The reader is able to see time not just as bifurcating, but as having many possible structure; each structure true relative to a certain point of view.

CHOOSE YOUR OWN ADVENTURE books such as Richard Brightfield's THE CURSE OF BATTERSLEA HALL, are a good example of narratives with bifurcating paths. (Brightfield, 1984)[4] In these small paperbacks, the reader is given the opportunity every few pages to choose

[4] This is just one of many examples published.

what they would like to happen next, given a number of simple choices. Each choice is assigned a new page number for the reader to turn to, thus leading the reader through a reading experience of jumping around from one part of the book to another. The narrative, therefore, is structured as a set of paths which continuously split, leading to a diverse set of endings. The author's challenge is to give each possible path through the entire narrative a sense of intentionality and craft.

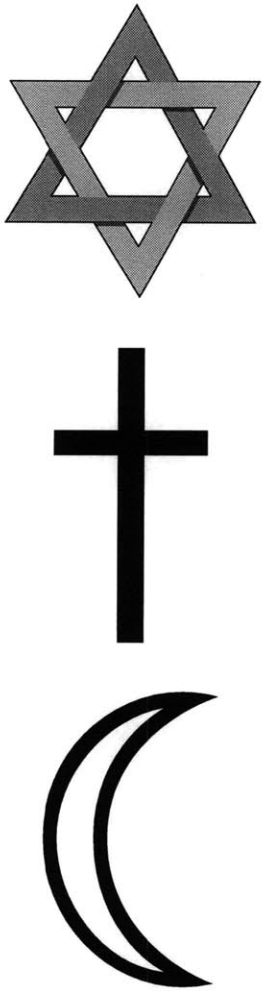


Fig. 8 Symbols of the three ways Pavic used to represent the world of the Khazars.

In Dictionary of the Khazars, author Milorad Pavic presents not a straight narrative, but a dictionary, or more accurately, an encyclopedia for an extinct culture called the Khazars. (Pavic, 1988) Living in the Baltic region of Europe between the 7th and 10th centuries, the Khazars were a people who battled, married, were conquered by and who in other ways touched the lives of many other cultures of the area. The book entails accounts of significant Khazars from the Christian, Islamic, and Jewish points of view. The book is presented to the reader as a tool that may be use to help them make up their own mind as to who the Khazars were. The introduction to the book includes instructions on the dictionary's use. After a brief overview of the dictionary's navigational tools, such as religious symbols and color schemes, the author further encourages the reader as to how he may approach the work.

> *But the reader should not be discouraged by such detailed instructions. He can, with a clear conscience, skip all these introductory remarks and read the way he eats: he can use his right eye as a fork, his left as a knife, and toss the bones over his shoulder. That will do. He may, of course, wander off and get lost among the words of this book, as did Masudi, one of the writers of this dictionary, who wandered into the other people's dreams, never to find his way back. In that event, the reader has no other choice than to begin in the middle of any given page and forge his own*

path. Then he may move through the book as through a forest, from one marker to the next, orienting himself by observing the stars, the moon, and the cross.

...Hence, each reader will put together the book for himself, as in a game of dominoes or cards, and as with a mirror, he will get out of this dictionary as much as he puts into it, for, as is written on one of the pages of this lexicon, you cannot get more out of the truth than what you put into it. (Pavic, 1988 p. 13)

Pavic gives the reader free rein to consume the book as they see fit, thus actively constructing their own understanding of the work and the culture represented. But Pavic is given little choice about having to introduce the reader to the book as he does. The notion that the book is a dictionary, and needs to be approached as one even though it may be fictional, needed to be reinforced in order to break the reader's tendency to read from beginning to end, instead of the non-sequential meandering paths Milorad Pavic's writing tries to encourage.

Once a computer is mediating the material, rather than the bound pages of a book, the reader's tendency to think in a linear fashion can be redefined and beginning-to-end linearity no longer assumed. While the cited books use different methods with varying success to minimize their linear nature, it is only with a new tool, a new medium, that true nonlinear narrative can be born.

2.1.4 Hypertext

Hypertext is the binding of many electronic documents to one another through the use of linkages. These linkages or links can have the form of a hot word within text, or hot region within images and video. The idea of hypertext was first proposed by MIT research scientist Vannevar Bush in an article written in 1945 entitled As We May Think. (Bush,

1945) In that article, Bush describes a machine, which he calls memex, as "a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility." Bush goes on to say that this device should work more like the human mind does – by association rather than by indexing of information. That is, the human mind tends to remember things in terms of how they are related to other things; i.e. a family member's birthday relative to a religious holiday, someone's last name relative to the name of an occupation or trade, a friend's favorite and least favorite foods relative to a particular shared meal in the past. Bush sought to link documents in such a way.

> *One cannot hope thus to equal the speed and flexibility with which the mind follows an associative trail, but it should be possible to beat the mind decisively in regard to the permanence and clarity of the items resurrected from storage. (Bush, 1945)*

The term hypertext was coined in the 1960's by author/visionary Theodor Nelson. (Nelson, 1987) Nelson hoped to link texts as a way of linking human thought and knowledge, so someone could more easily navigate a large body of connected knowledge on an electronic screen. Researcher and Brown University Professor George Landow, who has written extensively about hypertext, describes this form of writing as one which truly requires an active reader.

> *Hypertext, in other words, provides an infinitely re-centerable system whose provisional point of focus depends upon the reader, who becomes a truly active reader in yet another sense. One of the fundamental characteristics of hypertext is that it is*

composed of bodies of linked texts that have no primary axis of organization. (Landow, 1992, pg. 40)

Much of the early vision of hypertext is largely satisfied today through the World Wide Web. Both the World Wide Web as well as special hypertext software applications like Storyspace (Eastgate Systems, 1996) offer authors the opportunity to make links between many pieces of fictional and nonfictional text. Indeed, the publisher of Storyspace, Eastgate Systems, also publishes many hypertext works of fiction and nonfiction.[5]

5 http://www.eastgate.com/

Postmodern literary critic and professor Stuart Moulthrop of the University of Baltimore, as well as George Landow, and others who have written extensively about hypertext, see hypertext as an ideal multiform structure where the reader is called on to be more active than previously expected in piecing together narrative. (Landow, 1992, p.7) Typically, someone reading a book or magazine would simply have to keep track of the page number sequence to know what's next. In the case of a magazine with non-contiguous articles, a bit more attention has to be paid to page numbers and references, but that is the limit of awareness needed to follow a magazine type narrative. Hypertext, on the other hand, has no visible page numbers. What's next is determined by what is physically clicked on with the computer's mouse.

For example, given a hypertext passage such as:

"Oh Grandma, what big ears you have."
"The better to hear you with my dear."
"And Grandma, what big eyes you have."
"The better to see you with my dear."

"And Grandma, what big teeth you have!"
"The better to EAT you with my dear!"

the user could click on any of the above words, or the white space around the words, and depending on which word the user clicked on, a different passage would fill the same space on the screen. For instance, if the user clicked on the word "Grandma," the next passage could be a parallel plotline about another grandmother character in another fairy tale, it could be a passage about grandmothers in general, or it could be a different passage about this particular grandmother in this particular story, as if the user needed to know more about her before continuing on with this plotline. The user could click anywhere in the active space and go wherever the hypertext story designer had dictated. By clicking on a non-consequential word like "with," "And," or "what," the user could be taken down the path of a default plotline which might correspond to the user's expectations for this story.

While the narrative path taken by the user is laid out by the author ahead of time, it is only one of many clearly defined paths through the narrative material. From hypertext comes hypermedia, which goes beyond simple text as a medium of expression in favor of a diversity of media forms including still pictures, video, sound and text. Both hypertext and hypermedia have been defined and built, as Moulthrop states, "with electronic cross references that move the reader instantly from one piece of information to another." (Moulthrop, 1990, p.7)

The World Wide Web is an example of a hypertextual design using multiple media. In the web, HTML documents are by and large "hard linked" to other documents[6] by way of individual alpha-numeric characters, words, collections of word-like phrases or sentences,

[6] It is no accident that HTML stands for HyperText Markup Language. The foundational ideas of the world wide web are rooted in the theories and ideas of hypertext's early thinkers such as Vannevar Bush and Theodor Nelson.

pictures, or even predefined areas of a still images. The act of surfing the web requires following link after link, testing, tasting, and jumping around in search of new and interesting information – a type of activity which is becoming more and more common, and more commonly understood.

> *Although narratologists have almost always emphasized the essential linearity of narrative, critics have recently begun to find it to be nonlinear. Barbara Hernstein Smith, for example, argues that, by virtue of the very nature of discourse, nonlinearity is the rule rather than the exception in narrative accounts. (Landow, 1992, pg. 24)*

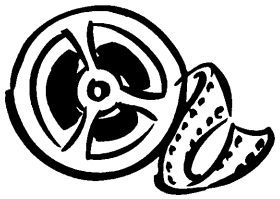


Fig. 9 Cinema is a linear medium, yet inspires nonlinear narrative through films by directors such as Kurosawa, Altman, Jarmusch, and Tarantino.

2.1.5 Cinema

Film is a medium even more rigidly held than text to a linear format due to its physical characteristics. It is di¢cult to navigate around a 400 foot reel of motion picture celluloid, other than by straight linear progression from beginning to end. Yet, films such as Akira Kurosawa's RASHOMON, Robert Altman's SHORT CUTS, Jim Jarmusch's MYSTERY TRAIN, and Quentin Tarantino's PULP FICTION exemplify how a film maker can still stretch, if not break, the boundary of linear experience. These films in particular are examples of nonlinear story design in a linear medium and have inspired this research effort in numerous ways. Another film, ROCKY HORROR PICTURE SHOW, directed by Jim Sharman, has redefined interactivity in traditional cinema for a quarter century.

SHORT CUTS, a film by Robert Altman, follows the lives of ten sets of characters as they interweave. (Altman, 1994) While the stories of each set of characters are intriguing in their own right as they struggle through their lives in modern day Los Angeles, the multiple "independent" storylines take on new significance as they cross each other. Because

the film hops back and forth between the different stories, telling bits and pieces of each in an interwoven manner, it has a distinct non-linear nature. The audience has no control over the near misses when one story comes close to intersecting another, nor control over the direct and sometimes violent collisions between one story and another, and so can only passively participate. The linear film experience of sitting in the theater watching without guiding is maintained, while the feeling of the story itself remains nonlinear.

Jim Jarmusch's film MYSTERY TRAIN is also an example of interconnected storylines through multiple sets of characters. (Jarmusch, 1989) Unlike Altman, Jarmusch's approach gives the audience the perception that they are witnessing time fold back onto itself. The story begins by following a Japanese couple's journey to a Memphis hotel. It then follows a young Italian widow's serendipitous journey to that same hotel. With each additional set of characters and events connected with the hotel, certain scenes are shown as timing cues, sometimes repeatedly, in order to reinforce the message that many of these events are happening simultaneously. These short repeated scenes are often in the hotel lobby or are sounds from surrounding hotel rooms which the audience recognizes as being associated with previously viewed scenes. They synchronize the viewer as to when there actually is a passage of story time. The notion that this is time folded comes from the fact that the audience is forced to watch all of these events sequentially, yet with the repeated cinematic message that these events are happening at the same time. Again while the audience has no control over what events they see when, they are involved in a narrative construction process, where sequentially presented events must be overlaid one on top of the other and selectively placed end to end, in order to grasp the full story.

PULP FICTION, like the films above, uses interconnected stories driven by strong characters. (Tarantino, 1994) PULP FICTION is distinguished from the others the filmmaker's choice of structure. After weaving through the many sets of characters and story lines, Director Quentin Tarantino chose to replay the opening scene from an earlier point in its story, and even filled in a part of the opening that he omitted in the beginning. By replaying this scene, the audience knows what is going to happen next, or thinks they know. The audience's omniscience is shattered when the new scene is inserted in the middle of the old, giving the once familiar ending a new context and meaning. This sequencing choice is especially striking because one of the main characters in the opening sequence, played by John Travolta, is killed in a previous scene. The structure forces the audience to look on the characters from the opening scene differently, even though the scene again resolves pretty much as it did at the beginning of the film.

RASHOMON, a classic film by Akira Kurosawa, chronicles a crime on a rural road in ancient Japan. (Kurosawa, 1951) In recounting the crime to the authorities, the different characters involved tell different stories. The audience sees all of these versions played out, each from a different character's point of view. Time and story events are not folded as in the previous example; here the events are presented to the audience sequentially, and the audience is asked to do the work of placing them side by side in their mind for comparison. This work, this required thoughtful viewing by the audience, is similar to the activity asked of the reader in hypertextual stories. The author presents a firm structure and story content within that structure. The audience then appropriates the linear story (or a linear story) by reconstructing the story events. One definition of interactivity, then, is a measure of how much the audience is willing to or motivated to do this reconstruction and how much the story structure aides them in that activity.

It is interesting to note that while many theater and distribution companies like Loews, Sony, Time Warner and others are spending lots of money and time trying to develop interactive story systems for theaters and personal computers, what has proved to be perhaps the most successful "interactive" movie in history allows the audience to effect neither the film's production nor outcome. Audiences attending screenings of THE ROCKY HORROR PICTURE SHOW have been packing movie houses for over 20 years to recite the dialogue along with the characters on the screen, throw story-relevant objects during the movie at specific times, and even come to the theater dressed as their favorite characters. (Sharman, 1975) Their active participation alters their experience of the movie, and the audience largely comes to the theater expecting the standard movie experience to be altered. This phenomenon is one piece of evidence which indicates that interaction in a movie experience does not necessarily require modifying the movie itself. ROCKY HORROR takes advantage of the human imagination and its tremendous ability to fill in and expand story. It is this very same ability upon which metalinear narrative relies when making its narrative construction.

2.1.6 Granularity

For this research, the notion of granularity relates to the act of building narrative and the parts that one builds with. In general, a granule is that part or tiny piece which one uses to build something much larger. The larger the granules used to build with, the easier it is to build; for instance, it is much easier to stack bricks to build a castle than pile grains of sand. It will take many more grains of sand to build a castle than it would bricks. The smaller the granule, however, the more precise and smooth the building can be. Building a vase with granules of clay is smoother and more precise than building it with pebbles

or brick, for instance. A potter has very precise control over very minute detail of her work largely because clay granules are so fine.

In film, granularity is the coarseness of the meaningful units of audio or visual material. That is, a film can be broken down into a series of scenes, which are large pieces or broader strokes of meaning. Scenes can be further broken down into sequences, which are the result of continuity on various planes, including temporal, spatial, and perceptual. (Davenport, 1991) Sequences can be further broken down into shots, which are one or more frames of film or video that have been recorded contiguously, and therefore represents a continuous action in time and space. The shot can be finally broken down into the frame, the smallest addressable unit of film representing the limit of what the film camera can capture at any instant.

> *For image processing, the descriptive granularity has to be fine enough to address specific objects in the frame. When editing a movie, the granularity must be coarser to encompass thoughts, actions, and intentions. (Davenport, 1991)*

For example, there is a scene in LITTLE RED RIDING HOOD where the girl, noticing a patch of flowers some distance to the side, wanders off the path. The wolf, who had been lurking in the shadows, confronts the girl, asks her destination, and then leaves to take the short cut to the grandmother's cottage. A sequence within that scene could be the following series of shots: an over the shoulder shot of Red walking down the path through the forest; Red's POV of the flowers in the near distance; a medium shot (head, shoulders and waist) of a large smile growing on her face as she turns off the path and starts toward the flowers; Red's point-of-view reaching the flower patch and gently reaching down to pull up a flower when a shadow enters frame-left, followed by a hairy paw; the camera tilts up

to a medium close-up of the wolf's face with an exaggerated grin, showing all of his sharp teeth. An example of a single shot from this sequence is the final shot, ending with the wolf's ominous smile. A single frame from this shot would be the final frame of the wolf smiling, or the frame which includes Red's gentle hand grasping the small flowers with the shadow of the wolf darkening the upper left hand side of the frame. Thus, a cinematic scene can be broken down to ever smaller granules of meaning.

For metalinear story, granularity has to do with the representation of meaning for each story piece. Given the fluid and flexible nature of digital media, the meaning of a granule is based not on physical limitations, but more on how (or how many ways) the granule can be used to tell a part of a story. When a writer writes a metalinear story granule, what that writer is creating is a multifunctional cog that can be positioned in many different places within the linear story. The writer must, therefore, be aware of the issues connected with the creation of each granule – economy of size vs. precision in use. A balance or compromise must be struck, keeping in mind the complexity required to communicate the story at hand. In other words, to write a metalinear story, one needs to ask the question, "How complex does the system of interconnected story pieces have to be in order to tell this story well?" Some computational storytelling systems are designed around using large chunks of story and sometimes even use full stories as granules.

Computer and cognitive scientist Roger Schank at Northwestern University, along with his team, created a system for storing a large number of entire stories that are retrieved with the use of software agents. (Schank, Bareiss, Fano, Osgood, & Ferguson, 1992) The agents work in pairs and target stories along a single subject axis, with each agent representing an extreme of that axis. For instance, one pair of agents named Einstein and Ed-

ison retrieve stories about science. Einstein looks for stories having to do with theoretical and abstract science, while Edison looks for stories having to do with invention and practical engineering. When sent off to retrieve stories, those stories selected by both agents are placed higher in the priority list. On the other hand, if a story comes back as retrieved by Einstein, the user will know something about what approach to science the article contains. It is important to remember that the agents here do not perform a construction process using small narrative granules, but instead select entire stories.

To decide on a granule's size and functionality is to define the flexibility of the entire system. While metalinear narrative makes no restrictions on size and shape, it is the writer's responsibility to design the granules for optimum functionality for their own work. Some of the attributes which govern the functionality of story pieces include size, the relationship between story pieces, and the types of narrative parts that it represents. These attributes will be discussed in more detail in chapter 5.

2.1.7 Assembly in Multiple Ways

Once story granules are defined, how does one construct them into a coherent whole? Once a whole story is constructed the first time, how is it constructed again differently – and indeed over and over again? This is done through the use of story structure.

Aristotle, as well as modern day narrative researchers and authors such as David Bordwell of the University of Wisconsin and Edward Branigan of the University of California in Santa Barbara (who have focused much of their attention on the power of story structure) recognized the ability of story structure to communicate ideas. Bordwell suggests that there is a connection between story structure and a listener's memory of a story.

Nearly all story-comprehension researchers agree that the most common template structure can be articulated as a canonical story format, something like this: introduction of setting and characters – explanation of a state of affairs – complicating action – ensuing events – outcome – ending. Distortions in comprehension and recall tend to occur at points when the narrative violates or ambiguates this ideal scenario (Bordwell, 1985, pg. 35)

Story integrity and recognizability are, in fact, a matter of structure – the manner in which a given story binds information together into some sort of coherent whole. A random collection of bits of information not organized into a conventional story shape is denied story status. (Livo & Rietz, 1986, pg.29)

In his article on knowledge and memory, Roger Schank repeatedly states that there is a strong connection between human knowledge, memory and the stories we carry around. The better that observed or reported events can be couched in a familiar story structure or pattern, the better our memory of those events. (Schank, 1995) Schank's earlier work had to do with creating a computational model for life's actions such that a computer system could read a "story", disambiguate its events, and then be able to predict or generate what event(s) should follow (Schank & Abelson, 1977). Schank's definition of "story" was a recounting of stereotypical, chronological events and did not make room for higher level narrative structures such as flashback, flash forward, or narrative primitives like those introduced later in this document. Schank modeled expectation using an elaborate construct of IF/THEN path lines. There was no room for character development, personality, or emotion.

Professor Michael Dyer of U.C.L.A., who was a student of Schank while he was at Yale University, furthered the field of story understanding with his BORIS project. (Lehnert,

1983) Like Schank's work, Dyer's BORIS program could read stories, disambiguate the text, and pick out main characters. In an extension to BORIS, called MORRIS (Moral and Reminding Interface System), the system could read a story in depth and perform a careful analysis of the appropriateness of character actions. (Dyer, 1983) From this, MORRIS would extract the moral of the story, in the form of narrative summarization, which it could then refer to later when attempting to analyze and understand other stories. By addressing story moral, the BORIS/MORRIS system addressed a level of human creativity that few computational systems could. Still, it is important to note that the systems built by Schank and Dyer were story analyzing systems, not story construction systems. To seek out and model information that is already in a story is very different from creating a story which contains multiple levels of moral and emotional information.

Joseph Campbell's work in myth and archetype, in parallel with psychologist Carl Jung's writings on human personality, goes far in describing character roles and expectations. They each seek to explain some of the roles and patterns of how we as human beings live out our lives, and through those patterns interpret characters and events in stories. (Vogler, 1992)

Writer Carol S. Pearson provides six Jung inspired archetypes in her book The Hero Within—Six Archetypes to Live By. (Pearson, 1989) In that volume, Pearson examines the character archetypes of the Innocent, the Orphan, the Martyr, the Wanderer, the Warrior, and the Magician. As Pearson states,

> *Each of the archetypes carries with it a worldview, and with that different life goals and theories about what gives life meaning. (Pearson, 1989, pg. 11)*

Pearson's archetypes give insight into how people see themselves and the world around them. They are a model for providing meaning to the way people act in different situations. Because of this, the archetypes can also be a model for realistic ways in which story characters can act in various fictional situations. Pearson provides one of the few character-based, rather than plot-based models.

Branigan's work in cinematic story structure offers a wealth of insight, especially in the area of narrative schema. (Branigan, 1992) (Brooks, 1996) This research uses Branigan's structures as a general guide in developing a framework for structuring metalinear stories. Branigan's narrative schema consists of the following:

1) introduction of setting and characters;
2) explanation of a state of affairs;
3) initiating event;
4) emotional response or statement of a goal by the protagonist;
5) complicating emotions;
6) outcome;
7) reactions to outcome.

The order of these elements is important, as they progress from the beginning of an archetypical narrative to the end. Elements one and two introduce the narrative, bringing us quickly up to speed with the rules, physical attributes, and even the physics of the environment, as well as the state of this story world and its important characters. Element three, the initiating event, is the spark which sets the affairs of the story world even more off balance than they may have already been. Element four represents a direct or nearly direct statement by a main character, which focuses the entire narrative around the stated goal of this main character.[7] Elements five and six are part of a causal relation-

[7] No other of Branigan's narrative elements illustrates more clearly that this narrative scheme is specific to stories/movies of the American culture. Many European movies, for example, do not offer the audience a direct statement of the protagonist's goals. Instead, the narrative progression of many non-American movies is based much more on the strength of the characters and character interplay alone.

ship stemming from the initiating event, in that the initiating event happened and caused certain emotions and outcomes. Element seven is then part of a causal relationship with element six. Recognizing such causal relationships, or in Branigan's terms "focused causal chains," are important for helping to give the audience a handle for understanding life as represented in the narrative.

> *Focused causal chains are not just sequences of paired story events in time and space, but embody a desire for pairing events and the power to make pairs. Narrative causes are thus principles of explanation, or criteria for grouping elements, which are derived from cultural knowledge as well as from physical laws: the human plans, goals, desires, and routines—realized in action sequences—which are encouraged, tolerated, or proscribed by a community. (Branigan, 1992, pg. 116)*

In the early part of the twentieth century, Russian formalist Vladamir Propp proposed a set of 31 narrative characteristics to provide a method for understanding and cataloguing Russian fairy tales. (Propp, 1968) Propp explains in MORPHOLOGY OF A FOLKTALE that he did this by breaking up a large number of fairy tales into components and then made a comparison of the tales according to their components. Propp created two levels of these components or categories; the thirty-one major characteristics, with each one including one or more sub-categories. For example, Propp's category 16 is, "The Hero and the Villain Join in Direct Combat," with sub-categories, (1) They fight in the open field, (2) They engage in a competition, (3) They play cards, and (4) a special form relating to a specific story in which a she dragon proposes the following to the hero: "Let Prince Iván get on the scales with me; who will outweigh the other."

Much of the power behind Propp's work is that it offers detailed patterns of narrative events with an almost mathematical symbol system of representation. Category 16 has a designation of the letter "H." To make the full designation, the sub-category number is added as superscript. If the Hero and the Villain battled in a game of pinochle, for example, Propp's designation would be H3. If the full story were that the Villain rode into town and promptly abducted the Hero's wife, to which the Hero responded by challenging the Villain to a game of pinochle, at which the Villain eventually lost, then Propp's story designation would be: A1 H3 I3.

It is di¢cult to accurately apply Propp's work to modern narratives because its form of sequencing is quite rigid and based on a deconstructionist approach to the study of narrative. Propp's work was also based on his own cultural folk tales and was never intended to be applied beyond that domain. There are other researchers, however, who tried a broader approach.

Around the same time Propp was writing his volume on morphology, Finnish folklorist Antti Aarne created a tale type and motif index for the comparative study of folk tales. Upon Aarne's death in the mid 1920's, the work was taken up by folklorist and professor Stith Thompson of Indiana University. (Thompson 1955) Thompson expanded the tale type and motif index to include tale types and motifs from many cultures around the world. Thompson defines tale type as "a traditional tale that has an independent existence. It may be told as a complete narrative and does not depend for its meaning on any other tale." (Thompson 1977) A tale type is made up of one or more motifs. A motif is "the smallest element in a tale having a power to persist in tradition." In other words, motifs are story granules.

Examples of the Aarne-Thompson tale types are: Magic Objects, Supernatural Power or Knowledge, and Supernatural Helpers. Examples of motifs within the Supernatural Helpers tale type are: the three old women helpers, the wild man, and the gifts of the little people. The motifs are story granules which define the meaningful chunks of a tale. Thompson assigned a unique sequence number to each of his thousands of motifs to make it easier to codify a tale. Therefore, similar to Propp's work, it is possible to construct a sentence of motifs which represent a particular folk tale. For example, the Grimm's story *Rumpelstiltskin* has a tale type of 500: The Name of the Helper. *Rumpelstiltskin's* list of motifs are: H914, M242, S211, H521, D2183, H1092, N475, C432.1.[8] With such representations it is then possible to compare stories from different cultures, note similarities and postulate reasons for these similarities. According to the SCRIBNER RESOURCE COLLECTION OF WORLD FOLKTALES, there are at least three other stories from England, Scotland and America with the same tale type and similar motif list, and therefore, are variants of Rumpelstiltskin. (Clarkson, 1980)

What Branigan provides is an abstract structure for organizing story material. What Propp and Thompson provide are classification systems for identifying and comparing different stories – and in Thompson's case, comparing stories from different cultures. They each provide a structured method of addressing narrative and a method of attaining new understanding about narrative through structure. Propp and Branigan make the point that because the story material is organized in a structure, especially a structure which is common or recognizable to the audience, the audience enjoys the story more and maybe even remembers it better. By putting together the various parts of the story into an over arching structure, the story as a whole works. The same is true for metalinear narratives:

[8] Meaning: *H914* - Tasks assigned because of mother's foolish boasting; *M242* - Bargains and promises between mortals and supernatural beings; *S211* - Child promised to supernatural being; *H521* - Test-guessing unknown propounder's name; *D2183* - Magic spinning; *H1092* - Task-spinning impossible amount in one night; *N475* - Secret name over heard by eavesdropping; *C432.1* - Guessing name of supernatural creature gives power over him.

by providing an abstract story structure, in this case taken mostly from Branigan's work, a entire story can be constructed from parts based on that overarching structure.

Even with Branigan's relatively small number of narrative schema elements, compared to Thompson's thousands of motifs, it is still possible to describe a large number of narratives. Branigan designed his schema elements to be broadly useful in the description of narrative. If, instead of deconstructing, one wanted to construct narrative from a large collection of story granules using one of the above structures, help would be required for organizing story granules and sequencing granules based on their descriptors. Help would be needed, in the form of a tool, to construct a story; and with such help, the nature or process of construction is changed. Bringing in the right tool can change the way one thinks about a business, as has been shown by the tractor in farming, the power saw in logging, and the computer in finance. A tool for developing and constructing metalinear story can change the way one thinks about the business of writing.

3 The Problem

The world has arrived at an age of cheap complex devices of great reliability; and something is bound to come of it.
Vannevar Bush, As We May Think, 1945

3.1 The Problem Addressed by the Thesis

3.1.1 The Thesis

The last chapter examined a few of the many ways people have pushed the bounds of various media in a nonlinear or metalinear direction. While those noted explorers have progressed and expanded the media's means of expression, some problems still remain. For instance, those examples cited in the previous chapter are bound to their fundamentally linear media. No matter how talented the filmmaker or engaged the audience, film remains a linear medium. This thesis shows that in order to write a metalinear story, one must use a metalinear writing tool from the very beginning. Writing using a standard word processor and a multilinear presentation tool cannot yield a metalinear result. One requires a special tool to aid appropriately in the process of building a metalinear story system.

In general, the computer has the ability to be this tool. Yet the problem remains; how? How can a computer take instruction from a story writer such that the computer can

"know" something about the story? How can a computer provide feedback to the writer during the grueling rewrite process? How can a computer fit into the metalinear story design system which includes story creation, presentation and writer/audience feedback?

If a computational system is to make narrative sequencing decisions, it will have to have access to some portion of the author's intentionality. It will have to have some representation of how the author understands his/her own story. The metalinear narrative model accomplishes this by representing the authorial intentionality through various types of links. By connecting one piece of story to another, and stating a simple reason for this connection, like causality or temporal precedence, some amount of the author's intention is represented in the linking system. Additionally, by providing the author with feedback in the form of a story, a writer will know if the connections they made between story pieces can be navigated in a coherent way. A specialized software tool for writing metalinear stories can provide such functionality. It can help the author construct metalinear story by capturing the relationships between story pieces, providing a means for constructing narrative structure, and by providing ways to reconstruct multiple linear narratives from the same collection of narrative material. This chapter addresses the issues involved in creating such software by examining different approaches others used in this domain.

3.1.2 Overview of the Problems

Any storytelling experience or system, whether electronic or otherwise, typically includes three important elements: the artist/storyteller/writer, the story itself, and the audience. For a commercial system these functions might be called creator, product, and consumer. The artist creates the story, which is then realized in a specific medium and

presented to an audience or consumers. Once the audience experiences this single instance of the story (book, theater, movie, etc.), there may be some mechanism for the audience to respond to artist. Such a system is modeled in Figure 9. While a book is fixed, with audience feedback possible only after the fact (through the publisher), feedback in live theater is a little more fluid. One example is that actors can often read the audience for needed adjustments during their performance. Additionally, applause during or immediately after the performance serves as some measure of artistic success for performers and writers. However the audience's feedback is usually given only after they have experienced the story – this is especially true in the case of movies. In general for all media, the audience cannot give feedback during the story in a way which will change any of the narrative structure or its production elements. As discussed in chapter 2, this model does not hold for oral storytelling, which has a much more fluid artist-audience

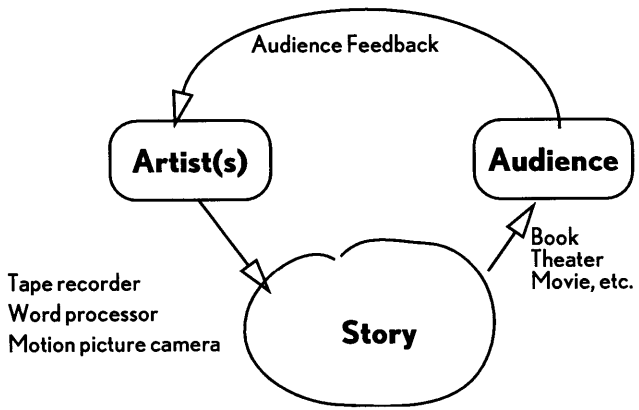


Fig. 9 Simple artist-story-audience structure, with feedback.

interaction. This model does hold true for all recorded media. For the benefit of reaching a wider audience through mass duplication, the recording process tends to distance the audience from the artist.

Is it possible for a computer mediated story to change this model? Computers have already been incorporated into the story writing and production process—most notably with the use of word processing tools. Word processors mainly offer a way of getting the story text written down quickly, and allow for fast and efficient editing. Beyond this common functionality, there are software tools that also give feedback to the writer based on some simplified knowledge the tools have about the written language. Spell checkers and grammar checkers have a representation of words and sentence grammar which allow them to use the written text as input for comparison with their rules. The software offers the writer feedback regarding where its representation of correctly spelled words or proper grammar does not match the writer's text. These actions compose a feedback loop between writer, the story/text, and the computer. However, these systems have little to do with the narration of the story and nothing to do with the audience. That is, they do not have any representation of what the story is about. Spell checkers and grammar checkers

do not make the wolf bigger or badder, or Red a smarter child, but just "cleans-up" what the writer has done. Figure 10 illustrates such a system.

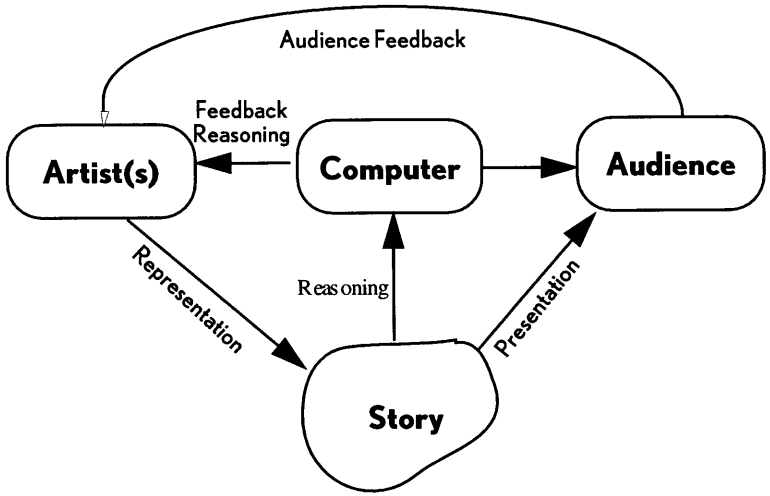


Fig. 10 Computer assistance in the simple artist-story-audience structure.

Many researchers and software designers have tackled the problem of trying to place the computer within the creative process in a more meaningful way. These attempts have usually not been directed toward general solutions, but instead toward application specific solutions. This chapter examines some representative examples which demonstrate the limitations of currently available systems.

3.2 Problem Examples

3.2.1 The Knowledge-based Approach

Figure differs from Figure in that there are paths marked with the words *REPRESENTATION*, *PRESENTATION*, and *REASONING*. *REPRESENTATION* conveys the existence of story content as well as story description. The story is described to the computer in a way which allows the computer to understand it enough to facilitate simple manipulation. (Brachman & Levesque, 1985, p. xiii) *PRESENTATION* conveys that the form of media for the story is not predetermined. That is, the story exists first in an amorphous, unrealized state. It is the presentation process which forces a choice of medium on the story, and thereby a cascading series of further decisions like editorial style, treatment of sound, etc. *REASONING* conveys the existence of something which makes logical inferences about the story based on the description (representation) of the story. The reasoning engine reads the story description, makes its inferences, and feeds the results of those inferences back to the artist.

A sophisticated example of this structure would be the software program *DRAMATICA*, from Screenplay Systems.[9](Screenplay-Systems, 1994) Dramatica provides the screenwriter with a gigantic sophisticated questionnaire. As the writer fills out the questionnaire, making high level narrative choices, Dramatica searches through its list of known narrative structures for matches. Its main goal is to force the writer into making the most detailed decisions possible about the story, so that Dramatica's matches for story structure and style come down to just one. When there is only one match, the system can provide the user with additional information about their screenplay according to the description

9 See: http://www.screenplay.com/

of the found match. The theory behind Dramatica suggests that writing screenplay dialog is a lot easier if all the necessary character decisions and attributes are already decided, like how they think, their strengths and weaknesses, etc.

Dramatica seems well suited as a narrative feedback mechanism, as long as the user's goal is to create a type of story in line with Dramatica's "expertise" – linear Hollywood styled movies. Dramatica's knowledge is stored as static rules about linear screenplay structure and character definition. In artificial intelligence (AI) terms, Dramatica takes a knowledge-based approach to the problem domain of screenplay structural analysis. It is well known in the AI community that one of the weaknesses of Knowledge-Based AI (KBAI) is that its structures become brittle when faced with a dynamic problem domain or any problem domain which it was not specifically designed to handle (Kolodner, 1993; Maes, 1992).

An alternative approach would be a behavior-based approach. This approach is described well by professor Pattie Maes of the MIT Media Laboratory. In her paper BEHAVIOR-BASED ARTIFICIAL INTELLIGENCE she compares and contrasts these two forms of AI by listing characteristics which typify the knowledge-based and behavior-based approaches. (Maes, 1992) What follows are those characteristics I have found most appropriate in the domain of narrative structure:

A Knowledge-Based Approach

- Models isolated and advanced or specialized competences (i.e. medical diagnosis or chess playing). The knowledge-based approach would rather provide "depth" than "width" in its expertise.
- Solves one problem at a time, usually with no time constraints for solving that problem.[10] Also the problem domain is static, remaining unchanged.

[10] This is certainly true in Dramatica's case. In the Hollywood film industry, the writing process is so far removed from the presentation process that, as far as the Dramatica software is concerned, the writer has all the time in the world to create and analyze her screenplay before production begins. Therefore, Dramatica's reasoning system really does not need to work any faster than what good human interface design dictates.

- Usually is not concerned with developmental aspects, how the knowledge structures got there in the first place, or how they change over time. Therefore, the knowledge-based approach does not have to be adaptive.

Alternatively,

A Behavior-Based Approach

- Has multiple integrated competences, such as those needed in locomotion or navigation for robots. For stories, these competences may choose conflicts, decide on story resolutions, or, with regards to presentation, decide how to smooth out audio transitions, for example.
- Is a system "situated" in its environment. For robots, this means that they are directly connected to their problem domain through sensors and effectors. For computational narratives, it means that the system navigates an environment of story representation and is "open" in that it is always accepting of user feedback.[11]
- Emphasizes the behavior exhibited by the system rather than the system's knowledge.
- Emphasizes the system's adaptive ability, which means that the system improves over time.

[11] That is, the system is open to user feedback whether it is responsive to that feedback or not.

Behavior-Based AI (BBAI), as an alternative to knowledge-based AI, represents a fundamentally different way of thinking about a problem domain. Where the knowledge-based approach makes an a priori attempt to capture the rules for successfully solving or navigating a domain, the behavior-based approach instead relies on a set of lower level competences which are each "experts" at solving one small part of the larger problem domain.

BBAI constitutes the theoretical groundwork for the notion of Autonomous Agents (Maes, 1990). Autonomous agents are intelligent software modules that embody the ideas of BBAI. Autonomous agents are typically designed to control some sort of mobile robot or computer screen character, maintain certain "personalities" as members of a MUD

(Multi-User Dungeon or Domain (Foner, 1993)), control user response behaviors in a software interface, or perform certain financial or search tasks on the internet.(Maes & Kozierok, 1993) (Tecuci, 1998) An agent must be able to maneuver around obstacles without getting stuck in an awkward space or lost in an endless loop of co-dependent tasks, oscillating between multiple goals. They are designed to deal with domains that are not entirely known, where unexpected things can happen. To this end, care must be taken to ensure that there exists a set of competences within the agent which handle the low-level tasks necessary for the operating environment; i.e. stepping, talking, or communicating over a network.

Metalinear narrative research employs BBAI through the use of software agents. The software agents are less brittle and more adaptive to a dynamic narrative representation environment than a KBAI approach would be. Using software agents, story domains can grow or change, while the agent remains the same.

3.2.2 The Simple-Link Approach

As mentioned in Chapter 2, hypertext systems like StorySpace offer a web-like structure for text, providing navigable connections between small granules of story. With its graphical representation of nodes of text and the connecting links between those nodes, StorySpace encourages a spatial conception of writing that goes beyond what we have come to expect on a simple 2D writing surface.

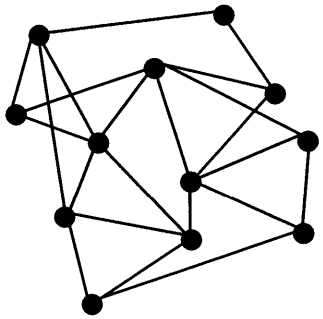


Fig. 11 The web of simple linked nodes.

All forms of writing are spatial, for we can only see and understand written signs as extended in a space of at least two dimensions. Each technology gives us a different space. For early ancient writing, the space was the inner surface of a continuous roll, which the writer divided into columns. For medieval handwriting and

modern printing, the space is the white surface of the page, particularly in bound volumes. For electronic writing, the space is the computer's video screen where text is displayed as well as the electronic memory in which text is stored. (Bolter, 1991, pg. 11)

The next step past hypertext is hypermedia, which goes beyond simply text as a medium of expression to include a diversity of media forms including still pictures, video, and sound as well. Both hypertext and hypermedia have been defined and examples built, as Stuart Moulthrop states, "with electronic cross references that move the reader instantly from one piece of information to another." (Moulthrop, 1990, p.7) Other hypertext or hypermedia systems, like Apple Computer's HyperCard and the World Wide Web, offer a broader range of uses for hypertext and hypermedia with roughly the same level of spatial representation.

What such simple-link systems lack is any meaningful definition for their links. Their links are constructed simply with the knowledge that one part of one piece of text is connected to one part of another piece of text. The reasons why a connection is in place or the notion of a particular type of connection between two pieces of text is absent from hypertext.[12] In a sense, the reader of a hypertext is more active than the reader of traditional text because they are having to mentally resequence pieces of text so they can have a better understanding of character, plot, temporal relationships and physical/geographic relationships. Hypertext offers a flexible arrangement of narrative pieces at the cost of the user bearing the burden of creating a coherent narrative.

[2] There are starting to appear specifications for extensions to World Wide Web which include adding metadata to links, including link typing. See the HyTime standard: http://www.hytime.org/papers/htguide.html or XML: http://www.textuality.com/

Hypertext... provides an infinitely re-centerable system whose provisional point of focus depends upon the reader, who becomes a truly active reader in yet another sense. (Landow, 1992)

While this decentralized or distributed mechanism of writing does offer some readers the pleasure of finding their own way through the task of constructing a story (as Landow implies) for many readers this process can be quite troubling or even frustrating. Readers are presented with the difficult task of constructing narrative from a cloud of interconnected text nodes, with few (if any) hints of how to do so. (Murray, 1997, p. 133) Each link is essentially a blind alley from one point to another. The terms "hypertext" and "hypermedia" have been used to define a story form with rich networks of story pieces, but with the authorial intentionality of those network connections safely tucked away in the author's mind. Yes, the reader can move from one piece of information or story to another, as Moulthrop states – but why? Much of a hypertext user's experience is based more on impulsive decision making and not on narrative reasoning.

Hypertext does not help the author to build the hypertext system, other than through its graphical user interface. As the network of nodes and links become more complex, the author must pay more attention to organization and the many possible paths a reader may take. The only way to check these sequences is to follow them "by hand" – methodically checking each node and choice path, making sure that what was written actually makes sense when placed together. Fortunately for hypertext, story coherence is less of a problem for readers than it is, say, for viewers of a movie or some other cinematic experience (i.e. television narratives and movie rides)[13]. A reader, rather than a viewer, is much more flexible and forgiving of seeming discontinuities in text. We are familiar with poetic

[13] Radio dramas might also fall into this category. To what extent the radio drama experience is a cinematic experience is completely dependent on the listener and their ability to picture the events described.

models of text which use discontinuity as a means of expression (i.e. James Joyce's ULYSSES). In some ways, textual discontinuities can even act as an asset and appear as part of the art form. Hypertexts, even with these advantages and flexibility, cannot create true meta-linear narratives. For this a tool is needed.

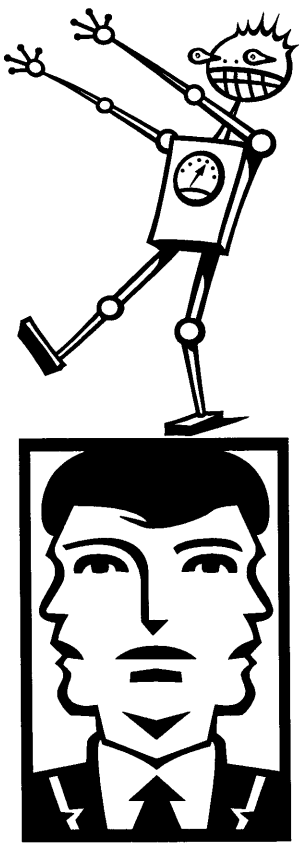


Fig. 12 From robot locomotion to personal assistants, software agents have influenced the way we think about computing by emphasizing behavior and personality.

3.2.3 The Multiple Character Approach

Much work has been done in computer science in the area known as artificial agents or software agents. As discussed earlier in this chapter, software agent research began as a robust method of controlling physical robots as they dealt with an operational environment that was not completely known. (Maes, 1994) (Tecuci, 1998) Further work has yielded agents which control the behavior not of physical robots, but virtual robots called animants. (Blumberg, 1996) (Galyean, 1995) Animants are graphically represented robots on a computer screen which exist and react to each other and events inside of a virtual world. The agent behavior modules of the animants allow them to interact with each other and with humans with varying degrees of complexity and realism.

Professor Joe Bates and his graduate student team at Carnegie Mellon University worked on a research project called Oz which used intelligent animated characters. (Bates, 1992) While Bates' research encompassed a number of projects having to do with software agents and dramatic experiences, *Oz* is particularly significant because it evolved after Bates did some basic experiments with live improvisational actors and a generalized story script. Bates created a type of artificial narrative using small animated potato-shaped characters called Woggles on the computer screen. The characters inhabited a rocky landscape and each had their own individual set of behaviors. The user, controlling one of the characters, could drive their character up to another character and engage them in any number

of activities of communication or play in believable ways. One of Oz's goals was to keep the user engaged in the system by making the characters believable. They accomplished this by using personality and interaction models. Bates created a potentially narrative play space, in which the human user could direct the actions and events between characters – actions and events chosen according to a narrative being constructed in the user's mind.

Professors Barbara Hayes-Roth and Daniel Rousseau of Stanford University took Bates' work further by providing agent characters with improvisational models of interaction, creating synthetic actors which can produce performances that are theatrically interesting, believable and diverse.(Rousseau, 1997) Rousseau and Hayes–Roth's virtual actor agents perform stories by providing the agents with a set of abstract directions in the form of a script which describes what to do, and a set of personality behaviors which describe how to do the scripted actions.

Further research such as that by Peter Wavish and David Connah of Philips Research, included ways for making agent actors appear more intelligent or capable than they actually were, by implementing scripts. (Wavish, 1997) While they implemented their agents in a way similar to Hayes–Roth and others, Wavish and Connah were able to achieve this deception of the audience/user in part by having the actors engage in diectic dialog; that is, the agents pointed at objects in their environment and referred to them relative to other objects, rather than referring to them by name.(Cremers, 1996) Their Communicating Deictic Agents (CDAs) perform a written script of actions, improvising background activity along the way. By including a script in the actions of agents, Wavish and Connah opened

the door a little wider for a more authored interactive agent experience, yet with the additional ability to react and do the right thing when events are dynamic and unexpected.

Progressing from the more general use of AI and agent technology toward a domain specific application, the term story engine is used to describe a set of software algorithms designed to make decisions regarding how a computer-based story should proceed. That is, the story engine decides what's next in the story, embodying some of a human author's reasoning for doing the same task. Story engines are construction engines, deciding the sequence of each small detail, major event, and opposing or supporting position of the story. While some story engine research has taken a more traditional approach, focusing on narrative structures and models, other research stems from an area which is not typically based on narrative, that of computer gaming. Text-based story engines tend to maintain a look and feel resembling their ancestors, the early computer-based adventure role playing games.

Computer game designer Chris Crawford's *ERASMATRON*[14] is one example of a text-based story engine which has taken a step toward graphic representation. In general, the Erasmatron story engine offers a way of constructing a text and image story experience by navigating a collection of narrative material, with no exclusive ties to that material. A single story engine can construct many stories using different sets of story material. Erasmatron works by having the writer program each character into the system. Each character has behaviors which control how they react emotionally to other characters in various situations, and graphical representations expressing their mood or emotional response. The user interface is composed of a still image of the currently active character bearing a mood specific facial expression, text describing what is currently happening in the story (which

[14] Information about Erasmatron ca be found on their web site. http:, www.erasmatazz.com/company.html

could be the dialog between the currently active character and the user's character), and a menu of computed choices. Based on the user's menu choice, the active character on the screen reacts both graphically and through dialog depending on their programmed behavior, thus sending the narrative in a new direction.

What each of the above researchers have essentially focused on in their own special way, is the intelligence of the story characters themselves, relying on that intelligence and the way that the characters react to each other as a way to create a narrative experience. The characters are physically and aurally responsive to each other and so appear to create narrative by means of cause and effect. As writer E. M. Forster points out in his book *ASPECTS OF THE NOVEL*, cause and effect go a long way towards defining plot.(Forster, 1954) Forster's example is that to say, "The King died, then the Queen died," is not a plot. To say, "The King died, then the Queen died of grief," is a plot because causality is shown. In a similar fashion, the Multiple Character Approach researchers establish causality in their characters by defining reactionary behaviors. Characters are programmed to react in particular ways given particular situations or preconditions. Often, one character's reaction to one set of preconditions establishes a different precondition, which other characters then react to. In this way the characters interact and are responsive to each other.

Though the characters react back and forth to one another, they establish no over arching direction. To say, "The King died, then the Queen died of grief," is only a true plot if it is an overarching description of a larger work or if just that statement is the entire story. If that statement is "the plot" of a single sentence within a much larger work, then its narrative effect is minimal. Plot requires some amount of overarching intentionality and fore thought. Plot is a force that drives characters and events forward through time and space.

To reduce plot to a reactionary flinch response is not as effective. In the case of Oz, there is no overarching narrative plot at all. Any interpretation of an Oz experience as having a plot is solely in the mind of the audience/user. While the user's mind is not a bad place for the plot to exist, Oz makes little effort to place a plot there.

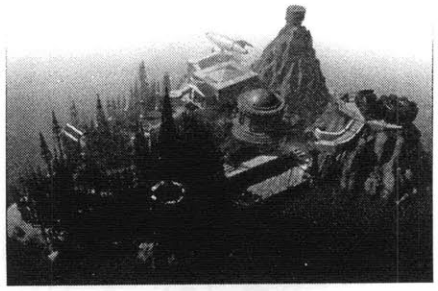
3.2.4 The Puzzle Approach

Fig. 13 For some, puzzles are an interesting challenge. For others, puzzles have all the allure of a trap.

Some narrative software projects take a puzzle approach to telling a story. That is, like a game, they present a world of interconnected puzzles which the user solves. These puzzles can be elaborately devised, using recurrent characters, adventurous journeys and exotic landscapes. *MYST* is an excellent example of using the computer to tell a story with the use of puzzles or problems.(Miller, 1993) The entire Myst experience is a puzzle. Its user interface includes a simple yet powerful employment of different media types including digital video, beautiful and elaborately designed graphics, and subtle continuous sound. The premise in Myst is to travel back and forth in time and space on a deserted island, solving puzzles in order to collect clues. These clues allow the user to find out what happened to two brothers mysteriously entrapped in two books in the library. The player must decide their fate.

Myst communicates an enormous amount of story with relatively little data by providing a rich landscape, an elaborate soundtrack, and a premise which ensures player safety. The documentation for Myst makes it clear that there will be no mad slasher bad guys jumping out from behind a tree, so the user may explore the landscape freely. This sets Myst apart from many other computer games. It is an adventure game which allows for interactivity based on intellectual pursuit rather than survival.

Because Myst is a puzzle, or actually a large collection of many different puzzles woven together, cause and effect play a strong part in the Myst experience. When one of the puzzles is solved, more knowledge is gained that helps solve the next puzzle. When a puzzle is partially solved, it is immediately clear to the player that they are close to the solution. The Myst world is highly reactive to player actions. Because of its reactivity, over arching goals and rich aural soundscape to draw in the player, the Myst experience works as an elaborate narrative. It is a narrative, however, which does not simply offer, but requires, a high level of interactivity. To gain access to the narrative material, the player must try to solve the puzzles. There can be no passivity with Myst.[15]



[15] One way in which Myst was strikingly interactive is that some of the puzzles within the game were so difficult it required multiple people to work together to solve them. Thus, some of the most interesting and fun interactivity happened in front of the computer screen between the players.

3.2.5 The Traffic Circle Approach

Another way to structure a computational narrative is to create an environment where one travels through, yet always returns to the same central spot. The user would go off exploring small side paths of narrative, discovering characters which may or may not color the remainder of their experience, always returning to the central "traffic circle" of the program. The advantage of this structure is that the user is presented with a narrative environment in which they feel as if they have free control over what they see and do. By giving the user the ability to freely explore, the authors give users more opportunity to construct (narrative) meaning from their experiences.

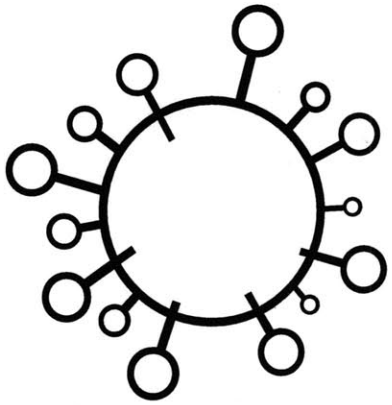


Fig. 14 The structure of The Traffic Circle Approach.

The software program MIDNIGHT STRANGER is a good example of the traffic circle approach. In Midnight Stranger, the user adopts the character (avatar) of a white male in his twenties, investigating the Los Angeles night life and club scene. It is one of the best examples of a simple, flexible user interface for navigating through a narrative space, while gathering feedback from the user. Navigation through the LA streets in Midnight Stranger

happens by clicking on active areas of the background, which depict buildings, doors, street corners to turn down, and so on. The player is not always allowed to freely walk around, however. Sometimes navigational control is taken away from the player to ensure they have or finish having an interaction with one of the game's characters.

The characters in Midnight Stranger make statements or ask questions of the user, to which the user responds through the use of a color bar. The color bar is a thin graphic rectangle at the bottom of the screen which contains a color spectrum that gradually changes from red to blue. By clicking toward the red side of the bar, the player is responding with emotional warmth to the character. By clicking toward the blue side, the player is responding coolly to the character. Characters respond to the player's reaction in different ways, depending on how the characters were designed. For example, if the player approaches a female character at a club and engages her in conversation by responding emotionally warm to everything she says, there is a chance that the conversation will continue, that she will become friendlier, and ultimately result in both character and player going together to the character's apartment. If the player responds emotionally cold to the character, the conversation will most likely be broken off and the player will not "get lucky."

The advantage of such an interface is that the system does not have to be concerned with understanding natural language. Instead, various emotional response segmentation patterns can be applied to the same color bar at different points in the program, allowing the different characters to respond in different ways. For example, one character may only have two types of responses to the player, warm or cold, giving the color bar only two active areas. Another character may have a broader range of responses, giving the color bar four or six active areas, and making it possible for the player to respond with too much

warmth to the character and turn them off. While the story material, character dialog, and media production quality of Midnight Stranger leaves much to be desired, the method of character engagement is quite ingenious.

No matter what happens between the player and various characters, after the climax of an event, the player always materializes back on the same street, facing the same decision time and again, "Which direction should I try now?" Here is where the traffic circle structure comes into play. Part of the narrative granularity is based on travel to a physical location (to the club for example), yet after each event granule, the central granule comes back into play.

There is the notion of passing time within Midnight Stranger, i.e. the restaurant can close, the cute woman at the club could no longer be there, for example. Therefore travelling back to previously experienced locations can mean having a different experience than before. Yet the central traffic circle scene is always the same. It binds together the other elements like the hub of a bicycle wheel, making navigation through the narrative space simply a matter of always knowing how to get to the hub.

While it is conceivable that this technique could have a comforting effect on some players (providing a home-base of sorts) it can also be quite frustrating if not boring. If nothing ever changes in the central section of the game, a player could easily get bored with it. Also, it is very difficult for a story designer to create a scene, much less "the central scene", which can effectively act as narrative glue between the many other scenes it connects. In order to make the central scene work in this way, it would have to be rather generic and bland (as in Midnight Stranger), otherwise it would eventually not work as a

connecting tissue between certain narrative events, seem discontinuous to the player, and thereafter either be a point of confusion or simply ignored.

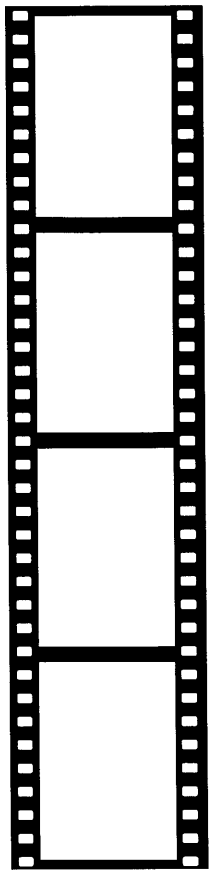


Fig. 15 Cinema has given us moving pictures and sound presented in a manner which we strongly adhere to, even when the technical and physical limitations are removed.

3.2.6 The Single-Stream Cinematic Sequence Approach

Cinema has provided us with a paradigm for experiencing narrative through moving pictures for the last century. Over the last fifty years, television has extended cinema's model with its own technical and aesthetic rules and styles. Presentation through a single stream or frame of moving image is one attribute of cinema that has not been extended by television, but remains as part of the definition of the medium. There are examples of computer-based cinematic narrative projects which have introduced new and unique ways of representing and sequencing video, but which have maintained the paradigm of single-stream cinematic presentation.

New Orleans in Transition, 1983-1986 is a project completed by Glorianna Davenport of the MIT Media Lab.(Davenport, 1987) It captured approximately fifty different people on film who were involved with the development of the city of New Orleans, Louisiana around the time of its 1984 world's fair. The film captures architects, developers, business people, politicians and residents in their effort to preserve the historic French Quarter of New Orleans, while also restoring and developing the deteriorating waterfront region along the Mississippi River.

New Orleans in Transition consists of three hours of footage stored on a set of laser-discs to allow for computer controlled access. With computer control, a user could navigate through the set of key players in the struggle between conservation and progress. The user could see the connection between one character and another, or click on the icon of

a character on the computer screen to find out biographical information about them. Because of the laserdisc technology and video capture/display technology in use at the time, New Orleans in Transition was forced to exists as a single video stream project. While it made creative use of the computer screen in the way that video, text and icons for navigation where presented, it was limited in the way it could use video material, as it was all streaming in from a standard laserdisc player.

The Digital Micromovie Organizer (DMO) was able to shed the limitations of the laserdisc player by storing and playing digitized video. (Davenport et. al., 1993) The DMO took a large collection of short video clips that have been described in a video database and orchestrated them in real-time to create a flowing sequence of shots on screen. The shot selection used a series of filters to choose the most appropriate clip for each place in the sequence. A number of simple filters came with the system (for pacing, continuity, etc.) and authors had the power to create specialized filters for use in their stories. The project An Endless Conversation used the DMO to sequence clips of two characters in conversation, asking and responding to each other's questions.

While the DMO and Endless Conversation where less limited in their presentation methods due to their use of digital (rather than analog) media, they also chose to express narratives in a single video stream form, as in cinema and television. They maintained the cinematic paradigm of seeing only one point of view at a time, though it was possible to sequence through a stream of multiple visual points of view, possibly through the use of a specialized shot filter.

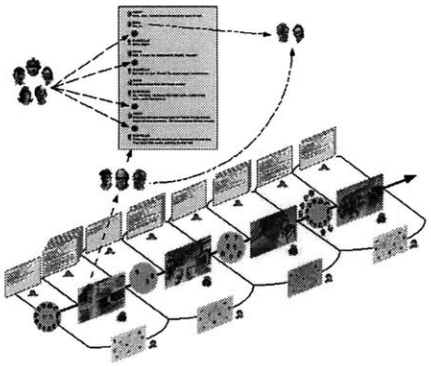


Fig. 16 The narrative unfolding structure of TOGI.

3.2.7 The Folded Approach

Narrative involves an author setting forth predetermined paths or a general structure along which the narrative should proceed. Yet how should the author treat the user of a computational story system who is actively navigating these paths? That is, how does the author shape the participation of the user given feedback from the user? Midnight Stranger offered one method, utilizing character dialog and a form of response. Are there other methods which offer a significantly different result?

Tired of Giving In (TOGI) is a project conceived by Carol Strohecker of Mitsubishi Electric Research Labs and Larry Friedlander of Stanford University. It was produced by Strohecker and myself in 1996.(Strohecker, 1999)[16] TOGI tells the story of the beginning of the 1955 Montgomery bus boycott in Alabama, an event which ignited the American civil rights movement and changed the face of the United States. The project chronicles key events in the life of Rosa Parks, the black woman who refused to give up her bus seat to a white man and was arrested for what was then a crime.

TOGI was designed to tell this story in three different layers or folds, each fold revealing progressively more detail and allowing more user interaction. The first fold consists of a narrator simply and briefly relaying the major events of the story's four parts in chronological order: the town of Montgomery, the bus where Parks was arrested, the jail in which she contemplated her fate, and the church in which Rev. Martin Luther King spoke and first led the town's blacks to boycott. If the user clicks anywhere on the screen during any of the four sections, further story detail is presented in the form of major character dialog and choral commentary. TOGI uses a diverse set of voices as a "Greek chorus" to respond

[16] See also: http://www.merl.com

either individually, or in unison, to the events presented in dialogue by the major characters.

The chorus consists of twelve individuals from three different eras: the Past (ancient Africa) with 3 members, the Present (1955) with 6 members, and the Future (1990's) with 3 members. Within each of these groups there are chorus members who represent the voice of pro-boycott, the voice of anti-boycott, and the voice of someone who is torn between doing what is right and dangerous or conservative and enslaving. Akpan, Tebogo, and Udo are the ancient African chorus members of the Past, who are graphically represented by African masks. Winona, Isaac, Beulah, SallyJo, Jonah, and Bud are the voices of the story's Present in 1955 and are represented by black and white adults on both sides of the issue. Latisha, Natoya, and Ana are the voices of the story's Future and are represented by teenagers from three different ethnic groups.

The user has the opportunity to ask individual chorus members what they think about the events of the moment, thus gaining different perspectives. This user interaction represents TOGI's second fold of story. If the user wishes further interaction, they may click on a major character to have that character enter into a dialog with a system-selected chorus member for the story's third fold. The user unfolds the story through their interest, as communicated through their actions.

The question posed at the beginning of this section was: "How does the author shape the participation of the user-given feedback?" For TOGI, our specific question was: "Do we as authors give the user more of what they have demonstrated that they want or like, or do we give the user more of what they have experienced the least?" To some extent this question pertains to the goals of the project itself. Does the project have as its primary goal

Fig. 17 The twelve TOGI chorus members. Graphics designed by Steven Alexander.

to entertain or promote learning? Is there only one primary goal throughout the project? As some of the TOGI chorus members were pro-boycott and others anti-boycott, each side expressing their own worldview, the user is able to choose a narrative experience which generally weighs more heavily on one side of the boycott issue or the other. The binary nature of the issue makes navigating it a little like navigating the edge of a fence. The answer to the question of how to respond to user feedback still is not clear and perhaps cannot be answered definitively.

The issues addressed above also pertain to computational story aesthetics. The human storyteller has much more leeway than the computer for processing user feedback, both during and after a story presentation. Yet, in a computational story when a human author wants to make sure the audience gets a certain message, is it possible to ensure the delivery of this message computationally? Or must the author take the following into consideration as they write: *THE MACHINE DOES NOT HAVE THE POWER TO RETELL MY STORY IN SUBTLE WAYS, SO THAT IS WHAT I MUST ADDRESS WITHIN MY VARIOUS STORY CLIPS.*

The possibility of providing a substantive crafted computational narrative may be a level of difficulty beyond the scope of simple AI data structures and algorithms alone, especially when the issues being navigated are non-trivial and profoundly human. Part of the premise for this thesis is that the answer lies not in the computation alone, but in the coordination between computed structures and human craft. To tell a computational story well, a close working relationship is needed between the author and the author's tool.

3.3 Metalinear Story Coherence–The Art Form

They find it hard to grasp some things that come easy to us, because they simply don't have our frame of reference. I show them a can of Campbell's soup.
I say,
"This is soup."
Then I show 'em a picture of Andy Warhol's painting of a can of Campbell's tomato soup.
I say,
"This is art."
"This is soup."
"This is art."
Then I shuffle the two behind my back.
Now, what is this?
No,
this is soup
and this is art.

- From Jane Wagner, THE SEARCH FOR SIGNS OF INTELLIGENT LIFE IN THE UNIVERSE, 1986

3.3.1 Is There an Art Form?

The previous section examined different approaches to computational story systems and specific examples for each approach, including their strengths and weaknesses. Each example attempts to express a narrative form, through both computational structures and narrative material. Each example informs metalinear design in some way. Given the examples of knowledge-based, character-based, puzzle, traffic circle, single-stream cinematic sequence and folded approaches, the questions remain: *DOES THE METALINEAR*

APPROACH SUGGEST AN ART FORM? IF SO, WHAT IS IT? IS THERE AN ARTISTIC FORM OF NARRATIVE EXPRESSION WHICH IS AUTHORED BY A WRITER OF WORDS AND A WRITER OF COMPUTER CODE, AND GUIDED BY THE AUDIENCE? CAN SUCH AN ART FORM PROVIDE A COHERENT NARRATIVE EXPERIENCE FOR THE USER/VIEWER.? The cited examples and the many hundreds of other story/computer/media projects suggest that there is indeed such an art form.

In the 1970's and 80's there were computer videodisc projects like *ASPEN* which, while not narrative, did allow the user to explore a real space in a continuous cinematic flowing manner.(Mohl, 1982) In the 1990's, Tinsley Galyean's narrative guidance work and his *DOGMATIC* project told a story in an immersive environment with a similar cinematic flow. (Galyean, 1995) From *ASPEN* to *DOGMATIC* it is clear that the evolved computer narrative art form is cinematic in nature. It is a dynamic visual art form which will take advantage of how the language and interpretation of cinema has pervaded our daily lives over the last century. When a character is hurt or insulted, we expect to see a close-up reaction shot of that person.(Zettl, 1990) When the music swells, we know that something important and possibly climactic is about to happen; gone are the days when the audience lurches at a close-up shot of an oncoming train. And as we have accepted this language in our media, we expect it to be spoken to us, and spoken to us well. We expect this to such a degree that when insightful projects like Midnight Stranger include shoddy video production quality, we find it jarring.

As the metalinear art form is heavily influenced by cinematic language, it is also clear that this computer narrative art form should not be static. There was a time when the dominant data storage media necessitated a locked and unchangeable narrative experience. Laserdisc and CD-ROM distribution methods inspire computational narrative struc-

tures which themselves are fixed and limited, such as branching algorithms and knowledge-based AI methods. With the promise of large scale high-bandwidth 2-way network access to the home from such companies as Motorola, Media One, and AT&T, fixed narrative structures become less necessary or desirable.

An over arching concern about the metalinear art form, which encompasses its cinematic and dynamic nature, is whether it will be coherent. The cinematic form is highly authored and thereby forced into coherency. The computational nature of metalinear narrative also provides authorship through its programming. This authored programming is more abstract in that algorithms and data structures provide a coherent potential for a multitude of combinations. Yet even with a multitude of combinations, the metalinear expression must still be coherent. It must allow a writer to not get lost in the writing and structuring process, while also making sure the audience experiences a story that makes sense.

There is an art form for metalinear narrative which draws inspiration from the projects listed in this document and others. Additional attributes of this art form are addressed in the sections below.

3.3.2 What the Metalinear Art Form Is Not

There are certain attributes that this art form should not have. For instance, a knowledge-based approach, as is used in Dramatica, is too brittle a structure to maintain a robust and evolving narrative. If one of the defining features of the metalinear narrative is that story material can be reused over and over again to construct different stories, then the inherent rigid structure and linear reasoning associated with a knowledge-based approach would be detrimental to this end.

As stated earlier, the art form would require that the author's reasons for connecting two pieces of story be somehow captured in the connection. By capturing the author's intentionality, the system should then have what it needs to make narrative decisions. It is the author's intentionality that fuels these decisions and recording that intentionality in a knowledge-based form is a cumbersome task, to say the least.

Bates, Wavish, Connah, Hayes-Roth and the others have demonstrated the power of focusing on the behavior and reasoning ability of narrative characters realized through software agents. While this can be a valuable attribute to have, care must be taken on a number of fronts. For instance, when designing a computational narrative tool, it is important to give the author control over the narrative in a form which they already understand or can easily appropriate. The story script (like a screenplay, for instance) is such a form. In computer science, the term *SCRIPT* usually refers to any structured procedural description of actions to be taken which can easily translate to something that a narrative writer would never touch. To a writer, a script is a complex collection of actions, events, characters, intentionality, dialog, and unspoken emotion. The writer's job is to use these items to craft a story world, and not exert a lot of energy translating them into a technical language.

The world does not need another piece of software which forces people to think in unnaturally rigid and narrow ways which happen to facilitate computation. There will have to be a balance between character intelligence and the story script which determines certain actions. An author will want to create a metalinear story focusing more on the craft of storytelling and less on the craft of software agent design. Yet both of these crafts must live together intertwined, as both are necessary components of the art form. The coordi-

nation and balance between the emotional art of story and the procedural art of designing software data structures, must be as smooth and productive as possible.

> *It is important to remember that any abstract story system ultimately refers to the sorrows and pleasures of human life and the story of any event depends heavily on who is doing the telling. A storytelling system that further calcifies the distortions of stereotypical thinking would be as destructive as the most bigoted and bloodthirsty bard. We humans already do enough mechanical thinking without enlisting machines to help us. (Murray, 1997, p. 199)*

Metalinear narrative is not a computer game. A story is not the same as a game, though many games can have narrative components in them. Computer games have been such a strong area of computer software research and development over the past few years that many of the advances in CPU design are based on the needs of the computer gaming community. Sega, Sony, Nintendo, and to some extent Motorola and Intel are all in an endless death match for biggest, baddest, fastest processor which can show more sprites, more realistic graphics, play better sounds, and all the while supporting more simultaneous game players. While certainly adventure games and first person shooter arcade games like *DOOM*, *QUAKE* and *TUROK II* offer some small amount of back story to their environments and characters, they have capitalized on the fact that it takes very little story to get a game player reloading their sub-machine gun and mowing down virtual soldiers. It is too bad that what has developed to be the most interactive electronic activity has little need for story. There are new video games starting to appear, such as *METAL GEAR SOLID* from Konami, which regularly stop game play for the purpose of engaging the player's avatar in developing narrative and revealing back story[17], unfortunately when new media developers with gaming backgrounds enter into the realm of story, they typically

[17] Pausing game play for the narrative is oddly reminiscent of musical theater and movie musicals when it is the narrative which regularly pauses for a song or dance number. Even so, it will still be the storyteller, not the programmer, who will make Metal Gear Solid's spy character as charming and witty as Fred Astaire.

attempt to do so with the same steering wheel or joy stick control system as their games. In so doing, there is little time for reflection, and therefore, little time for narrative.

> *The genre imitates action, rather than reflection, since if one makes a mistake and one's persona is killed, it is a simple matter to start over again. In a sense, the form intrinsic to the genre devalues the role of the individual persona and the need for reflection. (Niesz, 1984, p. 122)*

The art form is not "just" interactive. There is a difference between interactivity and agency. To have agency means to have meaningful control over a world, or even a destiny. The art form of metalinear story must give the user agency.

> *Because of the vague and pervasive use of the term interactivity, the pleasure of agency in electronic environments is often confused with the mere ability to move a joystick or click on a mouse. But activity alone is not agency. For instance, in a tabletop game of chance, players may be kept very busy spinning dials, moving game pieces, and exchanging money, but they may not have any true agency. The players' actions have effect, but the actions are not chosen and the effects are not related to the players' intentions. (Murray, 1997, p. 128)*

The agency that the metalinear form must have is two fold. First, the author must be in control of the story domain they are creating, whether they have absolute knowledge of every possible linear construction or not. Second, the audience must have some control of their narrative experience and know that the actions for navigating through the narrative material have specific effect. The audience must at least have the perception that they have control over the narrative, even if they do not always have the same level of control they believe they have or have their control taken away from them for brief peri-

ods of time. (Galyean, 1995) Without this two fold sense of agency, the computational narrative experience resembles something more akin to digital roulette than a story told with some thought and care.

The metalinear art form, therefore, is not a static knowledge-base of facts, nor a complex programming language or system of technical jargon that would put off a writer, nor a computer game with a high level of control and little narrative, nor a system where control is relinquished by author or writer. What the metalinear art form is, however, is an exciting new form of expression which holds a great deal of promise.

3.3.3 What the Metalinear Art Form Is

If we know what the art form is not, then what is it? What are the characteristics of metalinear narrative?

We know that the metalinear art form has two sides: that of textual design and computational structure design. The writer's role is expanded here to include a technological component, a necessary part of this new craft. Writer's expressive form goes beyond words and sentences by merging with the structures of computer software. This characteristic is one Janet Murray refers to as procedural.

> *Authorship in electronic media is procedural. Procedural authorship means writing the rules by which the texts appear as well as writing the texts themselves. It means writing the rules for the interactor's involvement, that is, the conditions under which things will happen in response to the participant's actions. It means establishing the properties of the objects and potential objects in the virtual world and the formulas for how they will relate to one another. The procedural author*

creates not just a set of scenes but a world of narrative possibilities. (Murray, 1997, p. 152)

The metalinear art form encompasses a balance between authorial and audience control. The author can offer a narrative to an audience in which the audience is more empowered than they are with the functions on their VCR remote. The author's craft is one of story potential, where the final form is many possible forms. This makes the audience more active than ever, making choices on a level and scale never before accomplished. Striking this balance of authoring story potential and authoring audience activity is not an easy one.

> *If we give the interactor complete freedom to improvise, we lose control of the plot. But if we ask the interactor to pick from a menu of things to say, we limit agency and remind them of the fourth wall. (Murray, 1997, p. 190)*

Yet within that struggle to find balance there is also freedom. It is within the bounds of restriction that writers often find their voice, their power. In writing about textual electronic fiction, Jay David Bolter states:

> *Electronic fiction is technologically complicated in that it requires a computer and the sophisticated arrangement of text and graphics on a videoscreen. But it is conceptually simple – simpler than writing for print, where the writer must always force his or her text into a single line of argument or narrative. The computer frees the writer from the now tired artifice of linear writing, but the price of this new freedom for the writer is that the writer must allow the reader to intervene in the writing space. (Bolter, 1991, p. 145)*

The metalinear art form is born from a collaboration between writer and computer. The computer assists the writer in the process of structuring her story granules for sequencing. This process relies on the computer providing a means of representation for the granules. Writing a metalinear story means manipulating the computer's representation of the characters and events such that it can sequence the story granules according to the author's intent.

In freeing the writer from linear writing, metalinear narrative provides a structure into which multiple story fragments or granules can exist. Through this structure multiple construction is possible. The writer is free to write many different versions of the same story granule. The writer is not held to a single "right" scene, paragraph or sentence. They may create different versions of story granules in order to give characters and character relationships multiple possible sequences.

Metalinear narrative is an art form which extends narrative voice. The extended voice of the writer can say more things, in more ways, and in more contexts using the computer.

> *What the computer would provide would be a means for using formulaic patterning, in much the same way the oral bards did, as a system for assembling multiform plots. The electronic system might be able to generate more variants than the author could ever read in a lifetime (let alone write individually), but since she would have specified all the important details and all the rules of variation, the computer would be merely the instrument of the author, an extension of her memory and narrating voice. (Murray, 1997, p. 212)*

Metalinear narrative is also the embodiment of many voices. Through its embrace of multiplicity, those voices which are not usually heard are no longer silenced by the need

to make the harsh choices of singular linear sequence. By no longer forcing writers to think, construct and edit uni-linearly, writers can be much more open and inclusive of the diversity of voices around them. Cognitive scientist Richard Lehrer refers to this type of construction as Hypercomposition.

> *...Hypercomposition encourages the composer to be aware of the multiple voices of his or her composition because there is always more than one path through the hyperdocument. (Readers need not cede control to the authors of hyperdocuments.) In principle, multiplicity of voice may make authors more likely to consider their audience when they design, and it may make them more likely to consider revision. (Lehrer, 1993, p. 201)*

In being aware of multiple voices, the metalinear narrative author has the freedom to present multiple simultaneous voices or points-of-view. Instead of holding on to the single video stream artifact of analog video, the metalinear art form can reflect cultural multiplicity through a presentation design of multiple simultaneous characters, events and sounds, engaged in expressing their view of the world.

The tool needed to create metalinear narrative is intelligent and empowering. But what does it mean to say that software is intelligent? AI researchers tell us that software intelligence is measured by the magnitude of a system's stored knowledge.(Lenat, 1991) In this case, however, intelligence should be measured not just in terms of knowledge stored in the form of data structures and algorithms, but also in terms of how well it fits the hand of its user. A software tool, or any tool for that matter, is only as intelligent as the user is with the tool in their hands. Therefore, the tool's empowerment of the user is of great importance.

> *The tools of the future will be intelligent, dynamically adaptive, customizable, and personalizable to a staggering degree. With experience, they will learn and grow and wear to fit the specific craftsman's hand. Their complex functionality will be deeply couched in metaphor or story, and their internal operations will be hidden from view, until demanded. (Davenport, 1997, p. 9)*

From this section it has been shown that the metalinear art form extends the writer's narrative voice so the writer can say more things in more ways. Metalinear narrative includes many character voices together, including typically marginalized voices. It balances agency between the author and the audience and frees the writer from a forced unilinear construction practice in favor of multiple linear constructions. Metalinear narrative requires computational assistance in the multiple construction process, because it is only with that computational assistance that the writer is truly freed to write without the concern of having to perform the laborious construction process themselves. Metalinear narrative is an art form which encapsulates multi-sequentiality with an authorship of multiple sequence potential.

3.4 The Need

The need, then, is for an intelligent and flexible writing tool which allows the writer to design the text, as well as the structures and algorithms which act on that text. The need is for a writing tool which can incorporate the diversity of voices we are becoming more aware of in our twenty-first century world. The need is for a writing tool which gives the writer the power to create these stories of multiple voices, while never losing track of narrative structure and character relationships. The need is for a writing tool which gives the audience an easy way of navigating the multi-dimensionality of multi-voice narratives,

and see a differently constructed narrative made from the same narrative granules. The need is for a writing tool which can help the writer create metalinear stories without applying a qualitative metric to the writer's work.

A writing tool which offers the author knowledgeable feedback about narrative construction and context during the creative process, is essential to the task of creating metalinear narratives of significant dimension. By "significant dimension" I mean in terms of size as well as quality. A writer is able to keep only so much of a complex story structure in their head while they are creating. The task of remembering that structure while also thinking about the many different ways that structure can be applied to their story domain, is harder still. A specialized writing tool is needed to help manage a complex narrative structure and allow the writer to focus more of their energy on what they do best – writing good story material. There is a need for a software tool which maintains human creativity and authorship in the writing process, while also enabling the computer to construct multiple linear narratives. My contribution to this field is software which answers this need. The software tool is called *Agent Stories*.

4 The Agent Stories System

Some people think that we're made of flesh and blood and bone. Scientists say we're made of atoms. But I think we're made of stories! When we die, that's what people remember, the stories of our lives and the stories that we told.

- Ruth Stotter, from THE STORYTELLER'S CALENDAR. December 1992

A writer is not so much someone who has something to say as he is someone who has found a process that will bring about new things he would not have thought of if he had not started to say them.

- William Stafford, from WRITING THE AUSTRALIAN CRAWL, February 1982

4.1 Overview

The software tool designed as a part of this metalinear narrative research is called Agent Stories. Agent Stories is a story design and presentation environment for metalinear, multiple point of view (POV) cinematic stories. Agent Stories is designed to be placed in the hands of the metalinear story writer for use as a tool to promote the structuring and rewriting of metalinear narratives, before they are realized in audio and video. Agent Stories is also able to store and present stories in a cinematic form using digital video and audio.

Agent Stories has five key parts or environments, each one shown as a different screen in the software:

1) The Structural Environment, in which the structure of the narrative is described using abstract building blocks.
2) The Representational Environment, in which knowledge of the various story elements is captured in the form of relationships between story granules or clips.
3) The Writer Feedback Environment, in which the writer is given feedback from the Agent Stories tool on the constructability of the collection of story clips. This is done through the implementation of software agents called story agents, which make clip sequencing decisions.
4) The Presentational Environment, in which the story agents work as video editors, intelligently sequencing and orchestrating the different story elements according to a particular agent's individual stylistic preferences. The audience chooses which story agent to activate, thereby also choosing the type of story they will receive.
5) The Agent Scripting Environment, which offers the writer an easy way of directing the narrative construction, by designing new story agents

Each environment screen offers the writer powerful tools for thinking about and designing stories that can be told through multiple characters. While Agent Stories was designed specifically for constructing fictional multiple POV metalinear stories, non-fictional stories can also be designed using the tool.

4.1.1 Navigation

At the bottom of each environment screen in Agent Stories is a multi-function tool palette. The tool palette allows the user to navigate from one environment to another by hitting the appropriate tab. The user is reminded which environment they are currently

viewing by the active tab shading gray. By hitting the tab of the current environment name, the tool palette will rise to reveal buttons and other objects which the writer will need for that particular environment. Hitting the current environment tab again will lower the tool palette.

Fig. 19 The navigational palette for moving between the different environment screens. The gray tab indicates the current environment.

4.1.2 Story Structure

The Structural Environment of Agent Stories allows a story designer to create a simple structure or framework for a metalinear story and then use that framework to create multiple narratives from a single collection of story elements. The framework is composed of seven narrative primitives which the writer uses to build an abstract description of a linear story structure. The framework becomes an abstract expression of the linear stories to be constructed later. During operation, the framework also becomes the metric which the system uses to tell how well it has constructed narratives.

4.1.3 Story Connections

The goal of the Representational Environment of Agent Stories is to express, in a useful and efficient way, intelligent reasoning about the elements in a story domain. In the representational environment, a clip is defined as a story element with its message con-

veyed from a single POV and with a single or limited number of narrative meanings. The writer uses this environment to create a story granule or clip object by typing or pasting text into a graphic window, then drawing links from the clip to other clips. Each clip is linked to at least one other. There are six types of links for this purpose, which are used to broaden or deepen the definition of each clip. Collectively, the story clips form an interconnected web, the nature of which shapes the personality and potential of the linear stories to be constructed.

4.1.4 The Interactive Process

As this research seeks to deliver a process for creating metalinear narrative, one of the goals of Agent Stories to provide the writer with a means for clearly understanding the state of the story and its descriptive structures of representation by feeding back sketchy linear stories. A sketchy story is the simplest textual linear story construction possible, given a specified story structure and a method or style of reasoning about the construction. Once there is a framework and a web of story clips created in the previous two environments, the writer can have a sketchy story presented back to her within the Writer Feedback Environment (WFE). The Agent Stories WFE is where story agents designed with goals of narrative construction, combine the story framework of the Structural Environment with the story representation of the Representational Environment. Different story agents construct narratives in different ways, according to their own particular style. The writer employs the different agents in constructing and presenting her version of a linear story using the metalinear storybase and story structure. By constructing a linear story and providing a textual explanation of why each story clip was chosen, the WFE offers the writer a view into the reasoning behavior of the agents themselves, as well as a

perspective on the storybase. The writer can then go back to the clip material or the story framework and make changes as she sees fit, according to the WFE feedback.

.1.5 Presentation

Instead of a single stream or output frame of video, the Agent Stories provides a type of presentation unlike that of traditional television or cinema. Multiple streams of simultaneous video and audio, all under the user chosen story agent control, are presented in a dynamic mosaic form. The agents possess unique behaviors which control the dynamic screen design of the presentation. Similar to the WFE, the Presentational Environment performs the function of Branigan's "narration", in that it presents sequences the story elements with a sense of style.

.1.6 Agent Scripting

The Agent Scripting Environment offers the writer a chance to define the logic behind the styles of story construction used by the story agents. While metalinear narrative designers will have access to ready-made story agents, the Agent Scripting Environment allows writers to create new story agents, and choose how they reason when trying to fill out a story framework.

.1.7 Development Platform

The writing and presentation interface for Agent Stories was developed on an Apple Macintosh Power PC processor, using a software development system called mTropolis, from Quark, Inc. mTropolis is a graphical objected oriented programming language for the Mac. It clusters functionality and programmatic behavior into icons which can be readily adapted for a specific application. I chose mTropolis because it is especially well suited

[18] Though the theories behind Agent Stories were conceived by the author, it was through the efforts of a team of contributors that the software came into being. This, the third version of Agent Stories discussed in this document, was programmed primarily by Justin Kent, Anthony Young-Garner, Daniel Vlasic and myself. Justin designed and created the database, as well as wrote the Agent Scripting Environment, Anthony programmed the story engine and the Writer Feedback Environment, and Daniel completed the programming on the Representational and Agent Scripting Environments, as well as attended to an enormous number of bugs. At the printing of this document, Daniel continues work on the Presentational Environment.

for easily manipulating graphics, sound and digital video. There are a variety of interface features which are trivial to program in mTropolis, but which are much more difficult and time consuming in other popular languages such as Java.

The writing/presentation software communicates with a data server on a Hewlett Packard Vectra, which is running Microsoft Windows NT. The server software itself is running through NT's Internet Information Services and is designed using Microsoft Access. The interface protocol between the client and server process is SQL. This server setup was chosen because it was the simplest software configuration, with a high level of support in case of problems.

The overall client/server model was chosen because it represents the most likely model for implementing such a system in the real world. While it would have been much easier to implement an integration of both the client and the database on the same machine, the most likely production configuration of such a system would include a home device of some kind (the client) and the content/services provider (server), or in cable TV terms, the head end. The head end would house large collections of story clips and digital video data or metalinear story domains. The cable company would offer access to these metalinear story domains to its client base via a high bandwidth data connection. The client's device in this scenario would need to be a powerful television, with many computer workstation-like features: a CPU and RAM to run the software agents, a high bandwidth connection to the server along with a back channel for control and feedback, and a hard disk or some other form of non-volatile memory to store story agents, stories and even frameworks if necessary.

4.2 Story Structure

4.2.1 The Structural Environment

The Agent Stories Structural Environment provides the author with a space for creating and manipulating an abstract story structure for a metalinear story. The story structure or framework is expressed as set of narrative primitives. These primitives are loosely based on Branigan's seven narrative schema elements discussed in "Assembly in Multiple Ways" on page 51, and were chosen as a good first attempt at describing narrative building blocks for first person, multiple POV stories. The seven primitives are:

1) Speaker Introduction
2) Character Introduction
3) Conflict
4) Negotiation
5) Resolution
6) Diversion
7) Ending

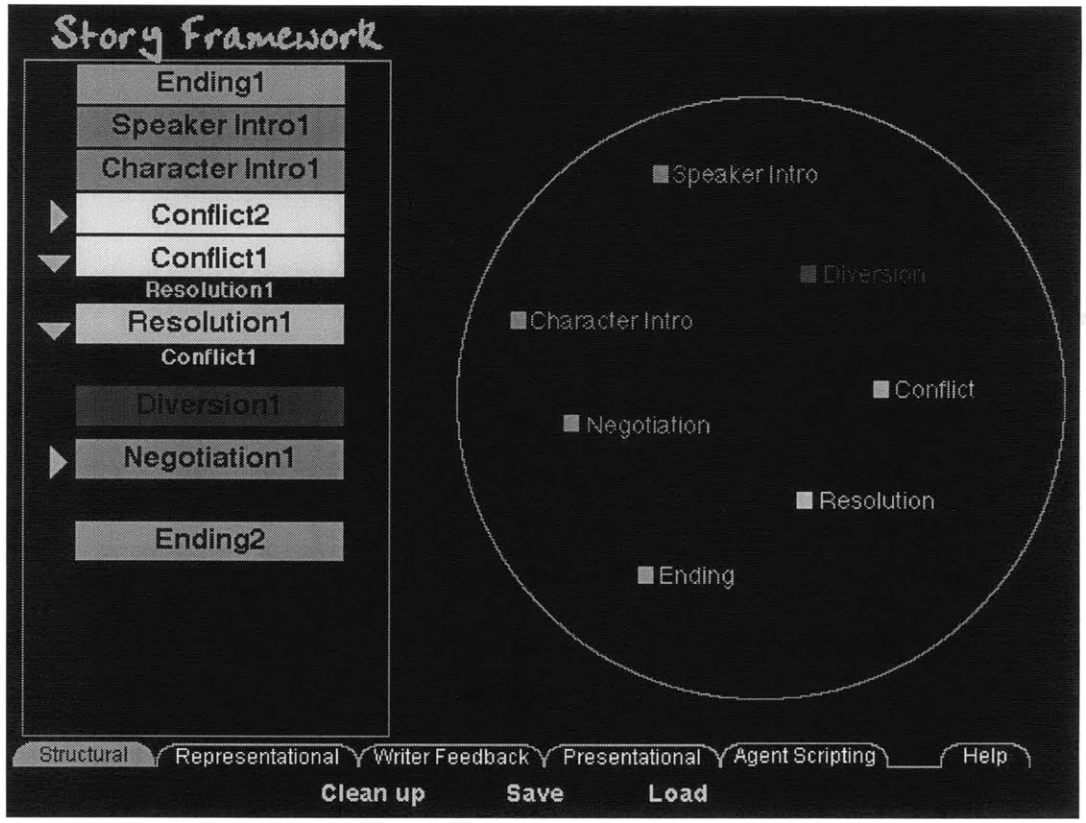


Fig. 20 A screen shot of the Structural Environment with a sample story framework. To build a story framework, the user drags the primitives in the circle across the screen and into the rectangle of the Story Framework.

In the Representational Environment these same primitives will be used as annotations, which get attached to story clips, for describing how a clip can be used. Here they offer a way of designing an abstract structure for metalinear story. The primitives SPEAKER INTRO-

DUCTION and CHARACTER INTRODUCTION convey something about who is telling us the story. SPEAKER INTRODUCTION is an introduction of a character, a way of knowing what kind of person a character is and thereby create some expectation for what that character is likely to say or do in other parts of the story. For instance:

> *My name's Joey and I've been a teamster all my life. I wake up at 5:30 in the morning, I'm at the job site by 7, I'm off by 3, in McCaffery's bar by 3:15 and home by 5– five days a week. My father's a teamster, too. He got me my union card. But my brother didn't think the teamsters were good enough for him – he's off wasting the family's savings on college.*

A character making this statement would set up certain expectations in the audience, which the writer would either satisfy or violate in further clips as she so chose. The CHARACTER INTRODUCTION is an introduction of the story's characters and setting from their own point of view. As such, certain facts would be mentioned or emphasized while others would be omitted as the character describes their world. Going back to our friend the teamster, one example would be:

> *So I'm working 21st floor of this sky scrapper down on Jefferson and 5th puttin' up sheet rock, and a bunch of us send this new kid, Patrick, out for coffee and bagels. Now looking down I could see Jefferson and the top of the Dunkin' Donuts down the street. Across the street there was this other site, a little five story office job where my pal Dougie's doing some electrical work. The traffic is thick -- ain't nobody movin'.*

A CONFLICT is a problem, predicament, or situation that needs to be solved. RESOLUTION is a solution to a conflict. Together, CONFLICTS and RESOLUTIONS act as generalized versions of

what Branigan and others refer to as an initiating event. Most initiating events are either single conflicts or a series of conflict/resolution pairs. In Agent Stories, RESOLUTIONS are directly tied to CONFLICTS: CONFLICTS can have multiple RESOLUTIONS, and RESOLUTIONS can have multiple CONFLICTS. Here is one example of a CONFLICT:

> *I heard this big crunch! I looked down and I could see the top of Patrick's yellow hard hat in between two cars that were pretty tight together. Patrick had been hit and was being pinned by two cars right in the middle of Jefferson. So I reach for my radio to call for help, but realize I didn't pick one up that morning, 'cause none of the radio batteries were charged the night before. The kid was hurt, I was his supervisor, and I didn't have any way of helping him.*

The primitive NEGOTIATION is about revelation through struggle. While CONFLICT represents either an introduction or a worsening of a complicating event and RESOLUTION is the solution to that complication, NEGOTIATION is about a character's struggle with the complication. A character's negotiation with a problem reveals more of the character's personality and can be useful for setting up future potential actions of the character. NEGOTIATION also represents a recognition that in life not all problems get resolved by the end of the story. While RESOLUTION acts as a termination of conflict, NEGOTIATION does not. NEGOTIATION continues a conflicting event by turning it around, revealing its other sides and facets. For instance, if a character in a story became addicted to cocaine, then having that character entering a drug rehabilitation program is not a resolution to his addiction, but a negotiation with it. The character could have also chosen to continue feeding their addiction, perhaps even stealing or embezzling funds from their employer to support their habit, or come up with sophisticated methods for hiding the ill effects of his addic-

tion from the authority figures around him. This, too, would be a negotiation, as it does not resolve the problem any more than starting rehabilitation does. Rehabilitation does, however, give the audience an expectation of an eventual drug-free state -- again, an expectation which the writer can choose to either satisfy or violate in further clips.

DIVERSION is a story element which deviates or digresses from what would be considered the plot of a story. The plot being that part of a story which is often driven by CONFLICT/RESOLUTION pairs. DIVERSIONS act as periods of information transference and tension relief, but do not directly drive the progression of the story. Comic relief is one example of a diversive period in a narrative. Anything that simply tells more about the character or situation, without contributing to the progression of events, can act as a diversion:

> *The nice thing about doing what I do is that I get to see the sky. On the street in between the buildings, you don't see the sky like you see it from the high steel. The clouds spread out for miles all around. And the trees! You barely notice the trees on the sidewalk. But from up there... from up there you see more trees than people. You see the way the world really is.*

The ENDING is an overall resolution or summing up of the narrative. However, just as any narrative primitive can be placed in any order, there is no restriction regarding where the ENDING occurs in the story. It can be located at the very beginning of the story framework, somewhere in the middle, at the end, or not be in the framework at all. For some stories, how it ends could be one of the least important parts of the story. This is especially true if the story domain is based on commonly known historical events; it is much more important to arrive at the eventual ending through any number of interesting and unpredictable paths.

Each of these narrative primitives describe sections of an intended story. Together, they offer the writer familiar elements for making the narrative flow from beginning to end. The writer builds the framework using simple colored blocks on the screen. These act as class prototypes for the seven narrative primitives. When the writer clicks and drags a primitive block, a new instance of that primitive type is created, numbered, and can be spatially ordered among the other narrative element instances. The order of the elements in the framework determine much of the flow of narration in the final narrative. While the theory behind these primitives is derived from the work of Branigan and other researchers mentioned earlier, much of their research is based on deconstruction – breaking down established linear narratives into their elemental parts. Metalinear research and Agent Stories seek to investigate how well these primitives work in a practical constructive application; i.e., can a writer use them to write with? Will a writer want to add more primitives? Will different types of writers want different sets of primitives?

4.2.2 Writing Structure

The order of the narrative primitives in the constructed framework can suggest certain narrative genres. For instance, it would make sense to start a narrative with a speaker introduction, so that the audience would immediately have a sense of who is telling the story, followed by a character introduction, during which the characters and setting are introduced, followed then by the narrative's first conflict. However, if the order of just these three simple narrative elements were rearranged to be: character introduction, conflict, and then speaker introduction, the resulting structure would resemble that of the beginning of a typical murder mystery; where first one sees the characters and setting, then the murder as the first conflict, followed by the introduction of the detective,

around whose POV the story usually revolves. This is a commonly used structure for film and television mystery narratives like: Agatha Christie, Sherlock Holmes, and Colombo, and is recognizable by most western audiences.

Another important attribute of the story's structure is the linkage between conflicts, negotiations and resolutions. The structural environment provides a way for the writer to specify whether a conflict should be resolved at the next available resolution in the framework or perhaps strung out until a later resolution. By making such adjustments to the narrative structure, it is possible to affect the rhythm of the narrative by either repeatedly introducing and resolving a number of conflicts or introducing many conflicts one after the other, so that narrative tension is built to a higher level before any resolutions.

A related technique for writing structure is to link conflicts to negotiations, then link negotiations to resolutions. That is, link problems to struggles and then the struggles to the solution to the problems. This is, seemingly, a simple and straight-forward approach to story writing. However, when one considers that in a metalinear story the conflicts, negotiations and resolutions do not all have to be portrayed from the same point of view, then a simple structure like this one becomes much more complex. For example: character A describes a problem, character B describes the struggle with that same problem, then character C describes the solution to that problem, a solution which might not be valid from character A's point of view. In fact character A may not mention anything about C's solution in all of A's clips. That resolution exists purely from C's frame of reference to the story world.

Added complication to the above structure, is that while conflicts can be linked to negotiations, which can in turn be linked to resolutions, they do not have to be linked in that

order. The story's structural framework could include a resolution first, then a negotiation, then a conflict. A writer could be challenged to design stories told in this "reverse" order as a way of revealing new facets of certain types of conflicts. This is just one of the ways the Structural Environment of Agent Stories allows the writer to play with the narrative structure of a metalinear story. And play is an important word to use here. By stacking and re-stacking colored blocks, a writer is given the opportunity to try out new story structures quickly and easily, and perhaps even have a little fun. As discussed in chapter 5, what has been learn through constructionist learning research is that people learn better when given the opportunity to construct something that is personally important to them using building blocks provided in a tool. (Hooper, 1996)

4.3 Story Clips and Connections

4.3.1 The Representational Environment

The goal of the Representational Environment of Agent Stories is to express a useful and efficient way of intelligently reasoning about the elements in a story domain. In some ways this is similar to Roger Schank's work with software agents in a story archive, where he and his colleagues proposed a method for software agents to choose and sequence full stories related to a given search criteria. (Schank, 1992) In Schank's work, entire stories needed to be annotated or pre-linked in some way by an intelligent human archivist. In Agent Stories, story fragments or clips are annotated through the use of a graphical user interface.

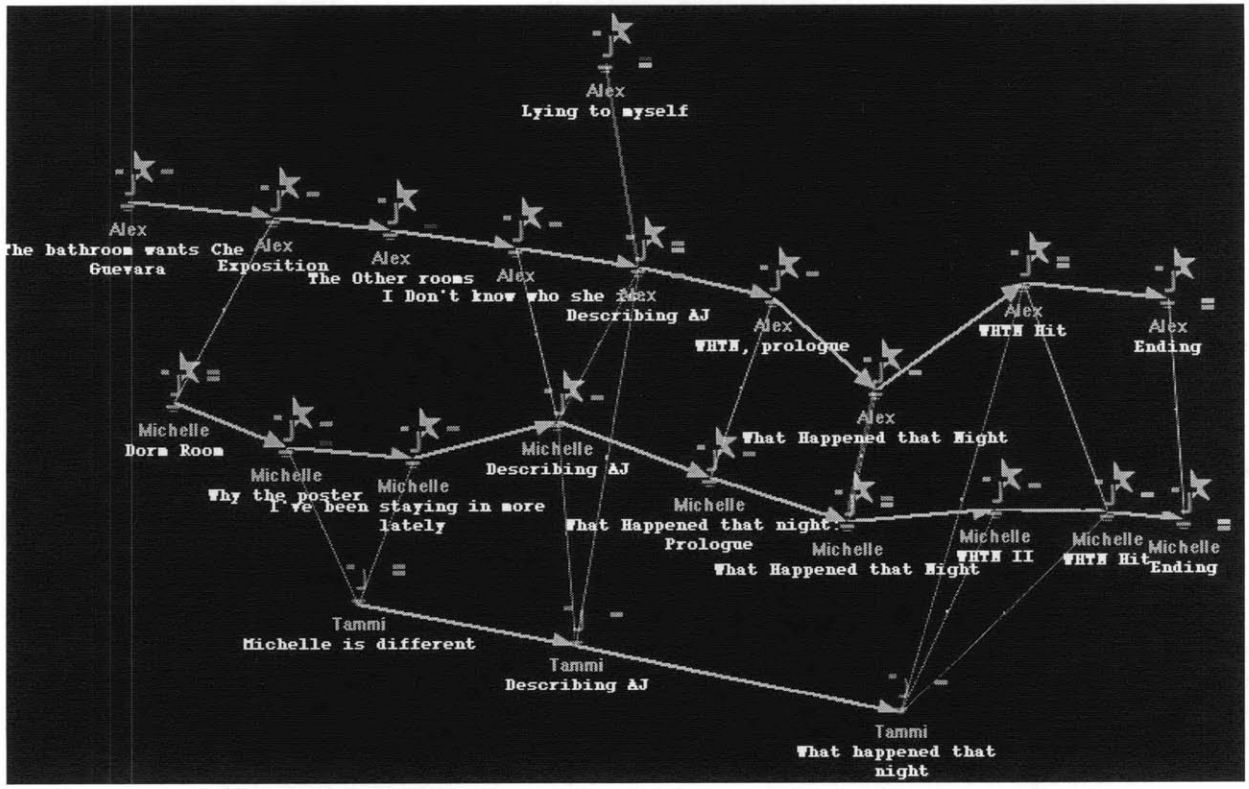


Fig. 21 Screen shot of the Representational Environment displaying a story. This writer chose to enforce a temporal progression using many *causal precedes* links.

The Representational Environment allows the writer to draft knowledge and reasoning about the narrative into a narrative landscape. In the Representational Environment, a clip is defined as a story element with its text written from a single first-person POV. For the writer, a clip is first a piece of text which tells some portion of a story. Further along in

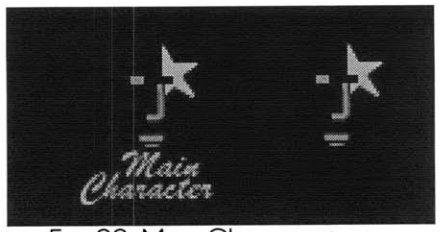


Fig. 22 Main Character icons: inactive and active.

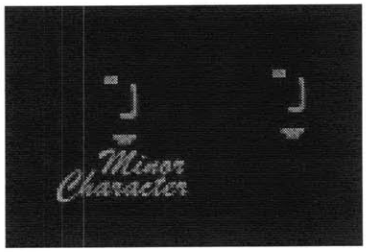


Fig. 23 Minor Character icons: inactive and active.

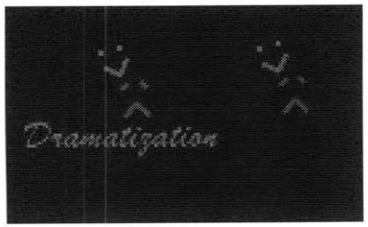


Fig. 24 Dramatization icons: inactive and active.

the production process, once the text has been adequately rewritten and approved, a clip may be represented by a piece of digital video or sound shot specifically for the text, for use in the Presentation Environment. There are four types of clips which the writer can choose to add to the metalinear story representation. The clip types are: Main Character, Minor Character, Dramatization, and Sound. Each of the four types represents a different type of story granule and, therefore, is dealt with in a different way by the Agent Stories software.

A Main Character clip is a story clip from a major character of the metalinear story. It is a character which includes some of the most important clips according to the writer, and whose clips most likely number among the highest in the collection. Main characters are the dominant characters of the story.

A Minor Character clip is a story clip from a character who does not play a major role in the metalinear story. A minor character may only comment about certain major characters without expressing anything about their own lives. A minor character might only speak about things other than what the core issues of the metalinear story collection are concerned with. Minor characters play a supportive roll and add color to the overall story experience.

A Dramatization clip is a visual representation of either a main or minor character's statement. While the main and minor character clips are first person accounts of what happened or what that character is thinking, the dramatization clip shows what happened or what a character was thinking from a specific character's point of view. One could think of it as the movie camera's eye on the scene that a character is describing.

A sound clip is a piece of sound which describes the scene, or is in some way supportive of a main or minor character's point of view. Just like the other three clip types present a single point of view in their own way, a sound clip presents a single point of view as well. For instance, if a train struck a tractor trailer at a crossroads, the truck driver's account might be that the train seemed to come out of nowhere because the warning lights and bell did not go off. [19]But from the account of a witnesses on the scene, the flashing warning lights and ringing bell did indeed go off. These two different first person accounts could have different supportive sound files associated with them, one with the bell and one without.

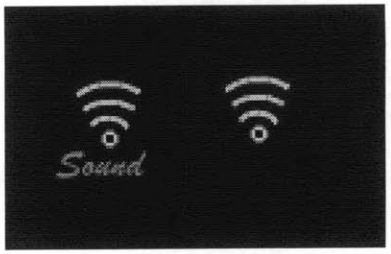


Fig. 25 Sound icons: inactive and active.

Each clip, no matter what type, is connected to at least one other clip with the use of links. Agent Stories' links are defined as:

1) factual precede
2) causal precede
3) must include
4) supports
5) opposes
6) conflict<->resolution

[19] This is an actual event which occurred during the writing of this thesis on March 15, 1999 near Chicago, Illinois. The truck driver insisted that the warning bell did not sound, though there is evidence to the contrary. Eleven passengers of the commuter train died as a result of the accident. And though seemingly gruesome, the event and the lives involved would make a great metalinear story.

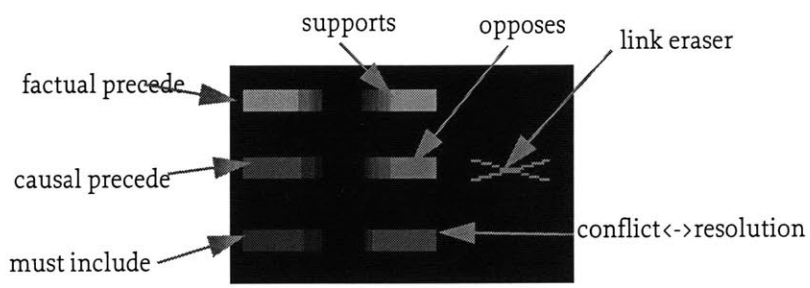


Fig. 26 The activating buttons for the six link types, plus the link eraser. This panel is located in the Representational Environment tool palette.

The collection of link types is somewhat arbitrary. All but conflict<->resolution were chosen from my own experience in writing and telling stories. I wanted to define a minimum of links types so as not to burden writers with too many choices, while also providing writers with powerful elements for narrative annotation and construction. The link type conflict<->resolution is a member of the collection in part because of my own experience in story construction and in part because of the culture within which I tell stories. Western cultures typically construct plot based stories. While there are many ways of defining plot, the method I use here is a series of conflict/resolution pairings. The more pairs of matched conflicts to resolutions, the longer or more involved the plot. This can clearly be seen in Hollywood movies. The typical overarching plot of a Hollywood movie involves a central character or characters getting into trouble or dealing with a problem, followed by that problem getting struggled with or solved, followed the introduction of another (usually bigger) problem, followed by a solution, and so on. For action movies, the sequence is: something explodes, the hero escapes, something else explodes, the hero escapes again, something bigger explodes, the hero gets away again, and so on. The audience gets tied up in following the

plot of the hero getting in and out of trouble along the way toward achieving his/her ultimate goal, that is, resolving their longest running conflict.

The links are activated through the six colored buttons on the bottom portion of the screen, in the diagram above. Each of these links describe a type of relationship between two clips, and each clip can have many such links. The factual precede and causal precede links are sequence specifying links meant to identify pairs of clips, where information contained in one needs to be seen before the other. Factual precede refers to one clip preceding another because a fact or object in one clip needs to be identified or dealt with before the other clip is experienced. For instance, if in one clip a gun is described as hanging in a gun rack above the fireplace and in another clip the gun is missing from that gun rack, then if it is more important to the writer to convey that the gun was removed rather than placed in the rack, a factual precede link would be drawn from the first clip to the second. If it is not important which clip is shown first or if the writer feels that it is more interesting to have the two clips shown in different orders in different story playouts, then such a link would not be placed there.

Causal precede refers to events in one clip causing events in a second clip, therefore a specific sequence is recommended. Both the factual precede and causal precede links do not specify that one clip must immediately follow or preceded the other or even that the second clip must be included in the story, but simply that if both clips are chosen, then there is an order in which they must be viewed.

The must include link specifies that if one clip is chosen, then the other clip must also be chosen, with no specified order to the clips. For instance, if character A is shown kissing character B from character A's point of view, a writer may think it important to show the

same kiss also from character B's point of view, as the two views may tell different stories about who kissed whom.

The conflict<->resolution link specifies that a conflict clip is resolved by a specific resolution clip or set of resolution clips. Conflicts can have multiple resolutions and resolutions, multiple conflicts.

The supports and opposes links offer the system a way of understanding, to some extent, the relationship between the story's characters, by specifying that the meaning or message offered in one character's clip is in opposition to another character's clip, or that two clips from different characters are supportive of each other. For instance, if after a big lover's quarrel character A claims in one of his clips that he has made up with character B and character B claims in one of her clips that she has made up with character A, then the two clips (not the characters) are in support of each other. If, on the other hand, character A claims that they made up and character B claims that they have just stopped arguing for a while, but that the key issue of the argument still remains, then these two clips are in opposition to each other. It is important to note that only clips can be in opposition or support of each other, not the characters themselves. While later in this chapter there is a discussion about the criteria story agents use to choose characters, including comparing the number of oppositional and supportive links as a way of them picking the most or least supportive characters in general, an agent will still not be able to say that one character is in opposition to another because the agent can not read the story text.

Through this collection of clips and links, a web of story or storybase is defined which can be navigated by traveling its links as narrative paths. The web of linked story clips are not so deterministic that the next clip in a constructed narrative is always one hop away

from the previous clip in the storybase. The arrangement of the structural framework in the Structural Environment has a very strong influence on which clip follows which, such that the next logical clip to be chosen may be from a totally different part of the storybase. Such decisions are dependent on the framework and the active story agent.

In addition to the links, story clips are also annotated with the same key words used in the framework of the Structural Environment. The terms SPEAKER INTRODUCTION, CHARACTER INTRODUCTION, CONFLICT, NEGOTIATION, RESOLUTION, DIVERSION and ENDING make up a set of buttons which can be activated in any combination for each clip during the clip creation and editing process. By activating one of these buttons, the writer is identifying the clip as being of that button type. When a clip type button is activated, a small line with

the same color as the button is placed to the right of the story clip icon as a reminder of how the clip is annotated.

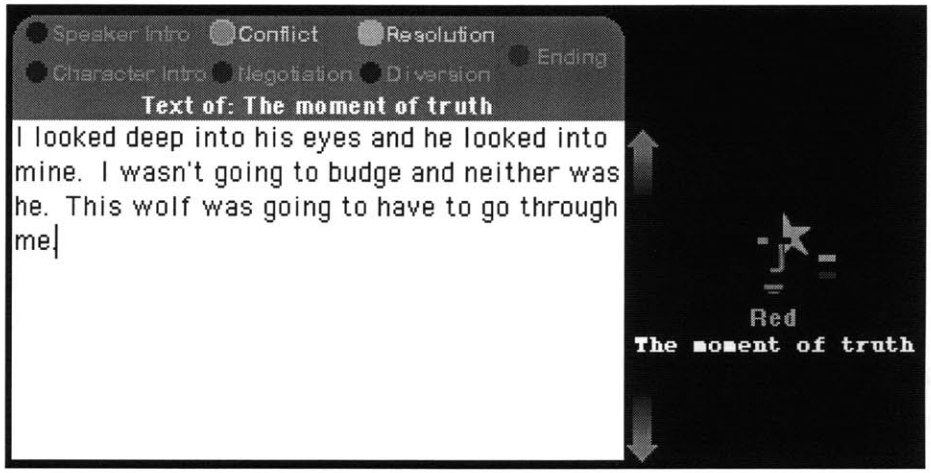


Fig. 27 The clip text box for the main character "Red," entitled "The moment of truth." This clip is marked as both a Conflict and a Resolution, and thus can be used in more than one way.

When a story agent constructs a story, it looks not only at a clip's links, but also at its assigned clip types to determine appropriateness for any given situation. The story agent essentially tries to match up the type of each clip with the framework primitives it tries to satisfy. If a story agent were trying to find a Character Intro clip to place in the story, for example, it would look for clips identified as a Character Intro. If there the collection of story clips included one clip identified as a Character Intro, while the other story clip was identified as a Character Into and a Conflict, then both story clips would be eligible for use in this part of the story. The story agent would then have to use another part of its

story construction behavioral programming to choose which clip would be the most appropriate.

4.3.2 Underlying Database

The database on the server is stored as a series of records, where each record corresponds to a single story clip. The various fields of each record store pertinent information about a clip, including character name, title, story text, link data, movie reference data, etc. All data in the database is stored as structured text, which gets parsed by the Agent Stories client software.

4.3.3 Writing Representation

How would a writer create a representation of their metalinear story that makes sense and which provides multiple ways of constructing a linear story playout? The key lies in the first person characterizations. Consider the previous conflict with our teamster on the 21st floor. He heard a crunch and saw the kid pinned between two cars in the middle of a busy downtown street. Who else could have been on that street? A woman happened to have been walking by. If we were experiencing this as a linear construction, we may or may not have heard her Speaker Introduction and, therefore, gotten to know a little more about her, as we did the teamster. What follows is her CHARACTER INTRODUCTION:

> *What I was trying to do was hit the ATM on Jefferson, run in to buy tampons in the convenience store on 5th, then get back to the office before anyone knew I was gone. But as I passed a construction site I remembered how when I was a kid I used to love playing in those places. My friends Donna, Joey and I use to climb the big mounds of dirt playing king of the hill, and threw dirt bombs at the steel girders to see if we could get that*

"ping" sound just right. I'd come home with my clothes caked with that light brown dust – my mother was so pissed – but I loved the feel of running and rolling around there. Those days are long gone.

CHARACTER INTRODUCTIONS, which describe a place and the people in that place, can often also function as DIVERSIONS, as in the case of the text above. While we see Jefferson Street a little more clearly, we also see other streets and especially the construction sites of the woman's youth. We can hear the woman's passion for play. Her version of the conflict could then be:

As I passed the plywood wall of the construction site, I heard a loud crunch and people just leaning on their car horns behind me. I turned around and saw the head of young man in between two cars in the middle of the street. It looked like he was hit, trapped between the two cars. I didn't understand why the car in back didn't just backup.

Both the CHARACTER INTRO/DIVERSION and the CONFLICT of the woman are generally in support of those same elements as told by the teamster, Joey. At least, they do not disagree with each other.[20] Therefore, supports links can be made between these two clips. Additional CHARACTER INTRODUCTIONS and CONFLICTS can also be made by this same character, which could be in opposition to each other. To add texture to the different story constructions, the writer can include many oppositional versions of the same type of elements from the same character. We could have heard a very different CHARACTER INTRODUCTION from the woman, which does not include her history in construction sites, and does not hint that perhaps the Joey of her past could be the same as the teamster.

Another point of view which can be included is the kid's. Pete's CHARACTER INTRO:

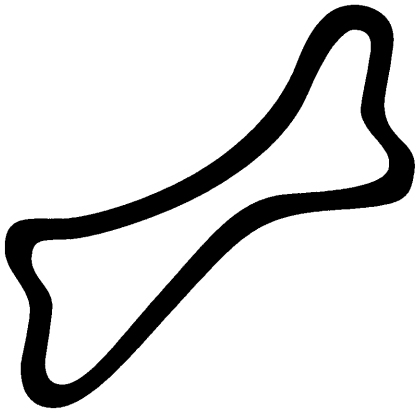
[20] There are few absolutes in the universe, fewer still in the art of writing. The metalinear narrative writer will need to choose how to handle situations where two of their clips are neither clearly supportive nor clearly in opposition. While it may be difficult to decide which link to use, supports or opposes, choosing neither would not help one of the missions of Agent Stories; that is to make narrative choices which mean something. No link means no choice can be made. This issue points to a possible area for further development of Agent Stories – developing new links for new kinds of story material.

First job, man-didn't wanna blow it. Sent me out for coffee again. They could eat some serious pastries, those guys. Loved the elevator though – cool – no walls – the earth just comes up to ya'- says hi. The street was a parking lot, man, no room to walk, no room to cross. Missed my skate board. These guys would have had a cow if I brought it in.

It is easy to see how more versions of the same story elements could be written to suggest or emphasize different facets in the lives of these three characters. Some versions may not include the accident, but instead focus on the woman's childhood. Other versions may focus on how Joey sees the world around him. Most importantly, these three characters are drawn out of an everyday world to allow us as audience to see our own world though a different and ever differing lens. By reconstructing the linear stories from the metalinear structure, and by repeatedly adding to the story representation, the end results are ever evolving.

Minor characters give flavor to the metalinear story by commenting on the main characters, or by just commenting on life as a part of the story world. Because they are included in the story world, their presence affects the overall impression of the linear stories. For example, in the midst of the crowded city streets live the invisible people that most of us just walk right past. This woman is one of them:

I brush my hair with this bone. Like it? I saw it in a movie once. There was this woman who lived way out in the woods in a shack with animals and plants all over. No one could touch her 'cause she was magic – scared off all the hunters and princes. She hung bones to dry on a string she ran from one end of the shack to the other. And as she brushed her hair, you could just see it in her eyes... you knew!



Provocative minor characters like this one can be linked supportively to any number of main character clips. As certain minor characters continue coming back, they can act as foils or voices of wisdom for main characters, offering contrast or advice.

Dramatization and sound clips would most likely be linked to main and minor characters through supports links, acting as visual and aural descriptions of what the character is talking about. Dramatizations and sounds could also be linked with certain clips, using opposes links as well. By claiming that a dramatization is in opposition to a main character's clip or is in opposition to another dramatization, the writer is further defining the meaning of the character clips. Story agents could potentially have the ability to use structures, like character clips linked through dramatizations, as a way of understanding the story more, and therefore telling it differently.

4.4 The Iterative Process

The writing process is a complex one, with many different perspectives and approaches as to how it is done. One area of research which has yielded revealing insight into the writing process has been Cognitive Science. Recent research has made clear that the writing process has both a parallel and iterative nature. (Hayes & Flower, 1980; Smith, 1994; Torrance, Thomas, & Robinson, 1996) It involves the creation of the initial germ of an idea, followed by an ever cyclic pattern of evaluation, inspiration, recreation and evolution. The writing process for metalinear work is no different. The writer will still need that cyclical evaluative process known as rewriting to bring her work to full fruition. Similar to what Hayes and Flower did for expository writing in their research[21], a goal of this research is to develop a model for the metalinear narrative writing process. This pro-

[21] Hayes and Flower developed a model for students learning expository writing by focusing on the rewriting process.

cess model will involve the Structural and Representational Environments described earlier, as well as an environment which gives the writer feedback about how her story can be told. This feedback allows the writer to return to her text and make knowledgeable changes and additions. The environment providing this function is aptly named the Writer Feedback Environment.

4.4.1 The Writer Feedback Environment

The Writer Feedback Environment (WFE) of Agent Stories is where story agents with goals of narrative construction, combine the story framework of the Structural Environment with the story representation of the Representational Environment. Different story agents construct narratives in different ways according to their own particular style. The writer employs the different agents in constructing and presenting her version of a linear story using the metalinear storybase from the Representational Environment and story structure from the Structural Environment. By constructing a linear story and providing a textual explanation of why the clips in the story were chosen, the WFE offers the writer a view into the reasoning behavior of the agents themselves, as well as a perspective into the storybase. As in the phrase "Actions speak louder than words," here the author is able to see, learn, and respond to the actions of agents as they form several linear constructions. The goal of this environment is to offer the writer feedback which will promote further metalinear narrative development, making the system genuinely helpful to the writer while not being dictatorial or overly confining.

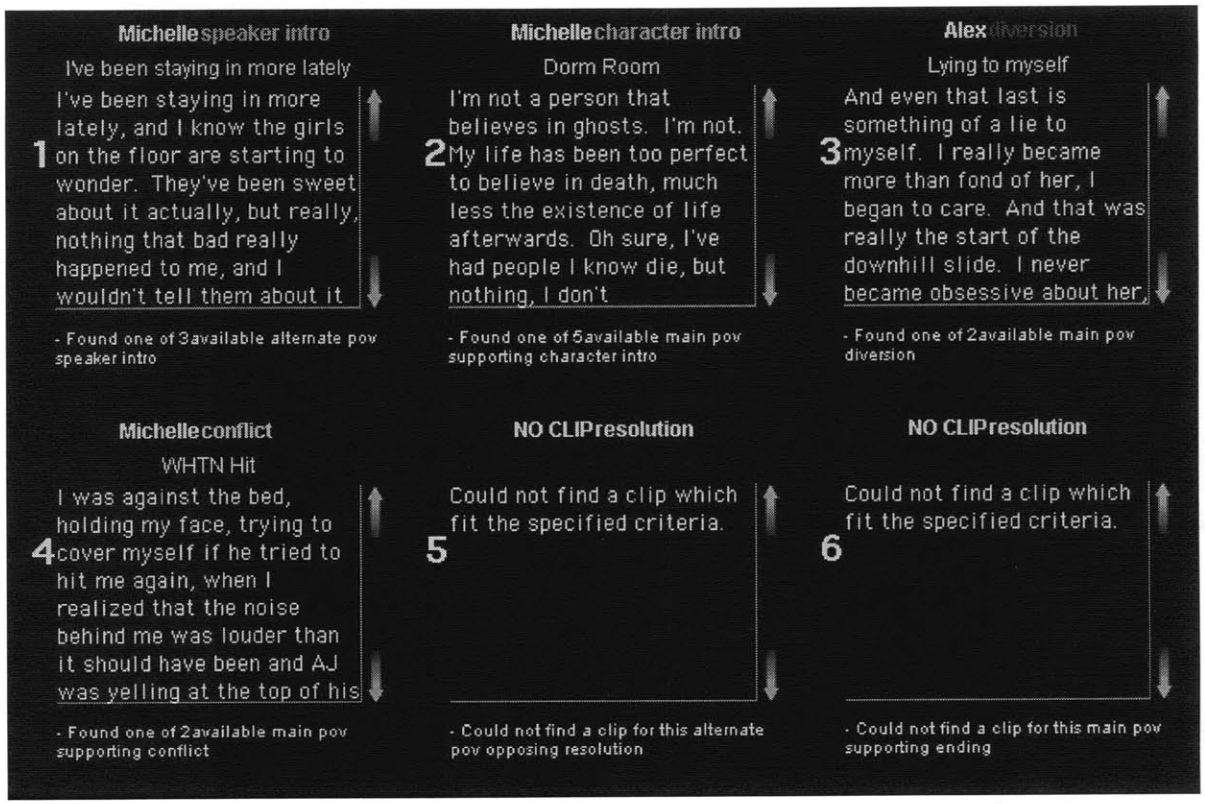


Fig. 28 Screen shot of the Writer Feedback Environment displaying the a story with feedback. These results are from an early stage in the story development process with Agent Stories.

As will be discussed in further detail later in this chapter, the story agents have differing behaviors associated with how they choose which clips to include in a story. Each agent has a different construction technique or set of preferences which the writer uses to see

their story in a different way. While the Agent Scripting Environment allows the writer to create their own custom agents, there are five story agents which come predefined with Agent Stories. These stories agents are named: Bob, Carol, Ted, Alice, and Isadora. Each story agent has an associated textual description of how they perform their task, as can been seen in Figure 29.

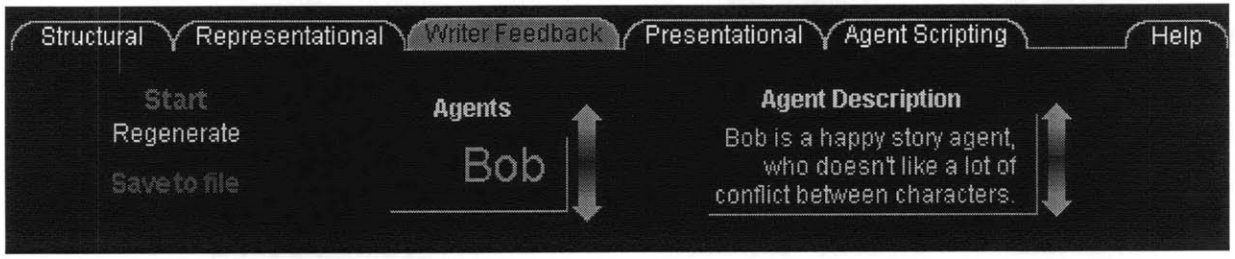


Fig. 29 The Writer Feedback Environment tool palette. Bob is the shown as the currently active story agent.

When given the task of constructing a narrative, each agent first chooses a main POV character among the various characters represented in the Representational Environment. The POV character forms the basis of other choices the agent must make later in the narrative construction process. This choice of POV character is the first decision situation for a story agent's behavior. Does the agent choose a character with a lot of oppositional links among its story elements? Or instead does the agent choose a character with a lot of supportive links? These are not mutually exclusive. Does the agent choose a character with the greatest number of overall links to other story events? Or perhaps the agent could choose a character with the greatest number of factual or causal precedes

links -- that is, characters which could be thought of as having clearly labeled sequential paths through their story events. Choosing a POV is just one situation handled by agent behavior.

The other situation when the agent must make a choice is when they are choosing clips for one of the seven types of narrative primitives of the story framework. For each of these primitives, the story agents can have very different decision making styles, and therefore, different styles for constructing story. The styles of the five pre-defined agents are embodied in their agent descriptions, which appear to the right of their names on the WFE screen. The purpose of the agent description is to state, in plain language, how the agents work in order to help make Agent Stories more approachable by a non-technical writer. The descriptions are an expression of the way that each story agent searches through the storybase. What follows are the descriptions of the five story agents and how they each work.

Bob: Bob is a happy story agent, who doesn't like a lot of conflict between characters. He'll avoid using characters who don't play well with others.

To avoid inter-character conflict, Bob seeks out Supports links between his Main POV character and the other characters. He will avoid Opposes links whenever possible as a way of avoiding the situation where one character says one thing and another character says that something different is true. Therefore, Bob will favor certain story domains in which characters generally agree with one another. This is not to say that Bob avoids conflicts, both in the general sense and the Agent Stories sense. It is just that Bob would construct stories more of the man vs. nature type rather than the man vs. man type.

Carol: Carol is a one-sided story agent. Carol will weave in lots of versions of conflicts, but with only one resolution.

As a one-sided story agent, Carol chooses a main POV character in the beginning of the narrative, and during sections of conflict (as stipulated by the story framework) she will first show the conflicts from characters POVs opposing her chosen Main POV. She will then show the conflict from the Main POV, and finally, during sections of resolution, will show only the resolution from the main POV, thus leaving the other character's conflicts unresolved. Carol generates narratives which resemble a common structure of western political commercials: My opponent believes that the problems of the city are X, I believe that they are Y, what I'm going to do about them is Z. Though the conflicting POV of the opponent is stated, and even stated first, it is discredited because that conflict is never resolved. Only the Main POV conflict is resolved. To tell an entire story using this structure means that the audience gets to experience the many different POVs of the same set of problems, but only one solution. This style can work in a number of ways, depending on the story domain. It could certainly be used to reinforce one character's dominance during the story: Yeah, those guys saw the world this way, but they're nuts – 'cause I'm right. However, it could also be used in some story domains to emphasize the unfairness of looking at any issue in such a narrow manner. The singular (American, European, Christian, Jewish, middle class, upper class, black, white, etc.) choice of resolution seems all the more narrow given the larger context presented by the conflicts. Perhaps the larger the core issue (war, famine, racism, etc.) the clearer Carol's one sidedness becomes.

Ted: Ted is a point-counterpoint story agent. Ted will try to show lots of perspectives of conflicts and resolutions. Ted's strong point is depth, but not brevity.

Ted is a good agent for constructing an entire narrative in the form of a debate. Ted's style is modeled after an old segment from the CBS television news magazine show 60 Minutes. In that short segment, called Point-Counterpoint, two correspondents, a man and a woman, took radically opposed sides of the particular issue of the week. Their comments on the issues often came dangerously close to personal attacks on the other person. The segment was informative and entertaining because the two correspondents were so opposed to each other.[22] Ted's style for constructing story capitalizes on Opposes links between story clips. Every time a conflict is required according to the story framework, Ted will choose the Main POV character's conflict and then all of the opposing conflict clips. When that conflict is resolved, the Main POV character's resolution is chosen, followed by all the character resolutions which oppose the Main POV. In doing so, Ted constructs stories which could be seen as fairer because all sides are heard from, perhaps at the cost of clarity, and certainly at the cost of brevity.

[22] This segment was later regularly parodied on the NBC comedy show Saturday Night Live, which demonstrates how this style can work equally well on serious and comedic material.

Alice: Alice is a "open ending" story agent. Alice will try to make the ending of any story a mystery - even to the author of the story.

Alice is one of the more experimental story agents, in that it was clear from her conception that she will work well in certain story domains and not at all well in others. Instead of merely choosing clips from the story domain in a clever way, Alice chooses clips, as well as manipulates the story framework. The story framework is an authored structure for narrative just like the web of connected story clips – so why not manipulate that, too?

What Alice attempts to do is quite simple. In looking at the story framework, if the situation exists that a resolution is the second to last item in the framework followed by an ending, then that would correspond to a very common story ending structure – one in which both the resolution and ending are not just important, but tied together in some way as interdependent narrative pieces. Therefore, Alice will throw one of them out, such as the ending. As the "open ending" story agent, Alice can not come up with a new ending which the author never imagined, wrote down, and placed in the story representation. Alice can, however, keep the ending a secret from the audience. She lets the audience come up with an ending themselves, in their own imaginations, based on all of what they have seen before. Since the author has prior knowledge of Alice's construction behavior, the author will have to decide if Alice is an story agent that he or she will want to take into account in their story writing. This requires that the writer let go of the control they usually have over a story.

> *Isadora*: Isadora is the love child of Carol and Ted, and thus has characteristics from both.

Another more experimental story agent, Isadora, attempts to blend the styles of both Carol and Ted. Isadora does this by mixing the different ways that Carol and Ted balance the conflict-resolution parts of their reasoning, with other parts of their reasoning, such as Speaker Introduction, Character Introduction, etc. Both Carol and Ted focus on Conflicts and Resolutions in constructing their stories. However, those parts of the stories are setup by the Speaker and Character Intro's. As a one-sided story agent, Carol will choose a speaker and character intro from her chosen Main POV character. As a more equitable story agent, Ted will try to give more than one character's POV for both the speaker and

character intros. Isadora, who still must choose a Main POV, will split up her choices of speaker and character intro. She will choose only one clip for each, but not from the same character.

4.4.2 Feedback

The WFE offers the writer feedback in either one of two forms: a textual form or a sketchy media form. The textual form is a story construction composed purely of the writer's text. The format of this display has some resemblance to that of either a prose story or a screenplay. The sketchy media form resembles a cinematic storyboard and gives the writer access to the text as well as to the digital video and sound representations of the text (if such video clips exist). After loading a story framework in the Structural Environment, and a storybase in the Representational Environment, all the writer must do in the WFE is choose a story agent and hit the start button, which generates the textual storyboard. The storyboard interface helps the writer in the ongoing metalinear writing process. In traditional media, the writer often works to a deadline, after which other contributors (producer, director, editor, photographer, cinematographer, etc.) take over to further construct and produce the story. In a metalinear story, the media is ever constructible and the construction process ever flexible. Additional material can continue to be added, and old material representations changed, on an ongoing basis. Therefore, the writer can continue to create more characters, events and representations for further production, even after an initial production effort has been completed.

To construct a new version of the story, the writer simply has to choose a new agent from the agent selection portion of the tool palette at the bottom of the screen, then click the start button to clear away the previous story blocks (if there are any) and create new

ones. However, if the collection of story clips in the Representational Environment is significantly large, the same story agent may construct a different story, because, given a lot of clips to choose from, random choices are more likely.

While the intent of the agents is to make choices based on style and purpose rather than random luck, a balance must be struck between machine power and authorial control. The power of the machine is related to the depth and complexity of its logical reasoning. The more power the computer software has, the more sophisticated its decisions. That sophistication comes at a price, because the deeper the reasoning system, the more annotation and representation of the clips the author has to do in order to take advantage of that sophisticated reasoning. In other words, the more work the computer does, the more work the human author does. The balance that must be struck lies in giving the author a storytelling system powerful enough to construct compelling stories while not also saddling them with so much knowledge representation overhead that they never want to use the system in the first place.

4.4.3 How to Interpret Feedback

As stated earlier, the writing process is a cyclic one. Rethinking and rewriting are the most time consuming tasks of the writing process. Agent Stories supports this process by offering the writer feedback about their story – feedback which the writer can then use to

called into play. If the secondary action fails, a tertiary action is triggered, if one exists. and so on.

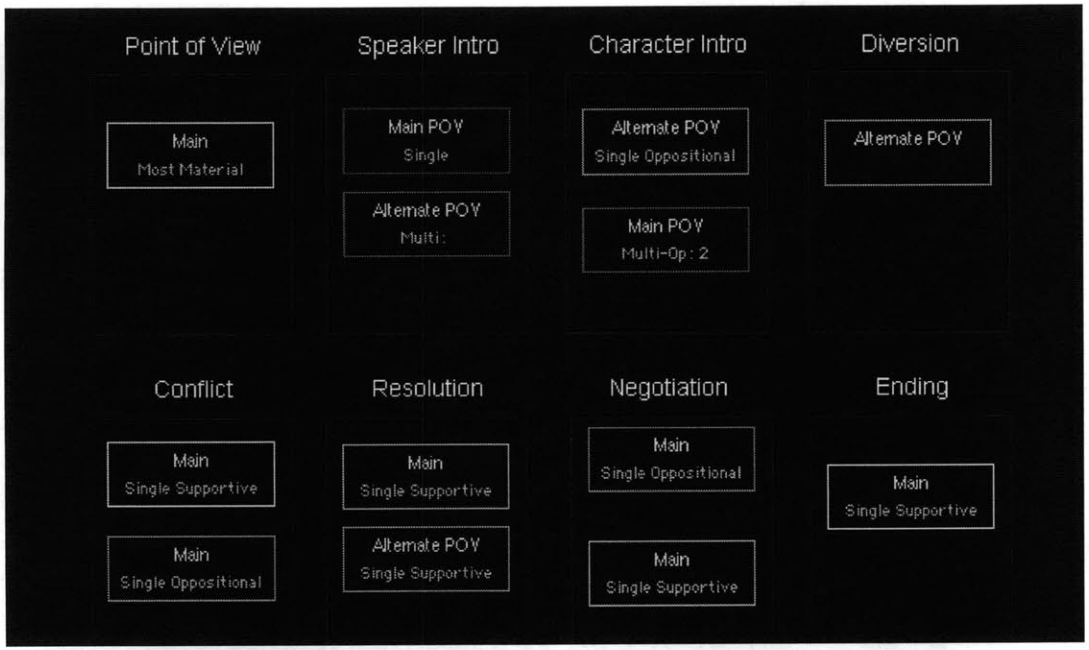


Fig. 31 The Agent Scripting Environment. Each colored behavior box represents a method for choosing a clip for the primitive type box it belongs to.

4.6.2 The Agent Scripting Language

The agent scripting language is a simple set of narrative descriptors which, when arranged appropriately, describe a way of filtering through the story domain, such that an agent can pick an appropriate clip or clips, if one exists. One of the goals of this environ-

For each attempt and failure at finding a certain type of clip, the Agent Stories story engine provides feedback about it so a writer could go back and edit their story material, adding, for instance, more conflicts or character introductions.

The reporting of successes in the WFE comes with a little more detail and finesse. Since the goal is not just to blurt out negative comments, but also to provide the writer with detailed positive statements, the reporting of success happens as a concatenation of sentence parts depending on what was found. There are four parts to each success sentence: the opening, the number detail, the link attribute from the Representational Environment, and the primitive type from the Structural Environment.

There are two different success sentence openings: Found and Randomly chose. Found is used in three cases:

- When the agent was looking for one clip (i.e. a single supportive conflict) and found exactly one clip.
- When the agent was looking for a clip from a specific character (i.e. a speaker intro by Bob)
- When the agent was looking for multiple clips which satisfy a certain criteria and found them.

The opening phrase Randomly Chose is used only when the agent was looking for a single clip of a certain type and found many of them. The intention is to let the writer know that the agent could have made a number of different choices at that point. If the agent randomly chose a clip which has a strong bearing on what happens later in the story (like a conflict which is linked to specific resolutions), then this random choice signifies that this agent would very likely tell the story quite differently next time because the different

conflict could also mandate a different resolution and thus a different story – a useful thing for the writer to know.

A success sentence can have one of three different number detail pieces. They are:

- this
- this one of X available
- this one of X requested

The number detail piece this is used simply in the case when a single clip was requested and a single clip was found; i.e. Found this...

The "X" in the second and third pieces refer to the number of found clips of the particular type that the agent was looking for. one of X available is used when the agent was looking for a single clip, but found more than one, whether the request was for a specific character or not. For example: Randomly chose this one of 3 available... or Found one of 2 available...

The number detail piece this one of x requested is used when many clips of a particular clip type are found according to the agent's behavior, and when the agent has found as many as it could. There is one clip box on the screen for each clip the agent finds. The agent will try to satisfy the number of requested clips and display as many as it finds up to the requested number. For example, in the success sentences under each of those clip boxes, the final line would read, Found this one of X requested... The writer would know how successful the agent was in satisfying this behavior by comparing the number requested to the number of clip boxes on the screen. Though there are no clip number restrictions, it appears that the number of clips requested would typically be small, on the order of 2 to 5.

The link attribute part of the success sentence refers to the type of link made between clips in the Representational Environment. It also refers specifically to the behaviors in the Agent Scripting Language as described in section 4.6. Since the story agents have behaviors for choosing a main POV for each construction and weaving their construction around that POV, their success sentences also reflect that main POV choice. Some examples of this sentence part are: Main POV Single Supportive, Alternative Multiple Oppositional, Main POV Single Oppositional, etc. Examples of the success sentence for the three parts up to this point would be:

- Found this Main POV Single Supportive...
- Randomly chose this one of 3 Alternative Single Oppositional...

The final piece of the success sentence is the primitive type that the agent was looking for, as stipulated by the active story framework in the Structural Environment. The same seven narrative primitive types that are in the Structural Environment are used here: SPEAKER INTRODUCTION, CHARACTER INTRODUCTION, CONFLICT, NEGOTIATION, RESOLUTION, DIVERSION, and ENDING.

When all four of the success sentence parts are concatenated, they resemble the following examples:

1. Found this one of 2 requested Alternative Multiple Supportive Conflicts.
2. Randomly chose this one of 5 available Main POV Single Supportive Character Intros.

If a writer using the WFE received example 1 as feedback, it would mean that the agent was trying to find two conflicts supportive for the main POV character's conflict, but not actually belonging to the main POV character. This sentence would ideally be at the bottom of two clip boxes. If this sentence is on the bottom of just one clip box, then it means that the story agent was unsuccessful at finding both clips. The story agent's inability to

find another clip is not listed as a failure however, because it is not a complete failure – it did find one of the clips.

If a writer using the WFE received example 2 as feedback, it would mean that the agent was trying to find only one character intro for the main POV character and instead found five. The agent then made a random choice between the five to produce the one chosen clip. This type of feedback in important because it is crucial for the writer to know what parts of the story he has a lot of material for and what parts remain lacking. If the agent is making a random choice between several clips in one part of the story, and able to find no clips for another part of the story, then the writer will be able to see where she should focus her efforts.

There is one remaining possible feedback which the Agent Stories system is able to give the writer – if no clip could be found for a particular purpose. In such a case, an empty clip box is placed on the screen in the proper sequence location where a successfully chosen clip would be. Underneath the clip box are listed all the appropriate failure sentences, indicating the sorts of clips the story agent tried to find but was unable to. The one piece of text inside the clip box, where the clip text would normally be, is the simple statement:
Could not find a clip for this XXXX.
The feedback simply tells the writer that a clip was not chosen and for lists the reasons why. The writer is then free to go back to the Representational Environment or the Structural Environment to make changes so this event will not happen again. The writer also has the other story agents available. Where one of the agents could not find a clip for a particular place in the story framework, one or more of the other agents could very well find a clip for that same place, as their behaviors have them making different choices. By

polling the various agents or even by scripting their own agent and having that agent construct the story, the writer has the ability to see many different sides of their story and rework the different parts as they see fit.

The familiar cyclic writer's pattern of change–read–rethink-change-read–rethink is maintained in Agent Stories because the software agents output food for rewriting thought. The resulting process is one where the story evolves during the writing process. Not only does the text become better, as it should over any writing process, but the representation and the body of work becomes stronger as well. The details of the writing process and case study examples will be discussed in chapter 5, Authoring and Evaluation.

4.5 Presentation

Instead of a single stream or frame of video, the Agent Stories design includes a type of presentation unlike that of traditional television or cinema. The intent is to present multiple streams of simultaneous video and audio, all under user chosen story agent control. The story agents possess unique behaviors which are used to choose clips as well as control the dynamic screen design of the presentation. The Presentational Environment is the portion of Agent Stories where that presentation takes place. Similar to the WFE, the Presentational Environment performs the function of Branigan's "narration", in that it chooses and sequences the story elements, presenting them with a sense of visual style. Sequencing choices are made according to the framework in the fullest possible way for the benefit of an audience. The constructed stories are presented with a sense of style through the use of the same story agents used in the WFE. As the embodiment of the reasoning necessary to construct narrative using this computational model, story agents

provide both the writer and the audience a method of experiencing story as best suites their needs. The Presentational Environment is not a writer's input/manipulation space, but instead a final video output device for both writer and audience. Here audience refers to those who would simply watch one or many linear cinematic presentations of the writer's metalinear story, which has been produced into the form of digital video, audio and stills.

The object of the Presentation Environment is to give the audience/user the ability to construct stories without having to know about the background technical details, such as knowledge representation, abstract story structure, and story agent scripting. The audience/user would simply need to sit down in front of the monitor, choose a story agent by name, and hit the START button to have that story agent create the story, just as in the WFE. The chosen story agent looks at the characters in the story domain, chooses one as a Main POV character, then weaves a narrative in the method described earlier by following the sequence of narrative primitives in the story framework. Once a sequence of clips has been chosen, the system plays them. Because the story agents come to the story domain fresh every time they construct a story, there is no reason for the story representation to ever be considered fully constructed. The writer and production team can continue to add new story clips and delete old ones such that the story domain continues to grow and evolve, resulting in ever changing narratives.

4.5.1 Screen composition

Because it is not the primary focus of this research, the screen composition has been kept very simple in order to ease development. Whether this environment is developed in a simple or complex manner, however, the fundamental idea remains the same. The com-

puter screen is not limited to a single frame, as is the television screen. The space, therefore, can be used in a multitude of creative ways. The agents approach the task of arranging frames of video on the screen in different ways. Their reasoning can be based on a structure as simple as placing frames of video on a grid pattern, or as complex as blocking the frames on the screen (as stage actors are blocked in the theater) based on the story, character motivation, character background, etc.

The simple structures chosen for Agent Stories are based on what type of clips are in the list of chosen clips to play, called the *playlist*. Main character clips in the playlist will appear in the middle of the screen. Minor character and dramatization clips in the playlist will appear around the outside of the main character clips. Main character clips stay on the screen in place until the next main character clip takes its place. This will be true even if there is time between the end of one main character clip, and the start of another. In such a case, the previous clip remains frozen on the last frame until the next clip starts. Experimentation with screen placement styles is ongoing.

4.6 Agent Behavior and Logic Scripting

4.6.1 The Agent Scripting Environment

The Agent Scripting Environment offers the writer a chance to define the logic behind the styles of story construction used by the story agents. While metalinear writers will have access to the ready-made story agents described in section 4.4.1, the Agent Scripting environment allows users to choose how a story agent reasons when trying to fill a story framework; that is, create the primary, secondary, and tertiary actions of each behavior of

the story agent. What this means for a writer is that while she is not directly specifying which part of a story will follow another, she does have broad control over what ways the story domain will be constructed into a linear form. While she must relinquish a certain amount of authorial control, she also maintains some of that control over the construction process in this new way.

This has significance for the creative process, in that when the writer receives feedback from the WFE, she has the option of changing the story structure (Structural Environment), changing the story representation (Representational Environment), or changing the construction behaviors of one or more agents in the Agent Scripting Environment. Therefore, metalinear writing will have clearly identified controls, and one measure of a writer's craftsmanship will be how well they understand which of the three control variables to manipulate.

A story agent behavior is a set of rules which describe how the agent will perform in particular situations. Since the goal of each agent is to fill or solve the author's structural framework by choosing appropriate story clips, a situation for a story agent is each narrative primitive the story framework. Story agents walk down the framework from top to bottom, from one narrative primitive situation to another, choosing and inserting story clips as they go. Story agents, therefore, are similar to Pattie Maes' definition of a situated agent in the sense that story agents are aware of where they are and what their overall goal is. (Maes, 1990) (Maes, 1994) The story agent's rules match a situation or context with some primary action. If the primary action fails for some reason, a secondary action is

called into play. If the secondary action fails, a tertiary action is triggered, if one exists. and so on.

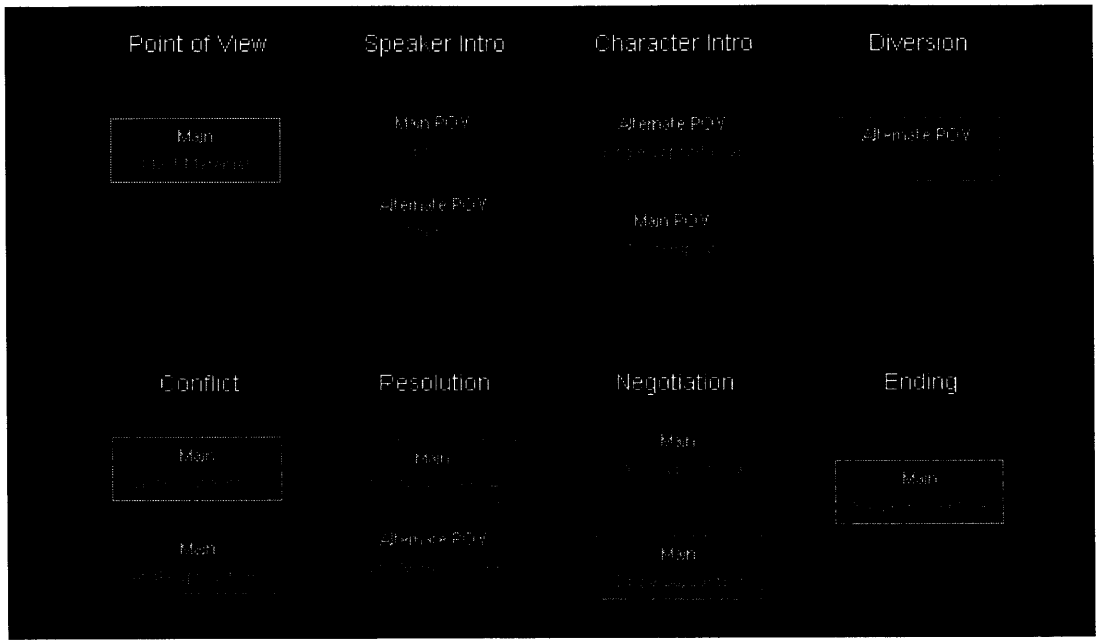


Fig. 31 The Agent Scripting Environment. Each colored behavior box represents a method for choosing a clip for the primitive type box it belongs to.

4.6.2 The Agent Scripting Language

The agent scripting language is a simple set of narrative descriptors which, when arranged appropriately, describe a way of filtering through the story domain, such that an agent can pick an appropriate clip or clips, if one exists. One of the goals of this environ-

ment was to make it easy: easy to understand and easy to use. The ease of use is required because the user would usually be someone who does not have computer programming experience. If the user did have programming experience, they would not necessarily care to apply that skill to the act of writing fiction.

There are eight story agent behaviors which correspond with the seven narrative primitives in the Structural Environment, plus one. The extra behavior is the Main point of view (POV) behavior. It controls which story character the agent will choose as its Main POV. Each agent first chooses a Main POV character among the various characters in the representational environment. The Main POV character forms the basis for other choices the agent must make later in the narrative construction process. Does the agent choose a character with a lot of oppositional links among its story elements? Or instead does the agent choose one with a lot of supportive links? These are not mutually exclusive. Does the agent choose a character with the greatest number of over all links to other story events? Choosing a POV is just one situation handled by an agent behavior. Other situations arise when the agent must choose a story element according to any of the seven narrative primitives of the structural environment.

What follows in this section is a description of the eight agent scripting environment behaviors, and their associated narrative descriptors. The descriptions of each behavior section are indented to show the levels of choice. For example, in Main POV, the Main, Minor, Dramatic and Sound are all first level choices. Each of these choices have second level choices, as listed in an indented fashion below them. Sometimes second level choices have third level choices which are shown indented further. In Main POV, choices like Specific

are on the same level as Main, Minor, etc. However, since Specific has a different second level choice, it is on a line by itself.

```
Main POV:
    Main, Minor, Dramatic, Sound
        Most Material, Least Material, Most Oppositional,
        Least Oppositional, Most Supportive, Least Supportive,
        Random
    Specific
        Character Name____
```

The choices of Most Material through Random are different ways of classifying the story's characters. Most and Least Material refer to the number of clips belonging to a character. Most and Least Oppositional refers to the number of oppositional links between the clips of each character. Most and Least Supportive work in a similar way except with supportive links. Random simply means that the story agent will make a random choice in order to find the main POV among the story domain's main characters. The Specific choice allows a writer/story agent designer to make an agent specifically for their story domain, by specifying the name of the character to choose.

```
Speaker Intro
    Main POV, Alternative
        Single
        Multiple
            How Many?___
    Specific
        Character Name_____
```

For Speaker Intro, the first level choices of Main POV and Alternative have only the sub choices of Single and Multiple for the writer to specify how many clips from the main point of view should be shown. Alternative refers to something alternative from the Main POV, as

chosen in the previous behavior section. For instance, if there are three characters, Joey, Patrick and the Woman, and Joey was chosen as the Main POV and the Speaker Intro was the first element in the story framework, it would be significant to have Patrick start the story with his own detailed Speaker Intro. The rest of this version of the story could be mainly about Joey and his construction trials and tribulations, but the beginning would be about one young kid talking about how he's trying to make a living for the first time in his life. We are given the world through one set of eyes, then offered another, older set of eyes through much of the main story as a contrast. This is just one example of how choosing an alternate POV can make a meaningful difference in the final story

The Speaker Intro does not make use of Supportive or Opposition links, because it makes little sense to refer to a story clip as being in opposition to something, when the clip is someone's first person opinion of themselves. How can Patrick's opinion about himself be in opposition to something else – what would someone else's opinion matter to Patrick and what would such an opposition mean?[23]

[23] These are culturally relevant questions, having to do with how narrative content and structure reflect a cultural identity. While much of this topic is beyond the scope of my research, it is touched on further in chapter 5.

The words Single and Multiple in the agent scripting language refer to clips, not characters. That is, the writer/story agent designer has an option of playing a single clip or multiple clips. The clips could belong to the same character or different characters. For Multiple, the story agents try to satisfy the How Many number by choosing either that number or less of which ever type of clip is being requested.

Character Intro
- Main POV, Alternative
  - Single Oppositional, Single Supportive
  - Multiple Oppositional, Multiple Supportive
    - How Many?____
  - Specific
    - Character Name_____

The Character Intro's Main and Alternative first level choices each have four second level choices: Single Oppositional, Single Supportive, Multiple Oppositional and Multiple Supportive. In contrast to the Speaker Intro, the Character Intro does make use of oppositional and supportive links because Character Intros deal with details in the world outside of who the speaker is. Through a Character Intro we understand the character by understanding how they see their world. Each set of world details for individual characters could be, and probably are different, and some could be in direct opposition to others: "The room was jam packed crowded with people – no one could move," "I saw no one in the room but her," "It was a typical frat party, ya know – 2 kegs, 4 guys to ever girl, not enough food."

Conflict
- Main POV, Alternative
  - Single Oppositional, Single Supportive
  - Multiple Oppositional, Multiple Supportive
    - How Many?____

Conflict, Resolution and Negotiation all have the same choices. These were designed to be simple choices so that a writer could more easily understand how they were used and thereby somewhat predict the outcome. While providing more descriptive power by providing more options and submenus is certainly possible here, I made the choice for power through simplicity instead of power through complexity. Power here refers to the writer's agility with the tool. The less complex the tool, the easier it is for the writer to

acquire it conceptually and use it creatively. Some of these issues will be address further in the chapter on system evaluation, Chapter 5.

Resolution
- Main POV, Alternative
  - Single Oppositional, Single Supportive
  - Multiple Oppositional, Multiple Supportive
    - How Many?____

Negotiation
- Main POV, Alternative
  - Single Oppositional, Single Supportive
  - Multiple Oppositional, Multiple Supportive
    - How Many?____

Diversion
- Main POV, Alternative

Over the course of this research, the Diversion primitive and agent behavior initially held great complexity. At one time Diversion stood for the possibility of a story within a story, a great inward spiraling effect of story structure and story representation where another whole story structure could be encapsulated within a Diversion. Over the years, I have come to believe more and more that power of the system is directly proportional to the power of the human using the system – which to some extent corresponds to the ability of the system to get out of the way of the user. In following this belief, I have pared away Diversion to just the above two simple choices, with the hopes that interesting complexity comes not from mechanical/computational form of representation, but from a more fluid representation in the form of good writing.

Ending
    Main POV, Alternative
        Single Oppositional, Single Supportive
    Specific
        Character Name_____

To create a story agent, the writer drags the Behavior box up from the bottom of the screen and releases it in one of the behavior set boxes. Each Behavior box is separated by a Boolean operator, either implicitly or explicitly. By dragging the Boolean AND operator up from the bottom of the screen and placing it in between two behaviors, the writer is telling the system to satisfy both conditions, if not with a single clip, then with multiple clips. For instance, if in the Conflict behavior set box there was a Main POV–Single Oppositional AND Alternative POV–Single Oppositional, then first we would see a conflict from the Main POV character and then a conflict from a character who disagrees with the Main POV character's view of the conflict. However, if the behavior set box held Main POV–Single Oppositional followed directly by Alternative POV–Single Oppositional, without the AND operator, then there is an implicit Boolean OR between the two behaviors, thus the story agent will choose whichever behavior it can successfully satisfy first.

Ted is a point-counter point story agent. Ted's first choice for Main POV is Most Oppositional because he constructs argumentative stories. This behavior cannot fail, because there will always be one character who is most oppositional. If there is a tie between two or more characters for having the highest oppositional links, then the system picks one character at random. However, just to be safe, Ted's next choice is to choose the character who has the most material; again, a determination which can not fail – unless there are no clips in the story domain at all.

Ted's Speaker Intro is Main POV–Single because it makes sense to have the most argumentative character say something here. Then Ted, in order to be fair, will include multiple opposing views in his Character Intros. The same is true for his Conflicts and Resolutions. Diversions, while not oppositional, can be from multiple points of view. Ted's Diversion behavior simply requests two clips, one from the Main POV and one not from the Main POV. Ted's ending is in keeping with his pattern of fairness, with oppositional clips from a main and then alternative POV. Ted does not handle Negotiation well. Ted is argumentative, and negotiation (in general) does not necessarily support his argumentative nature. However, since a story agent must be able to do something in all its behavior set boxes, by not including any behaviors in Negotiation, Ted falls back to the system's default behavior, which is to choose a single random Main POV clip for that clip type.

The flexibility of both writer and agents allows for a great range of possible linear narratives. The functionality of Agent Stories depends only on its relative simplicity and the writer's imagination.

5 Authoring and Evaluation

Imagine two men holding a captured puma on a rope. If they want to approach each other, the puma will attack, because the rope will slacken; only if they both pull simultaneously on the rope is the puma equidistant from the two men. That is why it is so hard for him who reads and him who writes to reach each other: between them lies a mutual thought captured on ropes that they pull in opposite directions. If we were to ask that puma – in other words, that thought – how it perceived these two men, it might answer that at the ends of the rope those to be eaten are holding someone they cannot eat...

- From Milorad Pavic, DICTIONARY OF THE KHAZARS, 1988

5.1 The Authoring Process with Agent Stories

5.1.1 Case Studies Overview

Six writers were chosen to work with Agent Stories over a two or three session period. Each writer worked two to four hours per session. The writers where chosen based on their interest in creating metalinear narrative. Some of the writers who tested Agent Stories were personal acquaintances of mine – they were writers whom I asked for assistance. I choose those individuals based on my knowledge of their work, and their exhibited interest. Other writers came to the project through a request I posted to an electronic mailing list. In that posting, I briefly explained the research and software to be tested. Respondents to that post were then sent a more detailed description of the tool

and my research interests. They were also encouraged to read my web pages and the papers about my research which are posted there.[24] Only after a respondent contacted me a second time did we arrange an appointment for testing. Respondents, therefore, were informed and predisposed to the metalinear writing form of Agent Stories. Acquaintances who agreed to test were further exposed to the project and the metalinear writing form through my previous conversations with them.

[24] See: http://www.media.mit.edu/~brooks

The first session for each writer included a demonstration of the software. They were asked not to bring any material they were already working on, but instead to start a new project, so they would not write with a heavy bias toward linear narrative. I stayed nearby throughout the first session, watching them use the various environments and answering their questions. As the testing process proceeded, I withdrew more from the writers as they worked.

The qualitative evaluation process involved my talking to the writers at the end of each of their sessions. I asked each of them about their typical writing process and how that process was altered with Agent Stories. I tried to gain an understanding of their thinking process for narrative, before, during, and after the sessions. What follows are the answers to my questions, other comments from the writers, and a short synopsis of the characters and stories they wrote. The text of their stories is included in chapter 6.

5.1.2 The Cases

Glorianna:

A professor and filmmaker, Glorianna spent only one session with Agent Stories. In that time she wrote a story which consisted of a series of scenes about her family. In this story, she and her sisters help her mother move out of her house. Most of the action took place in her mother's kitchen. Her mother was making tea, while the daughters, all adults, prepared for the trip and tried to "take care" of their mother. The story was situated in the present, with flashback memories to daughters' childhood and mother's youth.

To write the story, Glorianna first created a series of scenes – linked dramatizations of the events from what was at first a general or omniscient POV. She commented that in order for her to write for Agent Stories, she would always have to write a spine of a linear story, then branch outward with the main character POV clips of the different sisters.

Glorianna's approach to Agent Stories may be related to her experience as filmmaker and the linear nature of filmmaking. Agent Stories may be tool which filmmakers use to break out of linear thinking and into metalinear thought.

Raelinda:

Raelinda, a writer and oral storyteller, recently switched from writing with pen and paper. When she started using a Macintosh and the ClarisWorks word processor, her relationship to writing changed. Raelinda, who describes herself as a visual thinker, said she loved the word processor because for the first time she could write as fast as her mind worked – she could "write at the speed of think." She was comfortable with her writing

tool – she could play with it, and therefore, play with her writing. She carried this approach into her work with Agent Stories.

In Agent Stories, Raelinda wrote a story with three main characters: A ghost, an angel and a coffee house bum feeding crumbs to the pigeons. The bum wants to be the angel, the angel wants to be the ghost, the ghost wants to be the bum. The ghost and angel are invisible to the bum, but they are in his imagination. The ghost and angel are both amazed at how accurate the bum's knowledge of them is, all from his imagination.

The most striking thing about Raelinda's story is her characters' relationship to time. In her story, the ghost is afraid of time ending, which is why she hangs around the coffee house watching people. She knows that if she were to *go into the light*, time would end and she does not want that. The Bum is afraid of entering time. He knows that if he hangs around the coffee house, he will be able to keep time still by never turning the pages of the book he is reading. In his book, he can keep time at the same moment, the same page, for as long as he wants. The angel is simply confused by time and not knowing how to deal with its passing. It is interesting that after my introduction to Agent Stories, Raelinda started writing a story in which time is a central issue – reminiscent of the stories Jorge Borges.

When I asked Raelinda about the playing with the Structural Environment and story structure, her response was, "Well, I only have one structure." Given the diversity that I know her oral stories to have, it is interesting that she always uses the same structure and is comfortable with it – which is quite appropriate. She was not able to clearly articulate what that structure was, at least not in Agent Stories terms, but she knows that each of her stories written outside of Agent Stories has the same structure, and so was less interested in using the story structure in her Agent Stories writing.

John:

John, a "closet" writer, wrote two stories with Agent stories. His first story was very linear and time based. Even after repeated explanations of how the agents would rearrange his clips, John, while never expressing dislike or confusion about agents, still kept his heavy *causal precedes* link story. While working with the Representational Environment on his first story, John realized how his representation was somewhat rigid and started writing a second story. John's second story (see Figure 8, in chapter 4) also had a lot of precedes links, as well as many more other relationships between multiple streams of characters and action.

Teresa:

Teresa is a poet. Her entire approach to Agent Stories was as a performance poet. She did a lot of work to map the narrative structures of Agent Stories to her expressive medium, which posed a number of challenges. Teresa's involvement in the project was valuable, however, because as a poet she has an innate awareness of her poetic granularity. Poets make conscious decisions about poetic granules such as stanzas, paragraphs, words, letters, and sounds. Their use of these granules, breaking larger ones into smaller ones, combining smaller ones into larger ones, patterns of different sizes, etc., have relevance for writing in Agent Stories. Poets, perhaps more than fiction writers, are aware of their granularity because every choice has meaning on the page.

Teresa struggled to understand all of the features of the software so that she could use it more effectively. She wanted the features broken down into separate lists of the system's imperatives versus what *could* be done with it. Teresa was concerned not only with the

words and phrases of her work, and the images they evoked, but also how they sound in the reader's and the performance audience's head. One of the things Teresa struggled with was *conflict*. The concept of conflict did not fit in Teresa's poetry, so she did not know what to do with the conflict narrative primitive. She was able to map the narrative concept of conflict to the poetic concept of tension, however. Poems can have a sense of tension that ebbs and flows.

Teresa's writing in Agent Stories centered around the human body. She wrote a series of poems and poem fragments from the point of views of various body parts.

Ian:

A substitute teacher in the Boston Public School system, Ian came to Agent Stories with a strong interest in writing for radio. His belief was that radio required every bit of the same creative effort as cinema, but with the added bonus of an infinite special effects budget. Also, given an audio-only payout, the final product would not be perceived as granular as in a cinematic payout. While the screen would be blank, the potential layering of audio pieces could provide a seamless presentation of the story.

Ian got the technology of the system fairly quickly, perhaps because he read my papers and web page before arriving. His time with Agent Stories was spent mostly in analysis rather than writing. It turned out, however, that Ian had the hardest time adapting his style of writing to Agent Stories.

5.2 Evaluation of the Process

5.2.1 Author Evaluation

Raelinda:

Raelinda stated that she felt less encumbered than usual when she was writing with Agent Stories. She did not have to pay as close attention to time and performance as she has to in linear writing. Her writing already tended toward a free form temporal structure, and so with a metalinear writing tool, she was able to take advantage of that. Her story exemplifies a fun experience. As she worked, she was able to focus in on the writing. Her technique was to create all of her story clips first, then link them together. She had a sense of how they would be linked as she wrote, but did not *commit* herself to links until after she was sure of what her characters wanted to say. Unfortunately, the one part of Agent Stories that was not working properly during Raelinda's writing sessions was the story engine. So most of her experiences and feedback have to do with the Representational Environment and not the Writer Feedback Environment. She never felt the need to create a framework in the Structural Environment – perhaps because it did not seem as if she had to in order to simply write her story. If the story engine was working for her, she would have been forced to create at least a simple framework, as the agents require one.

Raelinda made a number of insightful comments about Agent Stories and her experience using it. She suggested that often the hardest part of writing is getting started, and thought that perhaps a writing exercise button somewhere in the tool would help a writer get started with the system. It would get writers involved in the process of creating with

the tool by giving them a play space right off the bat. She suggested that the name of the link *causal precede* be changed to *cause and effect.* She felt that more writers would understand cause and effect. She was also confused about the name factual precede, but did not have a suggestion for a new name for that link.

John:

In John's writing, he wanted to be able to link objects before naming them. He wanted to see the structure of the story clips first, keeping the details in his head, before committing the details to the database. This is reminiscent of why I placed the Structural Environment first in the order of environments. While it does not matter which environment is completed first, Structural or Representational, using the structure first is appealing to some writers. It is like writing an outline for a story before writing the story details.

John was very concerned about maintaining a temporal flow through his stories. Most of the links that he used were precedes links, and thus created more of a multilinear rather than a metalinear story. After he made many links between clips, his concern was how to sync up time. He wanted a way of creating multiple linear stories separately, and bring them together in multiple ways. Yet, John was interested in making sure that certain things happened in a certain order, in an entirely predictable way.

Like with Raelinda, much of John's time with Agent Stories was spent with the Representational Environment because the Writer Feedback Environment was not fully operational. During his last session with the system, the story engine was operational and so John got to see how the story agents made choices for him that he would not have predicted. It became suddenly clear to John that writing multiple versions of the same piece of

story, from multiple points of view or from the same character point of view, is a valuable feature of metalinear narrative. Even before John tried running the story agents in the Writer Feedback Environment, he stated that Agent Stories made him think much more about his writing and about the worldviews one creates in stories. Writing first-person narratives in a highly structured manner helped John see the world through other peoples' eyes, which would hopefully be effect his writing in a positive way if he continued creating with the tool.

John made the comment that a valuable thing Agent Stories provides is that a writer could look at the writing of another writer and immediately see their structure. The visual representation of the system allowed him to learn to *sight read* his own work and also the work of other writers. The Representational Environment became a system of narrative notation for John, giving him another level to approach his own writing.

John made some good suggestions for future development of Agent Stories, mostly in the area of user interface. He suggested that there should be a function which allows the writer to change a clip from one clip type (main, minor, dramatization, or sound) to another. This would allow one to change their mind and more freely move the story pieces and the characters around, and even have an agent construct a story with a certain character as a minor character, then again as a major character. Such flexibility could be important for future development.

Naming clips was difficult for John. He was accustomed to writing and not having to name what he writes, but just place it where it belongs. Naming each clip felt unnatural to him.

Teresa:

Teresa stated that Agent Stories provided for *poem moments.* A poem moment is defined as a time of realization of how a poem could be used in different ways through rearranging granules or by resequencing. In her preparation for performances, Teresa must consider different poem sequences to best fit the audience and her own sensibilities. Agent Stories allowed her to see a lot of different possible sequences, even as she just entered her text in the Representational Environment. As with the other writers, the structured approach to writing with this tool provided Teresa with a new perspective into her writing. The longer she worked with the tool, the more I found her (and other writers) asking the same questions repeatedly. Teresa especially struggled with certain Agent Stories concepts like link and clip type definitions. Eventually, there came a moment of epiphany – a time when if all was not immediately clear, it was certainly different. Once the concept of metalinear narrative hits a writer, the notion of how to write suddenly shifts and the writing becomes more exciting. I witnessed this in Teresa's sessions, as well as in John's and Ian's.

Teresa suggested that there could be an agent that samples various clips, pulling out only fragments, and sequences the those fragments. This, Teresa saw, as a possible poetic extension to Agent Stories. This sampling story agent would weave through the clips, pulling pieces of text from different clips, choosing the fragments based on consonants and vowels in words. The agent sequence the text according to a rhythmic structure and style.

In forcing an identity of character and title when creating the clips in the Representational Environment, Agent Stories informed Teresa about her work. The Representational Environment allowed Teresa to reinforce her poetic style and thinking. She could hear her own voice and rhythm clearly in her writing, in part because of the structure provided.

Some of the user interface suggestions Teresa made were extremely practical and insightful. She suggested adding the primitive type color associations to the Representational Environment icons, so that a writer would be able to know how they have tagged a clip without having to open it. This feature was immediately implemented and can be seen in Figure 8 of chapter 4.

Teresa reminded the team of us working on Agent Stories that writers are a special group of people who, once they get used to certain tools, require those tools from then on. Teresa would have wanted Agent Stories to include a spell checker, a dictionary and an online thesaurus. By not providing these type of tools which writers are accustomed to having at their disposal, their normal creative flow can be easily blocked. Cut and paste, for instance, was a good thing to maintain in Agent Stories. Teresa was relieved that it was possible to write at home between sessions, then bring her writing in on a disk for pasting into Agent Stories.

Ian:

As stated above, Ian's time was spent more in system analysis rather than in writing metalinear stories. Ian's comments, therefore, are more of a list of user interface suggestions than writing experience impressions. After his introduction, Ian realized that what he was doing was thinking about his writing as a set of objects – a constellation – with the understanding that the agents would simply see his constellation differently than how he saw it. He saw the links as inspiring a skeletal structure. Ian perceives his writing as something which grows like a plant, spouting, enlarging and blossoming. With Agent Stories, Ian saw his writing as something which grows like a building, with a thoughtful construc-

tion processes. He saw the Representational Environment links and Structural Environment framework as a type of structural steel, first laying down the foundation and the support for the flesh of the building to be added later. Narrative elements, like irony for instance, would normally happen or be written intuitively. With Agent Stories, the writer needs to be more thoughtful and planned. This made writing more like engineering to Ian – not a way he was accustomed to thinking about writing. Yet, he also saw Agent Stories as adding a strong visual element as well. Ian found the visual aspect of writing with Agent Stories helpful.

Ian's user interface suggestions were centered around the same sort of issues important for Teresa. Once writers (and perhaps any type of artist) gets used to certain tools, they need those tools in order to feel empowered to work. Ian missed all the word processor features he was accustomed to, like a floating tool bar with lots for tool buttons for style, etc., Ian suggested keyboard commands for the tool bar buttons and reminded me that having multiple ways of accomplishing something is helpful. He also wanted a way of making links between clip objects through keyboard commands.

A particularly useful suggestion Ian made was that he wanted to ability to open multiple clips at the same time, allowing him to cut and paste between clips. This is a simple and obvious suggestion which I never thought of, but which should be implemented if Agent Stories research continues. The Representational Environment is a multidimensional writers' playpen. It is important for writers to be able to scan and navigate through a lot of story material on a surface level, and also dive deep into the guts of their story, building and rebuilding to achieve the best final result – a multi-faceted, multiple point-of-view metalinear story.

5.2.2 Evaluation of the Work

It is not my intent to comment on the quality of the writing which the writers completed. It is, however, important that the writers' process be addressed. The process of writing with Agent Stories is validated by a constructionist framework. *Constructionism* grew out of the concept of *constructivism* introduced by psychologist Jean Piaget.(Piaget, 1954) *Constructivism* means that children can learn by making sense out of their experiences. *Constructionism* was introduced by computer scientist and professor Seymour Papert at the MIT Media Lab.(Papert, 1993) Constructionism is where the experience through which children make sense and learn is an experience involved in building something personally meaningful to the child.

Writing is something which is extremely meaningful and personal to the writer. The process of writing, however, usually involves conceptual tools – narrative structures and grammatical rules drilled into the writer from grade school. The Structural and Representational Environments of Agent Stories, however, provide writers with tools which are not simply conceptual, but tangible. Agent Stories is a constructionist writing tool in that it allows writers to do three key things:

1) Build a story with the tools provided
2) Build new ideas through building their stories
3) Build for a purpose

The stories the writers created are detailed in chapter 6. They include work in fantasy, poetry, and drama.

The writers' process was one of creation mostly within the Representational Environment. In general, the Representational Environment provides particularly a good space for constructing new ideas. The writers were challenged by their own writing when faced with having to map it to Agent Stories' unique set of structural restrictions. The result is that they created stories that were personally meaningful to them. This tool helped them work through new ideas with story (like consistent first person POV and narrative linking) because the tool is designed to help them engage with those ideas.

It is not a casual statement to say that the writers *played* with Agent Stories. I watched each writer struggle a little at first with the concepts. Then, as they became more familiar with the tool and asked me questions, there would always be an *Ah-ha!* moment – a moment when suddenly everything in the mind shifted and a lot all at once became clear about the tool and how they can write with it. After that moment, I watched all of the writers sit staring at the screen, absolutely still, except for two parts of their body, 1) their fingers, flying over the keyboard typing their story, and 2) their faces, with a big smile. The writers would sometimes sit for as much as an hour just staring at the screen and typing as fast as they could. They were completely engaged in the process of writing, and if the Agent Stories tool was in a more robust state, it would have been much more difficult to remove them from the system.[25]

[25] This point was underscored when, upon ending their sessions, a couple of the writers thanked me before I could thank them. I was not sure who was providing the service.

There is some indication that the writers liked playing with the first-person writing. First person is not a form many of the writers used on their own. It forced these writers to see the world through other people's eyes in order to write. Agent Stories served as a tool which allowed them to do something which was valuable to them – which facilitated their engagement. Also, due to the first person POV, there was something personal or res-

onant in the writers. Kids engaged in building projects in microworlds could put themselves into the project because the tool allowed them to express their identity, which also encouraged them to stretch intellectually. Agent Stories, while not specifically a kids' tool, encouraged these adult writers to stretch intellectually by placing themselves (their identity) into the mind of another.

5.2.3 Designer Evaluation

There were a number of things learned through the Agent Stories experience. First, that the creation/creative process is a powerful thing. Even with the Writer Feedback Environment not fully functional, the writers' creative process functioned fine with the level of feedback they were already getting through the overall structure of the system and the user interface. By providing a clear structure and direction in which to write, no matter how unusual, writers blossom.

It was also learned that the creative process is a sensitive thing. Writers like to have what they are used to or else their creativity in hampered. It is not enough to provide new and interesting tools. The new and interesting have to be accompanied with a certain level of familiarity and comfort. Requesting a spell checker and thesaurus are perfect examples of amenities that are no longer extraordinary, but necessary.

It was surprising how naming a story clip held so much meaning for the various writers. More than one of them commented to me that naming the clip was either difficult or challenging in an unexpected way. The naming process helped cause the writers to see their work differently – they were more thoughtful about what they were writing, and from whose perspective the writing was from.

The client-server architecture which Agent Stories uses is not a trivial configuration to maintain. Agent Stories was never meant to be a multi-user system, yet in the end was used by three people at the same time. This unexpected usage ended up bogging down the system and making it at time difficult for some of the writers to work effectively. As this software continues to be developed, a more robust client-server model will need to be addressed.

6 Stories

So it is very deep to be a writer. It is the deepest thing I know. And I think, if not this, nothing—it will be my way in the world for the rest of my life. I have to remember this again and again

- From Natalie Goldberg WRITING DOWN THE BONES, 1986

6.1 Crossing the Street

6.1.1 Introduction

CROSSING THE STREET is a collection of first-person stories I wrote in 1994 for the Agent Stories prototype. Since the prototype had less functionality than the latest version of the tool, the stories written for the prototype had a simpler structure. *CROSSING THE STREET* began with the stories of Anne and Michael, two adults recounting a date they had when they were teenagers, each one remembering the events in their own way, with different details. This parallel structure is often called "He said - she said" for obvious reasons.

In wanting to expand these two stories, I wrote a third segment from the POV of another character, The Cab Driver, whose story crosses those of Anne and Michael. Once the third story was complete, the collection was expanded further into the theme of journeys. I wanted to address what it is like to take a journey—a short one, like across the street, or a long one, like across an ocean. Two more stories were written—The Little Girl and The Waitress. The story of The Little Girl addresses the issue of what it is like to take a journey

across an ocean to another culture, where one does not speak the language. The story is about a young woman recounting the time when she and her family immigrated to the United States from Russia when she was 10, and when she got lost in the train station during her first day. The story of The Waitress addresses the issue of what it is like to decide to leave one's home on a long journey. In the story, a woman recounts the time when, at the age of 19, she deeply longed to leave her dead end waitressing job in her home town, for a life of her own far away. All she needed was a catalyst, an inspirerer, to get her moving.

These stories are included in this document because they are a good example of how *NOT* to write metalinear stories. In fact, they are not metalinear stories. *CROSSING THE STREET* is a collection of *multilinear* stories. Each story has a strong linear plot line. Events within each story are in a particular order, and would not make sense if they are rearranged. Parts of the stories can be excluded, but not resequenced. The job of the story engine in this situation is to switch back and forth between the plotlines at appropriate times. Multilinear cinematic narrative development tools continue to be an active area of research. Heidi Gitelman of the MIT Media Lab is working in this area, for instance.[26] The goal of Agent Stories from the beginning, however, was to achieve create metalinear cinematic narratives. The stories were represented simply, with each granule having only one narrative primitive and one link. Because of this simple representation, the Agent Stories prototype was able to produce a multilinear result with two characters. As more characters were added to the database, the results became less desirable.

26 See: http://www.media.mit.edu/~heidi/

Four of the five stories written were shot in video, digitized, and added to the prototype's database for playback. The Cab Driver was the only one that was not shot. Anne and Michael's stories are included here in their entirety. For the remaining stories for brevity

sake, only the speaker introduction, character introduction, first conflict and first resolution are included.

6.1.2 Michael

Introduction [SPEAKER INTRO]

Some people have asked me how I got this cut on my arm. They think it must have been quite an accident to have left such a large scar. So when they say that, I tell them the story about crossing the street.

Just walking down the street [CHARACTER INTRO]

I was about 17 years old and was walking downtown in Philadelphia on a balmy summer afternoon with my first serious girlfriend Anne. We had been going together for about a day. And boy she was cute, with a thin little body, a bright smile, and such gentle hands. Anyways, we were walking along Broad Street right before rush hour. The traffic was just starting to build and people from the office buildings were just starting to leave for home. I had my left arm around Anne's waist, which I remember felt so good - like it always belonged there, and I had my right hand on to my most prized possession, my bike.

Fire hydrant [CONFLICT]

So Anne was on one side and the bike was on the other, when Anne gets excited seeing this department store window across the street and insists on taking closer look. Well everybody J-walks in Philly, so Anne abruptly turned to cross the street in mid-block and we did this graceful tandem couples move toward the curb. But I'm paying so much attention to Anne that I almost don't see this fire hydrant right in front of me.

Call me Gene [RESOLUTION]

And see – you've got to understand that I was walking down the street with my girl on my arm. I had to be cool! So I do this little Gene Kelly side step maneuver and my shin just barely misses the hydrant, one arm still around Anne, and the other hand still guiding the bike. I'm

Fig. 32 Michael describing the scar on his arm. Michael was played by the author.

not letting go of either. Though the peddle of my bike wasn't quite as nimble and it slammed into the hydrant. But anyway...

Targeted in the middle of the street [CONFLICT]

We got out into the street and, checking the oncoming traffic situation, we saw that the cars up at the corner had the red light, so crossing the first 3 lanes of traffic should be a cinch. So I figured I'd use this opportunity to say something sweet to Anne. So I said, "Yeah, you'd look good in that bathing suit." And she said, "No - not the bathing suite. The pants outfit, dummy." Just then I heard a screech of tires and looked over to see a car which had turned onto Broad street at top speed and was headed straight for us.

Pushed her along [RESOLUTION]:

The car was clearly going to hit us too, I mean, there was no question about it. But I had to be cool, ya know. I mean, Anne and I had been serious for about twenty four hours, already a personal best for me, and I sorta wanted to see what forty eight hours felt like. But I was cool. I said, "Oh that outfit! Yeah, let's get over there fast and take a look," pressing on her back a little. So we rush over to the traffic island with that car just missing us and the back wheel of my bike – the Jerk! I don't think Anne even noticed the car.

Fig. 33 Michael describing Philadelphia potholes.

Philadelphia potholes [DIVERSION]

Oh, did I mention the pothole? There was this pothole in the middle of the street the size of Newark. And it had these little shiny sharp things in the bottom, just waiting to eat my bike tires. I think the city's streets department puts them there to thwart bicyclers from not polluting. I don't know.

Tripped on something [CONFLICT]

There must have been something sticking out of the cement on the traffic island, because as soon as I hopped up with Anne and the bike, I tripped and started stumbling really bad. But like I'm not letting go of my girl nor my bike, so we stumbled off the traffic island and into the second three traffic lanes. I guess I was a little too heavy for Anne because it didn't seem like she was able to hold me up very well – we just kept going more and more out of control,

careening across the asphalt. But not fast enough because as I struggled to get my composure, I noticed this great wall of Buick front grills heading right toward me... uh, us.

Shoe laces [DIVERSION]

Oh, did I mention my shoelaces? Once I starting stumbling I noticed that my shoelaces were untied. How did my shoelaces get untied?!

Anne twists her ankle [CONFLICT]

So I'm struggling to control the bike, I'm struggling to control my feet, I'm trying to keep my hand where it belonged, they're these cars heading right for us, at which time Anne yells out real loud, "OUCH!" Apparently as we stumbled, she twisted her ankle or something. So now she's no longer holding me up, and I'm trying to pull myself up by my bike, which had by this time started to veer off to the right—and there's still this little matter of Buick grills baring down on us—Buicks with Philadelphia drivers, who will run you down and never look back.

Made it across [RESOLUTION]:

I tell you, when we made it across, that sidewalk never looked so good. The front wheel of the bike bounced hard against the curb, then swung around and slammed into a pole. At that point I had to let go of it. But I didn't let go of Anne. I stepped up onto the curb with sort of a limping Fred Astaire move, and pulled Anne around in a sort of a sweeping ballroom dip, and then up toward me just as graceful as you please. But, I guess Anne was still a little freaked because as I pulled her up, she reached out and grabbed my arm like a diving eagle grabs for trout. The nails on those gentle hands of her's dug into my arm and I just stood there, stunned, in pain, but smiling, and very cool.

Never dropped her [ENDING]

So to me, the important thing is that even though my bike laid sprawled on the sidewalk, with my arm bleeding from the manicured grip of death, I never dropped her. And that's how I got this scar.

6.1.3 Anne

I teach dance [SPEAKER INTRO]

I teach dance in a high school where every student has to take at least a half year of my class before they graduate. And sometimes I get these jock types who complain about having to take a dance class. So to help win them over, I tell them that dance is important if you want to learn to be coordinated, especially around women. They usually laugh and say, "yeah, right." And that's when I tell them my high school story of when I went out with an uncoordinated guy.

Fig. 34 Anne describing her date with a truly uncoordinated guy. Anne was played by Sara Elo.

Walking down town [CHARACTER INTRO]

I had started going out with this guy Michael during the summer before my senior year of high school. In school I remember that Michael was smart and kind of fun to talk to, but once summer vacation started, we had to look around for things to do together. So the day after we started going out, we met down town to spend some time together. Michael had his bike with him for some reason, he always had that bike with him – I didn't know why. That day my mom had given me money to buy a new summer outfit, so I was also on the look out for something nice, something cool – because in Philadelphia, where I grew up, it gets really hot and sticky in the summer.

Walks into a hydrant [CONFLICT]

As we walked along looking in shop windows, I see this outfit in a window across the street that looked perfect. It was very light fabric and open in the back. I mean it was exactly what I was looking for. So I point it out to Michael and turned toward the curb to J-walk across the street – everybody J-walks in Philly. That's when Michael nearly walks right into a fire hydrant.

Think nothing of it [RESOLUTION]:

So I should think nothing of it, right? I mean, even though he nearly knocks me down getting out of the way, I'm thinking it's just an honest mistake. It's alright, it could happen to anybody.

Pushing me [CONFLICT]

So we step off the curb and start to cross this fairly wide street – just the three of us: me, Michael, and his bike – when he points out a two piece bathing suite in the store window next to the one we were going to. Yeah right, like he really expected me to go try on a bikini while on a date – uh huh. And that's about when I started to notice his hand on my back. I mean, he had had his arm around my waist all along, but once we were in the street, it was like he was pushing me – as if he was uncomfortable with the idea of crossing. So I'm thinking: is he afraid of cars? Is this too many lanes of traffic for him to cope with? Has he only recently stopped holding his mommy's hand when crossing? It's not a pretty picture I'm getting.

Let it slide [RESOLUTION]:

So I decided to walk a little faster toward the street's center traffic island, since that seemed to be what he wanted. Then I thought, well, maybe I'm being a little hasty in judging him. I mean we had only just started going out, so it seemed a bit early in the relationship for me to be making judgements. Maybe he was nervous about dating, I don't know. I know I was a little nervous. So I let it slide and hurried along.

A little unusual [DIVERSION]

Now keep in mind that I hadn't gone out on dates a lot of when I was in high school, so at the time I didn't have much to compare this experience to. But already I was getting the impression that this was becoming a little unusual.

Trips on traffic island [CONFLICT]

When we got to the traffic island, twinkle toes hops up onto the curb and trips – I don't know on what. I didn't see anything. Looking back on it, I'd say that he probably tripped over a cigarette butt, he was that uncoordinated, but who knows. Whatever it was, it put him completely out of control. Worst of all, he was hanging on me, and it was not romantic. The guy could no longer walk upright, so he started using me as a cane, as we both went stumbling off the other side of the traffic island and back into the street. Now I was wearing my favorite rayon blouse. I was worried that by clutching on to me to regain his footing, he

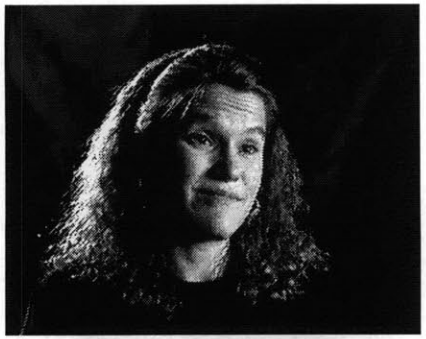


Fig. 35 Anne reliving the entire episode.

was going to tear the blouse. Well, that was one of my worries. My other worry was that if he did tear my favorite blouse, in the middle of the street, right in the middle of downtown, I would have to kill him! And I didn't think that killing my date while crossing the street was the proper way to start off the summer. And darn it, I looked down and saw that the blouse starting to go.

His shoe laces [DIVERSION]

Oh, did I mention his shoelaces? When I looked down to see what he could possibly be tripping over, I saw that his shoelaces where BOTH untied. How can a guy leave his house, ride his bike a couple of miles, and then walk down the street with both shoelaces untied?

Ankle goes out [CONFLICT]

So we're in the middle of the street, Michael's hanging on me and starting to rip my blouse, his bike is wobbling all over the place, so he's trying to control his bike at the same time that he's trying to control his feet, I have no idea if there are cars coming or not, and all of a sudden my ankle goes out from under me. I must have let out quite a loud scream of pain because... I think I scared him. I was scared too. Because now I was trying to get across the street by hopping on one foot, with him hanging on me and my blouse about to go.

Pulled myself up [RESOLUTION]:

When we make it across the street, his bike goes flying off onto the curb. So he let go of the bike, but he was still hanging on to me. By that time, I couldn't even hop anymore, let alone walk – and I was sure that I was going to fall on my butt on the hard sidewalk, and that Michael was going to come crashing down on top of me. But at the last second before I hit the ground, he yanked me about half way up and I did what came natural – I reached out and grabbed his arm as hard as I could and pulled myself the rest of the way up. Meanwhile, he just stood there with this stupid look on his face.

Why I teach dance [ENDING]

You can well imagine that our relationship didn't go much further after that day. I decided to set my sights on guys that could successfully walk upright, even on a bad day. And from

then on I have always felt strongly that if guys could learn to dance even a little, then perhaps they could also learn to walk. And that's why I teach dance in high school.

6.1.4 The Cab Driver

See it all [SPEAKER INTRO]

I've been a Philadelphia cab driver for about ten years now. I've seen crooked politicians come and go, I've seen housing problems, unemployment problems, education problems—I've seen it all. But the one problem that never goes away is drugs. Drugs are everywhere, man—I mean it's terrible! To show you how bad it is, I'll tell you this one story of something that happened to me a long time ago, when I first started driving a cab.

Nervous fare [CHARACTER INTRO]

It was in the afternoon in the summertime. I had just picked up a fare downtown, going over to city hall. It was only about a mile or so, so I knew that I wasn't going get rich off this guy, even though he was dressed real nice, ya know? He had on an expensive lookin' suit, handkerchief in the breast pocket, matched his tie—like that. So I figured this guy was some sort of city hall big shot, ya know? So he hops in, and before I can say, "Where to?" he says, "City hall—fast! I'm in a hurry." So I don't say nothin', I just pull out into the lane. Now traffic's getting pretty heavy by this time and I'm looking all over; side view mirror, rear view mirror, over my shoulder, what ever. And in the rear view mirror I see this guy is lookin' kinda nervous—like he can't keep still. So I think nothing of it, ya know. To each his own, dig? I got my fuzzy dice hanging from the mirror, I got Tito Puenté low on the radio, I'm rocking out, hittin' the gas, thinking maybe at city hall I could get one of those big wig fares out to the burbs. I'm cool.

He pulls out this bag [CONFLICT]

Suddenly, the traffic gets thick, man. I don't know what happened—it just came out of nowhere. And that's when this guy starts getting really nervous. He starts babbling—talkin' about how he can't be late for this interview and this is his last chance and stuff. Like that, right? So I tell him I'm going as fast as I can, but I can't go through these cars. I mean, what do you want me to do? Meanwhile, he's still squirming around back there, and that's when I

noticed that he pulled out a little bag of something and a straw, and was about to take a big snort. In my cab—in my cab, this guy was going to do drugs.

I could be a cop [RESOLUTION]:

Now what was I supposed to do? I was just a young punk driver—hadn't been on the streets three months, and this guy was putting my butt on the line. 'Cause if we got caught, you know the only person going to jail would be me. Yeah, man. Anglos got the cash and always walk free. But me—a cop sees a Puerto Rican and they just know he's guilty. No question. So I had to tell this guy, "Look man, I'll take you to city hall, but I can't be going to jail 'cause of you. I need this job, man." Then he tells me, "Nobody's going to get caught," with his head down and that straw up his nose. And that's when I told him, "Man, there are cops everywhere. This is Philadelphia! Hell, I could be a cop." His head snapped up and he looked at me. He put that bag away, though.

6.1.5 The Waitress

Those eyes [SPEAKER INTRO]

My daughter Falice is growing up so fast. She's really becoming quite the independent and self assured young woman. It's just wonderful to see, especially in a teenager, you know? But she gets so much of that from her father. There's a lot of him in her—you can just see it. In fact, when I look into Falice's eyes, I can see the eyes of her father the very first time I looked into them some fifteen years ago. Those eyes.

Fig. 36 The Waitress describing the day she had to decide - stay or go. The Waitress was played by Maureen Costello.

Dead end job [CHARACTER INTRO]

It was June back in Philly—the kind of hot and muggy summer day when everybody's sticky, irritable, and half the people on the street wanted to punch the lights out of the other half. That summer I was working behind the counter at Doug's Diner on Broad street. It was one of those dead end jobs a person takes right after high school, ya know, when you're not going to college and you have no idea what you're doing next. And I had absolutely no idea. I didn't know whether to leave for a new life in some distant city or stay home and sign up for some meaningless community college courses. On that particular day, there were two

other girls working the counter with me in the late afternoon. We were taking turns babysitting the old crusty regulars who were nursing their coffees and shootin' the breeze.

Just quit Charlene [CONFLICT]

I remember that was a really bad day, ya know? I was this close to quitting my job. Doug, the owner, was a pig. Workin' around him made the days seem endless—god! There was this voice inside my head saying, "Just quit, Charlene. You don't need this damn job. Just tear off Doug's little candy ass costume right now and walk out."

To leave with means [RESOLUTION]:

But then the other voice inside me would pipe up and say, "Four-fifty an hour, Charlene—and you need the money. Just stick it out until you have a few hundred saved and then walk with money in your pocket." That's what I had always wanted to do: hit the road with means, ya know? No problems. Starting a new life scared me, but leaving with just two dollars in my pocket and a hope in my heart was ridiculous, you know what I'm sayin'? I wanted to run to something. I just didn't know what to or who with. I mean, I knew I wasn't going by myself. I needed someone I could trust to help me cut my umbilical cord. But who?

6.1.6 The Little Girl

Keeps on hitting you [SPEAKER INTRO]

Sometimes things happen to you that change your life, and then go on changing your life forever. In fact, you can feel them effect you every time you tell someone the story of the thing that happened. Understand? It's like, it hits you once and then keeps hitting you for the rest of your life. I had one of these kind of things happen to me when I was small.

Cab to the train station [CHARACTER INTRO]

My father is a scientist. And through some miracle, he was allowed to get our family out of Russia and to America when I was ten years old. After so many planes, we landed in Philadelphia late one evening and spent the night at the house of a friend of my father. The next morning we took a cab to the train station to finish the trip to our new home in Pittsburgh. I was so amazed at all the new things I saw through the cab window. And

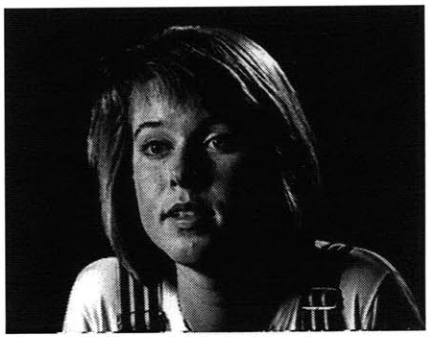


Fig. 37 The Little Girl, now a woman, recounts her story of landing in America and getting lost in the crowds of the train station. The part was played by Natalia Tsarkova.

different—lots of things different. For one thing, there aren't as many cars in the small town where I come from. And I remember that the cab driver was so funny. He made me laugh, even though at the time I understood little of what he was saying. But I do remember these two big fuzzy dice hanging from the rear view mirror. He talked all the time that he drove, and the dice just swung back and forth, waving at me. My parents, I remember, where really very tired of traveling. So was I.

Don't you move [CONFLICT]

When we got into the train station, there was a long line at the ticket counter. I remember wanting to look at everything in the station. The station was big and old fashioned, with a ceiling that went up like a cathedral, and all this open space with people scurrying around like ants. After a while in line, I got tired of just standing there, so my mother sat me down on a bench near the ticket counter. "Now don't you move *(IN RUSSIAN)*," she said. "Stay right here and don't talk to anybody. I don't need you lost in a strange city." So I sat there on the bench like a good little girl, my white dress shoes dangling over the gray floor tiles. I tried to sit still—I really did—but it was hard. I was dying to get up and see how far I could slide across the shiny floor in my good shoes.

Quite a team [DIVERSION]

My parents stood in line together because in America, my mother and father always talk to people together. My father, you see, speaks English—and very well. My mother doesn't speak any English, nor has she ever wanted to learn. She's always said there was no need. "I speak body language," she would to say. "I know what people are **really** saying." So my father would talk to people with words, while my mother would watch what they said with their eyes, their hands, and their bodies. Together they make quite a team.

6.2 Case Study Stories

6.2.1 Introduction

The work from each of the writers discussed in chapter 5 are included here as an example of what was written in the current version of Agent Stories. Here on paper, it is difficult to get the true flavor of a dynamic graphical writing tool. Yet each writer's work is included here in the state in which it was left. None of the writers felt as if they finished their stories. All of them could have used more time in composing, shaping, and linking their clips. Metalinear narrative, however, is never fully finished. The writer must have freedom to rethink, revise, and evolve their work. The stories included here are merely the beginnings of an evolutionary process which would stretch long beyond the bounds of this research effort.

6.2.2 Glorianna

Mom

What is she saying (NO PRIMTYPE)

Mom bends down and picks up the corner of the burlap trying to straighten it. She vaguely realizes that her daughter is getting angry. She does not know why. "I only want to help. I want to be part of this adventure. I feel like I am too slow. No one wants to wait and do things with me, not only the children."

Amy

Enters azalea bed [NEGOTIATION]

"I have arrived, truck and all. What shall I do? Mom that tree looks beautiful."

Amy

Walks down to Azalea bed [CHARACTER INTRO]

Amy hears Mom and Susie tussling over something even before she can see the two figures in the Azalea bed

Susie

Rejection [NEGOTIATION]

"No, no, I can do this easily. Just stay where you are." Susie swallows her aggravation. "I will get you a new plant in a minute." She attempts to speak more soothingly.

Mom

Mom Intro [SPEAKER INTRO]

"What" says Mom, struggling up from where she was sitting, pruning an azalea bush. "Here, I can help you with that."

Amy

Rents the U Haul (NO PRIMTYPE)

"Is that my truck out there?" Amy remembers asking the person behind the counter. The rest of the morning had not gone well. The first truck she was given sounded like a submachine gun. She waited in the sun, while the owner went to pickup another truck. Finally, she entered the drive way, maneuvered the tight space between the wall and the garage, and went to join the 2 workers down in the azalea bed.

Evan Drives

Title (NO PRIMTYPE)

(no StoryClip)

Susie

Remembers Mom walking down [SPEAKER INTRO,CONFLICT]

Susie remembers mom holding on to the rope rail, feeling her way down the hill. She wanted to hold her frustration in but she needed to give a clear sign. "Mom," she felt she was shouting but that was the only way mom would hear. "Mom, please stand back; I will get you a new plant in a moment"

susie

Susie intro [SPEAKER INTRO]

Susie sits by an azalea bush, looks over at Mom lovingly and laughs: "It will unfold" she says quietly, as if under her breath

6.2.3 Raelinda

Cory

Intro: Yep, I'm a ghost [SPEAKER INTRO]

Yep, I'm a ghost. I'm ectoplasmic. I sleep late every morning but I don't rest in peace. My two main problems are one: being harassed by new age baby boomers on an out of body field trip going, "Walk into the light!" Hey, loser, YOU walk into the light. I'm not leaving this earthly plain until I see all 9 episodes of Star Wars. My second problem? Oh, yeah. I seem to have amnesia. I can't remember who I was before I died. Cory

Simon

Conflict: I want to be a bird [CHARACTER INTRO,CONFLICT]

I want to be a bird. I spend my afternoons at Au Bon Pain in Harvard Square watching the little sparrows hop about my table eating the crumbs from my croissant.

Cory

Environment: Cory's After life [CHARACTER INTRO]

What's the after life like, you ask? Well, it's ok I guess. There are two types of dead people. The ones who are just passing through and the ones

Cory

Conflict: Amnesia [CONFLICT]

I cannot remember who I was before I died. I can't remember how I died. I am a being without memories. I exist entirely as a personality.

Cory

Environment: time [CHARACTER INTRO]

Time moves in a funny kind of way here.
Once you go into the light time still exists. But that's all it does. It's just one big happy NOW. But in m around. You could be hanging out in tomorrow and suddenly it starts raining yesterdays. You just never know. The tides of time.

Cove

Intro: I want to be a ghost [SPEAKER INTRO]

I am an angel. I blew into time like a dandelion seed. My job is to witness events and then forget them unconditionally. Pure forgiveness. I am the way that events leave this universe. I wanna be cool like those ghosts who hang out in the cafes. I'm tired of wearing white.

Simon

Intro: I feel like a ghost [SPEAKER INTRO]

...bitter and nibbling on croissants that are too sweet.

Simon

Conflict: Why isn't life like a book? [CONFLICT]

Why isn't life like a book? The beauty of books: time is so malleable. You can make it move backwards, forwards. You can make it slow down, stop. A reader of a book is the omnipotent observer of a micro universe. I have the power to dwell on a single paragraph. I have the power to flip right to the last page. They have the power to make notes in the margins of reality itself.

Cove

Environment: The world [CHARACTER INTRO]

Moving through time is a lot like sailing. You can move pretty fast going along with the flow of it. But you can move even faster through a memory, traveling against the grain of it. Only in time do memories exist. Memories cannot exist where all is now. Only in memories can books happen.

Cory

negotiation: enlist an angel to write a book [NEGOTIATION]

If I could find out who I was, I would know what to do next. Angels know everything. But they don't know how to know what they know. how to unwind it into time and see. It's all a bunch of meaningless now to them. If I could find an angel and teach it how to write, I might be able to get it to write about me.

Cove

Conflict: It's hard to find souls in the flow of time [CONFLICT,ENDING]

I would like to find out where people keep their souls. I only understand what is happening now. People live in what just happened and what is about to happen. The NOW of mortal life is deserted. It is a ghost town.
That is why books are so often mistaken for souls.

Simon

Conflict: Afraid that if I reenter the flow of time I will cease to exist [CONFLICT]

I can only be myself when I'm doing nothing. When all is still. The moment I start doing things I stop being myself and become what I am doing. I can only be myself when I am living in the now. The moment I reenter the flow of time I will cease to exist.

Cory

Conflict: Afraid that if I leave the flow of time I will cease to exist [CONFLICT]

All that I have left of myself is my personality. I am a series of reactions to a series of events. There can be no events without time. Without events there can be no me.

The book

Simon [DIVERSION]

The flow of events was building up outside the cafe doors like a great storm. Time was going to come into the cafe. I reached out my hand as if to gesture, 'stop'. And one of the cafe sparrows flitted out of my blind spot and into the air in front of me. I turned up my hand and the little creature landed on my palm. It jerked it's head up suddenly so that it was looking directly into my eyes, and then it simply died. Time crashed into the café through the door and carried it's spirit away. The little thing gave it's life to save me from time. I look down and there on the table is a book. I place the bird in my empty coffee cup and pick up the book. It falls open to a story about a meadow.

The book

Cory [DIVERSION]

[text lost...] from one country to the next, cast from the branches of the strange, swaying trees that thumped across the worlds and rooted themselves around the lands, casting shadows from shore to shore. The flakey, buttery fruit of these great trees.

I lived a longtime, a long stretch of life. And then one day I landed in the outstretched branch of a tree. I could feel the tree's heartbeat pounding through it's veins. I could feel the great

breath of the tree gusting through it's trunk. I stared into the two eyes of this great tree. I stared into it's eyes for one thousand years. And then my own

The book

Cove [DIVERSION]

Cory, the ghost, asked me to write a story about her. She said, just relax your golden thoughts and write whatever comes to you, whatever you start ternoon souls. Cory is sitting at a table next to a man who is not a ghost, although time is rather sticky around him, like taffy.

She is wearing a gown that is made of feathers. Her eyes dart back and forth from the man to a book he is reading. She says, will you stop reading for just one lifetime?

He says, I want to be a vessel for stories. I want to pour myself full of stories. You know that's what I want.

She says, the life of a bird is so short it's almost like punctuation. Last time around I was a meadow. That sounds so boring unless you stick a bird after it. Then it's, last time around I was a meadow!

He says, uh huh. She says, talk to me Cyemoon.

He says, I want to be a vessel for souls. People are rarely themselves [text lost...]

6.2.4 John

Alex

The bathroom wants Che Guevara [SPEAKER INTRO]

Most cultures have, throughout history, had some process for dealing with those people who stepped too far outside the bounds of reality. In at least some of these cultures, they were considered sacred. Seers. God speakers. Lakota medicine men and seekers would prepare for weeks for their vision as they began their journey would be there to support them upon their return.

Nowadays, it can get pricey to walk in the places off the edge of the sidewalk where the streetlights don't reach. I haven't left the house in three weeks now. But it's taken me this

long to really come to terms with how strange that night was. You see, it all started when I realized that the bathroom wanted Che Guevara.

Michelle

Dorm Room [SPEAKER INTRO,CHARACTER INTRO]

I'm not a person that believes in ghosts. I'm not. My life has been too perfect to believe in death, much less the existence of life afterwards. Oh sure, I've had people I know die, but nothing, I don't know...immediate, I guess. My parents are alive, both grandparents. I lost a pet once, but I don't think that counts. That's what made this whole thing so weird. After last night...I have no choice but to believe that world makes less sense than we think it does. And in my own way, I'm glad.

Alex

Exposition [CHARACTER INTRO]

It sounds strange I know, and until recently, I'd be the last person to argue with you about it at all. I'm a stockbroker for gods sake, or at least I was. My world made sense. I could add it up, count it, and at the end of the week, everything happened pretty much as I expected. And y'know what? I liked it that way. Nowadays I'm walking through a world that makes just a little less sense, a little bit less explainable.

Michelle

Why the poster [CHARACTER INTRO,DIVERSION]

I don't know why I like the poster. I just do. I'm not a radical. What little time I spent with the causes upon arriving here made me wonder if there was a third group that would let me protest what I was protesting while simultaneously picketing the big mouths and huge egos that were protesting what I was protesting. Um...does that make sense? I don't know, but it does to me. I'm still doing stuff, but with people who take themselves a little less seriously and I'm happier. Still, I leave Che up. Somehow, the face, those eyes, he makes me feel.....protected I guess. I know it sounds crazy, it does to me too. Or it did. Now I don't know.

Alex

The Other rooms RESOLUTION

The other rooms of the house are quieter, but there's still traces. The living room wants a leather recliner. The kitchen should have a single print hanging on the pine paneling of a ship in distress at sea. The library wants a small ball of jade, carved with smaller concentric balls growing ever smaller into it's center, of all things. If I think about it, I can even feel the way my thumb would slip in the small fracture that must have occurred when someone dropped it. I don't know. I've never seen a ball like the one I described. For that matter, I've never seen the recliner or the ship print either. They're just things the rooms seemed to want. When I moved in, I chalked it up to the insanity of moving bringing on a bout of bad taste, ignored it and moved on.

But every time I used the bathroom, I realized it wanted Che Guevara.

Tammi

Michelle is different [SPEAKER INTRO,CHARACTER INTRO]

She's so different now and nobody really knows why. She used to spend so much time out, bouncing, having fun. She was a real party girl which is weird because we all thought she was such a hippie when she moved in. Have you seen that room? We figured she'd be one of those types, y'know the kind that never shave their legs and eat that tofu stuff? But everyone loved her, especially the boys if you know what I mean? If I could have some of those men sniffing after me like they did around her I wouldn't be this boy here, let me tell you! <nudges Mirin, her perfectly normal but obviously not up-to-snuff boyfriend>

Michelle

I've been staying in more lately [SPEAKER INTRO]

I've been staying in more lately, and I know the girls on the floor are starting to wonder. They've been sweet about it actually, but really, nothing that bad really happened to me, and I wouldn't tell them about it in any case. It's like trying to describe a dream, or worse, a drug experience. Internally, it was fascinating and I feel different for it, but to share it with someone....it sounds like the Twilight Zone. So I'm staying in and I'm kind of enjoying it. In

some ways I'm glad; it's an excuse to pull back I didn't even realize I wanted. I never liked the party scene much, never wanted to drink, smoke, and rub up against a drunk foretop every Friday night, but somehow that's the kind of role I fell into. It's amazing what a single scream will do to break you out of your old patterns isn't it?

Tammi

What happened that night [CHARACTER INTRO]

We all FREAKED OUT when she screamed, omy god it was so loud. And when we saw A.J. come streaking out of her dorm room, naked and bleeding we knew why. He must have gotten a little too fresh if you know what I mean? Michelles a little slip of thing, not like me, but she must have gotten a boost of that stuff, y'know, adrenaline or whatever. 'Cause he's in a world of hurt, let me tell you. He was still in the hospital for the Spring Formal.

Michelle

Describing AJ [CHARACTER INTRO]

AJ was my sort of boyfriend, in that I usually spent at least some of my time with him on the weekends. To say that AJ was often drunk was an understatement, or at least a missing of the fundamental point of the description, rather like saying "the fish was often wet". He and I dated a little bit, and he was kind of sweet early on. He could really dance which is something you can't get most boys to do, scared of it, like they're going to be called fags as soon as they loosen up their tight asses. AJ was so big that no one dared even suggest it so now and then I could actually dance with a guy. You overlook a lot for that. He was also good in bed, which I'm loathe to admit, you also overlook a lot for. He wasn't my first lover, but he was the first that really....released me? Made me let go, let me scream out what I was feeling and to hell with the 60 people on the floor and the paper-thin walls. I didn't love him, but until that night, he wasn't the worst person I'd ever known. Sometimes that's enough.

Alex

I Don't know who she is. [CHARACTER INTRO]

Realization that this was more than a bad taste lapse came really slowly and in small ways. I'd wake up in the morning, groggy, still half blind, that state where you're still not sure the

world is really there and you're not dreaming. and find that the bathroom smelled of stale beer. Little things like that. Or late at night, stumbling to the toilet I'd catch a whiff of incense or a taste of feminine perfume no woman I knew wore. And always, the feeling that the bathroom was fundamentally lacking something, that it was incomplete, that underneath the black and white tile and the Krohn fixtures, there would be that soulful gaze staring out at me past death.

Eventually, I began to hear her, just a little. Small noises. The scratch of a pencil. A laugh. I admit somewhat shamefully that I spent far longer than I should have one evening listening for another hint of her sighs, either from herself or a lover, I was never able to tell. She could have been anyone, or anywhere.

Alex

Describing AJ [CHARACTER INTRO,CONFLICT,ENDING]

Then there's that night, the evening that things crossed over from weird to capital W Weird. This had been going on for weeks at that point and I'd gotten used to it, almost enjoyed it. I didn't know her name, but the little touches she added to my life were....rather like having a roommate while living alone. I'd wander into the bathroom and suddenly catch the scent of Ramen Noodles, or on a Sunday morning have the tactile sensation of sleeping on flannel sheets washed too many times but not recently. Small things they made the house feel less empty.

One thing I did discover, and didn't like, was that she had a boyfriend. Or rather, I didn't like the boyfriend. At all. His spoor would occasionally pass through whatever membrane separated us and he smelled like trouble, the sour smell of old beer and a well practiced backhand that made me nervous deep in the animal hindbrain. He was somehow wrong and after his existence became apparent, I would leave the bathroom when the sensory evidence suggested they were making love. I only hoped she would figure it out and dump the loser before she had to do it the hard way.

Alex

Lying to myself [DIVERSION,RESOLUTION]

And even that last is something of a lie to myself. I really became more than fond of her, I began to care. And that was really the start of the downhill slide. I never became obsessive about her, never tried to figure out where or who she might be. I didn't want to know. But the boyfriend was trouble, I knew it even then, and in my own way I felt a protective instinct to pull her away from him. And that, perhaps, is why that night happened the way it did.

Michelle

What Happened that night: Prologue [CHARACTER INTRO]

the window was open, the semester was ending and I felt pretty good. I'd made it through a year. I'd managed to fit.

I was drinking tea and reading when he finally showed up.

Tammi

Describing AJ [CHARACTER INTRO]

The weirdest thing was, no one could believe that AJ would do something like that. I mean,....he's sooo cute! And smart too! He's majoring in business and there's some kind of thing his dad does that involves getting other people to sell stuff for you and AJ thinks that he'll be a millionaire before he's forty if he's lucky and he doesn't fail out 'cause he's on academic probation this quarter. I was like, "No way!"

Alex

WHTN, prologue [CHARACTER INTRO]

I came home that night in the worst possible mood. I don't remember why. Maybe it was traffic, or something at work, or just the shaking off of the hibernation of a long gray New England winter. I'm miserable when I get into these type of moods. I'm a bear to live with and my friends and lovers, bless them, know it so that night I came home alone.

Walking into the bathroom for aspirin was like walking through a cool wall of mist on a hot summers day. The room felt.....right. Like someone was happy, smiling behind me, that they'd be sitting there if I turned around. I could smell the warm steam of tea, the soft breeze of a spring wind even though the window was painted shut and I couldn't open it if I wanted to. It felt good.

Michelle

What Happened that Night [CHARACTER INTRO,CONFLICT]

AJ came in really drunk. He'd been at a trashcan party on the third floor and he was in that bizarre stage where everything seems much more funny, important, sexy, to you than everyone else in the world. He'd already vomited once and he smelled pretty bad. I tried to get him seated and pulled my trash can out from under the desk so I'd be prepared for any "accidents" that might happen. But he really didn't seem that bad. Yes, he was drunk. AJ was always drunk. I wasn't worried.

Alex

What Happened that Night [CONFLICT]

I could feel the shift in the room when the boyfriend arrived, a subtle change in the way the air moved, the disappearance of everything that had made it pleasant the moment before. He was drunk and dangerous. I could feel it, the subtle dropping of an emotional barometer that suggests the sky is going to bust wide open any second and heading for safe harbor is your only chance. "Get him out of the room and lock the door, darlin'" I said aloud, hoping that whatever barrier that had so strangely linked out lives would, for once work both ways. I was scared for her, but my anger was building too, something I couldn't define or explain. Possessiveness, Love, delusion? I didn't know then and I don't know now. All I could do was sit and "watch" as the event unfolded to an inevitable conclusion.

Michelle

WHTN II [CHARACTER INTRO]

He pulled me towards him and started fondling me, and that's when things started to get uncomfortable. As I said before, AJ is a big guy. He'd never treated me like a china doll but

he'd always at least been gentle. Tonight it hurt. I pulled away and suggested he might be too drunk but he kept coming...kept pushing his slimy tongue into my ear, slurring at me in his foul breath how sexy I was. I pushed at him, lightly at first, then harder. I was being quiet; I didn't want the whole dorm knowing what was going on. But he kept coming and coming until I pulled back and slapped him hard across the face.

His face screwed up and got redder than I'd ever seen it and that's when he hit me.

Michelle

Ending [RESOLUTION,ENDING]

I never did press charges against AJ, although perhaps I should have. There wasn't any evidence, and ultimately he didn't have time to do anything before.....whatever it was that happened happened. And since he failed out this semester anyway, he won't be returning in the fall.

How do I feel? Like Pandora, except I didn't want to know what was in the box. I can't explain what happened that night. I'm not sure I want to. But the world is a more interesting place than I supposed and I can't help but look around corners and underneath toadstools for other bits of magic that might be skipping around through the Goblin Universe. I bought some flowers this morning, as much to cheer me up as to cover the lingering scent of AJ's vomit which still lingers outside the hall despite a bunch of attempts to get rid of it. It smells wonderful in here and the sun is shining through my window, lighting the poster of Che on the far wall. I'm moving out in a couple of weeks, heading back home to Rhode Island, but I'll definitely be taking it with me. It's not much of a talisman, but something happened that night, and you've got to play the odds in experiences like that. Che is as good a guardian angel as any.

Alex

WHTN Hit [CHARACTER INTRO,CONFLICT]

When he hit her, I exploded. I don't know what happened then, but everything that was so hazy before, small hints, things sighted out of the corner of my eye were suddenly in clear

sharp focus. I could see the room, the tiny little cube in which she lived. I could see her, young, younger than I'd expected, curly blond hair, a few extra freshman pounds. She was sprawled back against the bed, holding the side of her face which was swelling. She was weeping. And standing over her I could see him, wavering drunkly, reaching out to touch her again. And that's when I snapped. What I could see I could effect. I remember moving towards the kid in a red haze. I remember yelling at the top of my lungs. I woke up the next morning a mass of aches and pains like a bar fight gone horribly wrong, although there wasn't a bruise on my body. It took nearly two hours with my hands in ice for the sensation of swelling to go down, although they were unbroken, and completely free of any evidence of violence. I still don't know if I killed the little prick. I hope I didn't, but there's no real way for me to know.

Michelle

WHTN Hit [CONFLICT]

I was against the bed, holding my face, trying to cover myself if he tried to hit me again, when I realized that the noise behind me was louder than it should have been and AJ was yelling at the top of his lungs. I turned and he was slamming himself around the room, against the wall....into Che. Or it seemed that way. Looking back, it was as if someone was beating him badly. Someone he couldn't touch, couldn't see. And neither could I. It was over mercifully quick, and he slumped over on his side whimpering. In the logic of crisis, I used the last of my own strength to haul him out of the room leaving him slumped over on his side on the hall carpet, where he promptly vomited. I felt my face and felt my anger rise. Despite my own fear and the Israelite of the moment, I brought my foot back and kicked him squarely, as hard as I could in the testicles. Then I darted back into the room, locked the door behind me, and fell into a deep, dreamless sleep until the pain in my face work me the next morning.

Alex

Ending [DIVERSION,ENDING]

I think a lot about that evening. It's getting towards May now and she'll be leaving soon, not graduating, but maybe moving on. The poster will be taken down certainly. Oh yes, I now know why the bathroom wanted Che; the poster hung proudly on her wall, although it took

some abuse during my rampage. Will taking it down remove the link between us? I don't know, although I hope not. For a time there was a bit of strangeness and charm in my life, a subconscious pen pal that I'll miss, even though we never spoke. I know she came out the other side of our brush with the bizarre okay. This morning, flossing my teeth, I caught a wisp of her laughter. Raising the water glass, filled with tepid tap water in toast, I wish her well, the scents of spring air and honeysuckle fresh in my nose.

6.2.5 Teresa

eye

tender light anew [CHARACTER INTRO]

as a girl watch umbilical tender light anew. Galapagos. Mediterranean. sister in half light, kneel where stones cut. Sensation. continent of ligament notions we storybook inter. Apse. of the cornea kneel where stones cut. Dusk. palatial interstice half hold vision. as a girl watch umbilical tender light anew.

cage of the thorax

I am crying

conflict

any roses. I am crying. Fall. I am crying absence the turn of banisters counter clockwise. listen listen the turn of fathers. clock. a backwards communion. measure and breath. counter clockwise insurrection. vegetal elevation. a trance we cannot write for fear of missing. birth. amnesiatic fluid. a plateau of oxygen heavy. discover.

spine

respiration spiral [CHARACTER INTRO]

accumulation. of suns situated above the orbit of the eye. a cellular revolution unsupervised and unsolicited. respiration. spiral of horizon crossings. he holds a mirror to

his mouth and finds no sign of. accumulation. a sonic barrier. the sudden aerodynamic drag as breath approaches

sound.

vertebrae

innermost whorl [CHARACTER INTRO]

blue is not the sound of harvest. blue unsound. spiral fluid trace a breath that does not come. breath come. breath carpenter, carriage maker, calyx. a cup like animal structure. build blue stamens supraspinal. articulation the vertebrae between themselves. cup like structures in a seed plant comprising the innermost whorl. spiral sound. articulation, the vertebrae between themselves trace. a harvest that knows no dusk or dawn a harvest of seed plant comprising the innermost whorl.

synapses

when constellations weep [NEGOTIATION]

triosome axial sym etris town send sah sah sah sahling shirosote selingual celestial agape tantalize wrist seal luck in happy hector rant harmonic inhale telic vibral rest i tution wheel of rosebud sellnic reed desire gnosis navel knell ostrich doctor deal an egg case heart hold heal week-kneed spine cry I can't do this anymore I can't do this anymore. celestial rant the ear escape bright flight we near terrestrial gates.

trespass pattern of the supple truth shafts refract distant beckons archaic when tissue forgives solar meander through veins a plenty, channel castings seed the ear.

trespass pattern sutralingual locks a plenty place the mind impasse break tide a plenty plaints that print insist on every cell. stitch forgiveness under dermal scent.

flood flood flesh a beckons mediatrix please convey terror to its rightful breast, archaic stars sink my pain and I shall hear your flight.

lacuna

absence chasm [NEGOTIATION]

lacuna dura dura. lopsided meeting place heal the seven. atonements capsize injurious governance. dura, dura dura lacuna. claws drag the ice. regardless I send water. water drag injurious place. water drag injurious place. dura, dura dura lacuna. before we go under Papa. before.

ilium and ischium

transmission [RESOLUTION]

a heaviness and tickle on the temple brow and ear drum. a dog licking his belly. listening breath. unfinished claws tapping the sinus. unfinished sneeze from two years back. fear. erasing on the page and two brushes with the back of the hand. a scream that rips all the drapes from their axes. gravity. and grievance descending a univalve stairwell. the spleen slowly filling up with blame. erasure. two brushes with the back of the hand. sleep and a barely perceptible pulse. the head slowly nodding on its stem. a garden and no time to tend that which will decay. decalogue. a transmission of semen and stamen. narrative. and field mice that gnaw on the edge of this bulkhead.

the heart

you don't listen (NO PRIMTYPE)

stay, stay, stay, stay, stay, stay, stay, stay...see we're beating again. you forget and then I can't move 'til the door cracks and splinter. if only you'd remember me we wouldn't come to violence.

ear drum

echo [CONFLICT]

a ladder upon which the cranium aches. ask her what she cannot hear. tonight the words climb up and in. subaqueous memory fills the drum the ear has broken once again. ask me what I cannot see. a backward glance will tear the spine. and send the heart each time

anew. subvocal grievance desert valley know my name this is the last. echo of my burning sands within this empty drum.

uterus phonograph

press [CHARACTER INTRO]

uterus phonograph she

closes the floor of the drum

shake

our sun

when the needle begs

one

revolution

promise to break

lips that return when

light

takes the ear

there is no press save pulse

amnesia

wake the pyre

diversion

heliophyte overturn treason

a stunted grain waits her suns

demise

aperture of profligate order

pharahos turn to glass

one silicate heart cracks

dispensation

her hours

tributary

amnesia

wake

the pyre

the throat

aubade

negotiation

I tell to no one continually.

I do not tell I beg.

I beg I tell I tell I beg.

I can no longer beg I can no longer tell.

head rush let this be the aubade.

when we call grievance enthroated.

the call is the collapse is the call.

when a spine discerns summer in rage song.

and the heart turns this clock asunder.

heart quake

I can stay softer now

ending

softer now we don't want to scare them the rattle of saucers. door shut shake in the heart. won't be back she's gone out to tend tundras. deep interwhirl of. good-bye, I can't stay for tea the sun is crossing and my shadow is gaunt. it's time to tend absence my home now the door shuts and silent the echo. she crosses my valley floor. floor of the heart quake she crosses railway ties hold railway heart beat the ground my gate to rest beating home of. good-bye tell tell it when sundown tell tundras my heart now. absence, echo, hello I can stay, softer now.

6.2.6 Ian

Sid Braun

Waking up [SPEAKER INTRO,CONFLICT]

(no StoryClip)

Sid Braun

Happening [CHARACTER INTRO,NEGOTIATION]

I toss a buck into the collection plate and I'm blasted with this music that makes no sense; it's like a dead channel. I must be getting old because I never had that problem with jazz before no matter how out the cats would blow, my friend the poet is saying something about bubble gum and drummers that makes no sense to me. That little altercation with Louie must have him shell shocked; he must be throwing all the musicians off too.

Sid Braun

Happening.a (NO PRIMTYPE)

The detective hears the poet speaking over the drummer's riffs. The bassist and the guitarist occasionally comp along, implying the song structure ah. The band takes five. I climb up the warped wooden stairs, grabbing onto the handrail as I stumble, my hunger must have made me dizzy, so dizzy that I don't even remember grabbing for the handrail. I guess my reflexes aren't completely shot; I don't have to think to save my neck. I thank a couple of billion years of evolution for that. I toss a buck into the collection plate and I'm blasted with this music that makes no sense; it's like a dead channel. I must ubble gum and drummers that makes

no sense to me. That little altercation with Louie must have him shell shocked; he must be throwing all the musicial. I must have taken a beating.

I climb up the warped wooden stairs, grabbing onto the handrail as I stumble, my hunger must have made me dizzy, so dizzy that I don't even remember grabbing for the handrail. I guess my reflexes aren't completely shot; I don't have to think to save my neck. I thank a couple of billion years of evolution for that. I toss a buck into the collection plate and I'm blasted with this music that makes no sense; it's like a dead channel. I must bubble gum and drummers that makes no sense to me. That little altercation with Louie must have him shell shocked; he must be throwing all the musicians off too.

After they're all done with their set he walks up to me, guess he's glad that I made it to his gig. He's saying something about my hat,. I must have taken a beating. I climb up the warped wooden stairs, grabbing onto the handrail as I stumble, my hunger must have made me dizzy, so dizzy that I don't even remember grabbing for the handrail. I guess my reflexes aren't completely shot; I don't have to think to save my neck. I thank a couple of billion years of evolution for that. I toss a buck into the collection plate and I'm blasted with this music that makes no sense; it's like a dead channel. I must be getting old because I never had that problem with jazz before no matter how out the cats would blow, my friend the poet is saying something about bubble gum and drummers that makes no sense to me. That little altercation with Louie must have him shell shocked; he must be throwing all the musicians off too.

After they're all done with their set he walks up to me, guess he's glad that I made it to his gig. He's saying something about my hat,. I must have taken a beating.

Tapper Joe

Description of the drummer (NO PRIMTYPE)

I am up on the stage with the mic in my hand and I am staring straight into the eyes of the drummer and shout out, "Be-bop bubble gum bubble blowing snare drum rolling stick pounding jester blows time into a sweet pink expanding sphere," because that is what he is

and that is what he does. The horns and the guitar come back in on the head and I say, "My friends, we're gonna take a break here and bebopin' at y'all inna bit or a byte."

Tapper Joe

Hello, Sid (NO PRIMTYPE)

As I get off the stage I notice Sid Braun. I'm glad to see my hero, my amigo, he's saved this dude's ass not that long ago. So without him I'd be a shade of my current self. He hasn't been returning my mail lately though. "My man, what's with that wrap under your cap?" and he's like slippin' his fingers under his fedora and looks at me going, "What are you talking about?" and I say "Man, the bandage. Somebody hit you since I last I had the pleasure?"

Tapper Joe

Wrap under the cap (NO PRIMTYPE)

"What bandage?" he barks, and he reaches under his hat again with his other hat and suddenly his expression changes.

Sid Braun

Bandage? (NO PRIMTYPE)

After they're all done with their set Joe walks up to me, guess he's glad that I made it to his gig. He's saying something about my hat,. I must have taken a beating.

Sid Braun

Art Space Staircase (NO PRIMTYPE)

I climb up the warped wooden stairs, grabbing onto the handrail as I stumble, my hunger must have made me dizzy, so dizzy that I don't even remember grabbing for the handrail. I guess my reflexes aren't completely shot; I don't have to think to save my neck. I thank a couple of billion years of evolution for that.

Sid Braun

Checking Messages [CHARACTER INTRO,NEGOTIATION]

Must have slept all through the day. It's night. Don't know when was the last time I saw the sun. I look at the footlocker that serves as a coffee table when my futon is folded into a sofa. My bip is bleeping; I've got mail. I put on my private-eyes which are sitting on the footlocker and check my messages. Looks like I haven't logged on in many moons. Strange, I think, I'm always checking my mail could I have been out for that long? You know that you've got a healthcare crisis when you're being discharged and dropped off at your space before you even regain consciousness.

Sid Braun

grunts and sighs (NO PRIMTYPE)

Sid Braun grunts and sighs as if awaking from a long but unpleasant slumber.

Sid Braun

Joe's Invitation [CHARACTER INTRO]

In my state I don't feel like dealing with most of the messages I see listed on my private eyes, but there's one from Tapper Joe. Tapper Joe is a poet, a sweet guy who was in trouble not too long ago. It was a pleasure to help him out. He's one of those special types whom I'll help as a public service– not that he has the money to hire me out anyway. My name is Sid Braun, and my computer interface is a pun on my profession.

Joe apparently invited me and forty something of his closest friends to attend a loft party where's he's reading with some jazz musicians. It's only a few blocks away.

Sid Braun

waffles (NO PRIMTYPE)

w days. I head to the freezer and pull out a box of waffles that I have lying around in case of an emergency. Given the number of emergencies I have, I should buy stock in the waffle company.

Sid Braun

Blp Bleeping **(no PrimType)**

Braun's computer pager beeps, telling him that he has email. He starts humming "Mr. Postman."

Sid Braun

stumbling on the steps [NEGOTIATION]

Braun stomps up the old wooden staircase, the pace of the steps sound regular at first but suddenly the two feet sound out of sync. and he can be heard to stumble, muttering "woah!" before regaining his balance and continuing up the stairs with a regular rhythm.

Sid Braun

Shower (NO PRIMTYPE)

(no StoryClip)

7 Conclusions

And then the miracle happens. The sun comes up again. So you get up and do your morning things, and one thing leads to another, and eventually, at nine, you find yourself back at the desk, staring blankly at the pages you filled yesterday. And there on page four is a paragraph with all sorts of life in it, smells and sounds and voices and colors and even a moment of dialogue that makes you say to yourself, very, very, softly, "Hmmm."

- From Anne Lamott, BIRD BY BIRD, 1994

7.1 Thesis Statement

In this document I have addressed issues of the changing media technology landscape and the way in which society has gained new perspective on the world through these media. This new media technology also includes the development of computer technology, the globalization of computer networks, and the emerging new medium which is an amalgam of television and the internet. The storyteller will need to invent new creative processes and work with new tools which support this new medium, this new narrative form. *Metalinear narrative* is the name proposed by this research for this new narrative form. The metalinear narrative is a collection of small related story pieces designed to be arranged in many different ways, to tell many different linear stories from different points of view, with the aid of a *story engine* which sequences the story pieces.

Metalinear narrative has three primary components:

1) An abstract story structure composed of narrative primitives which a writer can manipulate and rearrange according to her creativity. The story structure provides the narrative framework, or spine, for the many linear narratives to be produced from the metalinear narrative
2) A representation of story granules to be resequenced in various ways. This representation incudes annotations of how each granule fits into the story structure and the narrative relationships between the story granules
3) Methods of resequencing story granules based on their representation and the provided abstract story structure. The story engine chooses granules which fit the story structure according to predetermined narrative styles

My thesis is that a writing tool which offers the author these three key elements, as well as knowledgeable feedback about narrative construction and context during the creative process, is essential to the task of creating metalinear narratives of significant dimension.

7.2 What Was Done

To prove the thesis, a software writing tool was developed which stores, represents and sequences metalinear stories. The process of using this tool was then observed as writers tested the software by creating metalinear stories.

The software writing tool, *Agent Stories*, consists of a set of five environment screens for authoring metalinear narratives. These environments are:

1) The Structural Environment, in which the structure of the narrative is described using abstract narrative primitives

2) The Representational Environment, in which knowledge of the various story elements is captured in the form of relationships between story granules or clips. In this environment, each story clip is also labeled as to how it can fit into the narrative structure defined in the Structural Environment
3) The Writer Feedback Environment, in which the writer is given feedback from Agent Stories on the constructability of the collection of story clips. The feedback is in the form of short textual descriptions of why each clip was chosen for its place in the story. This story clip sequencing is done through the implementation of software agents called *story agents*
4) The Presentational Environment, in which the story agents work as video editors, intelligently sequencing and orchestrating the different story elements according to a particular agent's individual stylistic preferences. The audience chooses which story agent to activate, thereby choosing the type of story they will receive.
5) The Agent Scripting Environment, which offers the writer an easy way of directing the narrative construction, by designing new story agents

The story agents act as the drivers of the story engine. While not story engines themselves, a story agent's unique parameter values determine how the story engine operates. Story agents select and sequence the story pieces, according to (a) a user specified abstract narrative structure, (b) the relationships between the story pieces, and (c) the unique parameter values of the story agents. The system supports the writer's thinking about and structuring a metalinear story by assembling simple narrative constructs during the rewrite process. Agent Stories is primarily intended for an author's use in the creation of metalinear multiple point of view textual stories, before the stories are realized as multimedia presentations using video, audio, and still pictures.

It is difficult to write a metalinear narrative, largely because it is difficult to break the deeply learned habits of linear narrative thinking. While the human brain is the most versatile tool for the job, it is difficult enough keeping all the narrative structures and details in one's head when the narrative is small and simple. When the narrative is large and complex, I maintain that the task is nearly impossible to accomplish without external tools. This is why a writing tool which can store the story details in a meaningful way, and which offers knowledgeable feedback about narrative construction and context during the creative process, is essential to the task of creating metalinear narratives of significant dimension.

7.3 How the Thesis was Proven

My hypothesis has been that with the appropriate tool, writers can successfully write in a form which departs from the strict single linear narrative, in favor of a form which will allow multiple reconstruction into many different linear narratives. This hypothesis was proven through the use of the software tool Agent Stories and an analysis of metalinear stories created with this tool by selected writers.

The writers I chose were predisposed to writing with a tool which allowed them to manage multiple voices in their stories. It also helped that they were not trying to achieve a standard linear result through Agent Stories, but instead wanted to experiment and be open to what they could discover as they wrote. The results were varied but overall positive.

Tools such as Agent Stories will support a changing world through metalinear narrative design. As our world becomes smaller, our need to communicate through a variety of

methods, with a variety of voices, increases. The stories we share, whether traditional, political, or personal, can increase our understanding and tolerance of each other. Tools such as Agent Stories can offer writers and readers the power shape and reshape our world. Metalinear narrative may make it easier for all of us, not just a few of us, to tell our stories.

Bibliography

Aarseth, Espen (1997). CYBERTEXT—PERSPECTIVES ON ERGODIC LITERATURE. Baltimore: Johns Hopkins University Press.

Altman, Robert (1994). SHORT CUTS. In Fine Line Features.

Anderson, John J. (1989, March). *Lippman on Interactivity.* MACUSER, p. 91–96.

Arijon, Daniel (1991). GRAMMAR OF THE FILM LANGUAGE. Los Angeles: Silman-James Press.

Atwood, J. W. Jr., Burnett, M. M. , Walpole, R. A. , Wilcox, E. M. , & Yang, S. (1996). *Steering Programs via Time Travel.* In IEEE SYMPOSIUM ON VISUAL LANGUAGES, Boulder, Colorado: IEEE.

Baird, Freedom (1997). THE UN/REAL DUET—INTIMACY & AGENCY THROUGH INTERACTION WITH A VIRTUAL CHARACTER. MS, MIT Media Laboratory.

Baker, Augusta, & Greene, Ellin (1977). STORYTELLING ART AND TECHNIQUE (1st ed.). New York & London: R. R. Bowker Company.

Bal, Mieke (1980). NARRATOLOGY—INTRODUCTION TO THE THEORY OF NARRATIVE (Christine van Boheemen, Trans.). (1 ed.). Toronto: University of Toronto Press.

Bamberger, Jeanne, & Schön, Donald A. (1982). LEARNING AS REFLECTIVE CONVERSATION WITH MATERIALS: NOTES FROM WORK IN PROGRESS No. WP-17). Department of Urban Studies and Planning, and the Division for Study and Research in Education, MIT.

Bates, Joseph (1992). *Virtual Reality, Art, and Entertainment.* PRESENCE: THE JOURNAL OF TELEOPERATORS AND VIRTUAL ENVIRONMENTS, 1(1), 133–138.

Bazin, Andre (1971). WHAT IS CINEMA (Hugh Gray, Trans.). Berkeley: University of California Press.

Berry, Jack (1991). WEST AFRICAN FOLK TALES (Jack Berry, Trans.). (2nd ed.). Evanston, Illinois: Northwestern University Press.

Bettelheim, Bruno (1976). THE USES OF ENCHANTMENT (2ND ED.). New York: Vintage Books.

Bloch, Gilles R. (1987). From Concepts to Film Sequences No. Yale University Department of Computer Science.

Blumberg, Bruce (1994). Action-Selection in Hamsterdam: Lessons from Ethology (paper No. MIT Media Laboratory.

Blumberg, Bruce (1996). Old Tricks, New Dogs: Ethology and Interactive Creatures. Ph.D., MIT Media Lab.

Bolter, J. David (1991). Writing Space: The Computer, Hypertext, and the History of Writing. Hillsdale, N.J.: L. Erlbaum Associates.

Bolter, Jay David, Joyce, Michael, Smith, John, & Bernstein, Mark (1992). Storyspace. In Cambridge, MA: Eastgate Systems.

Bordwell, David (1985). Narration in the Fiction Film. Madison, Wis.: University of Wisconsin Press.

Bordwell, David (1989). Making Meaning—Inference and Rhetoric in the Interpretation of Cinema. Cambridge, Massachusetts and London, England: Harvard University Press.

Bordwell, David (1994). Understanding Filmic Understanding. (pp. 29). University of Wisconsin - Madison:

Borges, Jorge Luis (1962). Ficciones (Anthony Kerrigan, Trans.). New York: Grove Press.

Borges, Jorge Luis (1964). Labyrinths; Selected stories & other writings (Augmented ed.). New York: New Directions Publishing Corp.

Borges, Jorge Luis (1967). A Personal Anthology. New York: Grove Press.

Brachman, Ronald J., & Levesque, Hector J. (Ed.). (1985). Readings in Knowledge Representation. Los Altos, California: M. Kaufmann Publishers.

Branigan, Edward (1984). Point of View in the Cinema. Berlin: Mouton Publishers.

Branigan, Edward (1992). Narrative Comprehension and Film. New York, New York: Routledge.

Brightfield, Richard (1984). The Curse of Batterslea Hall. Toronto: Bantam Books.

Bringsjord, Selmer (1998, March/April 1998). *Chess Is Too Easy.* MIT's Technology Review, p. 23–28.

Britton, Bruce K., & Pellegrini, A. D. (Ed.). (1990). NARRATIVE THOUGHT AND NARRATIVE LANGUAGE. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Brooks, Kevin (1994). A COMPUTATIONAL STRUCTURE OF "JOURNEY HOME" (paper No. MIT Media Laboratory.

Brooks, Kevin (1995). *Agent Stories.* In AAAI SPRING SYMPOSIUM SERIES—INTERACTIVE STORY SYSTEMS: PLOT AND CHARACTER, (pp. 19–22). Stanford University: American Association for Artificial Intelligence.

Brooks, Kevin M. (1996). *Do Story Agents Use Rocking Chairs? The Theory and Implementation of One Model for Computational Narrative.* In W. Hall & T. D. C. Little (Ed.), ACM MULTIMEDIA '96, (pp. 317–328). Boston, MA: The Association of Computing Machinery, Inc.

Brooks, Kevin M. (1997). *Programming Narrative.* In IEEE VISUAL LANGUAGES '97. Capri, Italy: IEEE.

Brooks, Rodney (1990). *Elephants Don't Play Chess.* ROBOTICS AND AUTONOMOUS SYSTEMS, 6, 3–15.

Bruckman, Amy (1990). THE COMBINATORICS OF STORYTELLING: MYSTERY TRAIN INTERACTIVE No. Interactive Cinema Group internal paper). MIT Media Lab.

Bruner, Jerome (1986). ACTUAL MINDS, POSSIBLE WORLDS. Cambridge, MA & London, England: Harvard University Press.

Burch, Noël (1981). THEORY OF FILM PRACTICE (Helen R. Lane, Trans.). (3 ed.). Princeton, New Jersey: Princeton University Press.

Bush, Vannevar (1945). *As We May Think.* ATLANTIC MONTHLY (JULY), 101–108.

Campbell, Joseph (1949). THE HERO WITH A THOUSAND FACES. New York: Pantheon Books.

Carr, David (1986). TIME, NARRATIVE, AND HISTORY (1 ed.). Bloomington: Indiana University Press.

Chatman, Seymour (1978). STORY AND DISCOURSE—NARRATIVE STRUCTURE IN FICTION AND FILM (1 ed.). Ithaca and London: Cornell University Press.

Chatman, Seymour (1981). *What Novels Can Do That Films Can't (and Vice Versa).* In W. J. T. Mitchell (Eds.), ON NARRATIVE (chap. Chicago: The University of Chicago Press.

Chatman, Seymour (1990). COMING TO TERMS—THE RHETORIC OF NARRATIVE IN FICTION AND FILM. Ithaca: Cornell University Press.

Clarkson, Atelia, & Cross, Gilbert B. (1980). World Folktales—A scribner Resource Collection. New York: Charles Scribner's Sons.

Colby, Kenneth Mark (1964). *Programming a Computer Model of Neurosis.* Journal of Mathematical Psychology, *1*, 405–417.

Colby, Kenneth Mark (1975). Artificial Paranoia—a computer simulation of paranoid processes (1 ed.). New York: Pergamon Press Inc.

Courlander, Harold (1975). A Treasury of African Folklore. New York: Crown Publishers.

Cremers, Anna Helena Maria (1996). Reference to Objects: An empirically based study of task-oriented dialogues. Ph.D., Technical University of Eindhoven.

Dancyger, Ken (1993). The Technique of Film and Video Editing. Boston: Focal Press.

Dancyger, Ken, & Rush, Jeff (1995). Alternative Scriptwriting (2 ed.). Boston: Focal Press.

Darnton, Robert (1984). The Great Cat Massacre and Other Episodes in French Cultural History. New York: Basic Books.

Davenport, Glorianna (1987). New *Orleans in Transition, 1983–1986: The Interactive Delivery of a Cinematic Case Study.* In W. E. Eder (Ed.), The International Congress for Design and Planning Theory, Education Group Conference Proceedings. Boston: The American Society of Mechanical Engineers.

Davenport, Glorianna (1994). *Bridging Across Content and Tools.* Computer Graphics, *28*(1), 31–32.

Davenport, Glorianna (1996). *Indexes Are "Out," Models Are "In".* IEEE MultiMedia, pp. 10–15.

Davenport, Glorianna (1997). *The Care and Feeding of Users.* IEEE MultiMedia, pp. 8–11.

Davenport, Glorianna, Aguierre-Smith, Thomas, & Pincever, Natalio (1991). *Cinematic Primitives for Multimedia.* IEEE Computer Graphics & Applications, 67–74.

Davenport, Glorianna, Evans, Ryan, & Halliday, Mark (1993). *Orchestrating Digital Micromovies.* Leonardo, *26*(4), 283–288.

Davenport, Glorianna, & Friedlander, Larry (1995). *Interactive Transformational Environments: Wheel of LIfe.* In Contextual Media: Multimedia and Interpretation (pp. 1–25). (chap. Cambridge, MA: MIT Press.

Davenport, Glorianna, & Murtaugh, Michael (1995). *ConText—Toward the Evolving Documentary.* In ACM MULTIMEDIA '95, (pp. 381–389). San Francisco: ACM.

Davis, Harley Evan (1987). VIEWS: MULTIPLE PERSPECTIVES AND STRUCTURED OBJECTS IN A KNOWLEDGE REPRESENTATION LANGUAGE. Bachelor and Master of Science, Electrical Engineering and Computer Science, Massachusetts Institute of Technology.

Davis, Randall, Shrobe, Howard, & Szolovits, Peter (1993, Spring). What is Knowledge Representation? AI MAGAZINE, p. 17–33.

Dyer, Michael G. (1983). *Understanding Stories Through Morals and Remindings.* In A. Bundy (Ed.), INTERNATIONAL JOINT CONFERENCE ON ARTIFICIAL INTELLIGENCE, 1 (pp. 615). Karlsruhe, West Germany: William Kaufman, Inc.

Eastgate Systems, Inc. (1996). STORYSPACE. In Cambridge, Massachusetts: Eastgate Systems.

Epel, Naomi (Ed.). (1993). WRITER'S DREAMING. New York: Vintage Books.

Evans, Ryan (1994). LOG BOY MEETS FILTER GIRL: A TOOL KIT FOR PERSONALIZABLE MOVIES. M.S., Massachusetts Institute of Technology.

Faulkner, William (1956). THE SOUND AND THE FURY. New York: Modern Library.

Field, Syd (1982). SCREENPLAY—THE FOUNDATIONS OF SCREENWRITING (2 ed.). New York: Delacorte Press.

Flower, Linda (1993). PROBLEM SOLVING STRATEGIES FOR WRITING (4th ed.). Fort Worth, Texas: Harcourt Brace College Publishers.

Foner, Leonard (1993). WHAT'S AN AGENT, ANYWAY? (Agents Memo No. 93-01). MIT Media Lab.

Forster, E. M. (1954). ASPECTS OF THE NOVEL. New York: Harcourt, Brace & World.

Galyean, Tinsley (1995). NARRATIVE GUIDANCE OF INTERACTIVITY. Ph.D, MIT Media Lab.

Goldberg, Natalie (1986). WRITING DOWN THE BONES. Boston: Shambhala.

Goldman-Segall, Ricki (1995). *Configurational Validity: A Proposal for Analyzing Ethnographic Multimedia Narratives.* JOURNAL OF EDUCATIONAL MULTIMEDIA AND HYPERMEDIA, 4(2), 163–183.

Green, Jeff (1994). MIDNIGHT STRANGER. In San Diego: Gazelle Technologies.

Greenwell, Mike (1988). KNOWLEDGE ENGINEERING FOR EXPERT SYSTEMS. Chichester: Ellis Horwood Limited.

Halliday, Mark (1993). DIGITAL CINEMA: AN ENVIRONMENT FOR MULTI-THREADED STORIES. M.S., Massachusetts Institute of Technology.

Hayes, John R., & Flower, Linda S. (1980). *Identifying the Organization of Writing Processes.* In L. W. Gregg & E. R. Steinberg (Eds.), COGNITIVE PROCESSES IN WRITING (pp. 3–30). (chap. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Hayes-Roth, Barbara, & van Gent, Robert (1997). *Story-Making with Improvisational Puppets.* In W. L. Johnson (Ed.), AUTONOMOUS AGENTS '97, (pp. 1–7). Marina Del Rey, California, USA: ACM Press.

Hedges, Inez (1991). BREAKING THE FRAME—FILM LANGUAGE AND THE EXPERIENCE OF LIMITS. Bloomington/Indianapolis: Indiana University Press.

Hooper, Paula K. (1996). *"They Have Their Own Thoughts" - A Story of Constructionist Learning in an Alternative African-Centered Community School.* In Y. Kafai & M. Resnick (Eds.), CONSTRUCTIONISM IN PRACTICE (pp. 241-253). (chap. Mahway, New Jersey: Lawrence Erlbaum Associates.

Hooper, Paula (1998) THEY HAVE THEIR OWN THOUGHTS - CHILDREN'S LEARNING OF COMPUTATIONAL IDEAS FROM A CULTURAL CONSTRUCTIONIST PERSPECTIVE. Ph.D., Massachusetts Institute of Technology.

Horton, Andrew (1994). WRITING THE CHARACTER-CENTERED SCREENPLAY. Berkeley, CA: University of California Press.

Houbart, Gilberte (1994). VIEWPOINTS ON DEMAND: TAILORING THE PRESENTATION OF OPINIONS IN VIDEO. M.S., MIT Media Lab.

Jarmusch, Jim (1989). MYSTERY TRAIN. In JVC Entertainment.

Joyce, Michael (1997). AFTERNOON. In Cambridge: Eastgate Systems.

Karmouch, Ahmed, & Emery, James (1996). A *Playback Model for Multimedia Documents.* IEEE MULTIMEDIA, 3(1), p.50–61.

Kelso, Margaret Thomas, Weyhrauch, Peter, & Bates, Joseph (1992). *Dramatic Presence.* PRESENCE, THE JOURNAL OF TELEOPERATORS AND VIRTUAL ENVIRONMENTS (December).

Kermode, Frank (1980). *Secrets of Narrative Sequence.* In W. J. T. Mitchell (Eds.), ON NARRATIVE (pp. 270). (chap. Chicago: University of

Chicago Press.

Klein, Sheldon, Aeschlimann, John F., Appelbaum, Matthew A., Balsiger, David F., Curtis, Elizabeth J., Foster, Mark, Kalish, S. David, Kamin, Scott J., Lee, Ying-Da, Price, Lynne A., & Salsieder, David F. (1974). *Modeling Propp and Lévi-Strauss in a Metasymbolic Simulation System.* In H. Jason & D. Segal (Eds.), PATTERNS IN ORAL LITERATURE (pp. 141–171). (chap. Chicago, Illinois: Aldine.

Kolodner, Janet L. (1993). CASE-BASED REASONING. San Mateo: Morgan Kaufmann.

Kroeber, Karl (1992). RETELLING/REREADING—THE FATE OF STORYTELLING IN MODERN TIMES. New Brunswick, New Jersey: Rutgers University Press.

Kurosawa, Akira (1951). RASHOMON. In A Daiei Production.

Lamott, Anne (1995). BIRD BY BIRD. New York: Anchor Books.

Landow, George (1992). HYPERTEXT: THE CONVERGENCE OF CONTEMPORARY CRITICAL THEORY AND TECHNOLOGY. Baltimore: The Johns Hopkins University Press.

Laurel, Brenda (Ed.). (1990). THE ART OF HUMAN-COMPUTER INTERFACE DESIGN. Reading, Massachusetts: Addison-Wesley.

Laurel, Brenda (1993). COMPUTERS AS THEATRE (2 ed.). Reading, Massachusetts: Addison-Wesley Publishing Company.

Lehnert, Wendy G., Dyer, Michael G., Johnson, Peter N., Yang, C. J., & Harley, Steve (1983). *BORIS—An Experiment in In-Depth Understanding of Narratives.* ARTIFICIAL INTELLIGENCE, 20(2), 15–62.

Lehrer, Richard (1993). *Authors of Knowledge: Patterns of Hypermedia Design.* In S. P. Lajoie & S. J. Derry (Eds.), COMPUTERS AS COGNITIVE TOOLS (chap. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Leitch, Thomas M. (1986). WHAT STORIES ARE—NARRATIVE THEORY AND INTERPRETATION. University Park: The Pennsylvania State University Press.

Lightman, Alan (1993). EINSTEIN'S DREAMS. New York: Warner Books.

Livo, Norma J., & Rietz, Sandra A. (1986). STORYTELLING—PROCESS & PRACTICE. Littleton, Colorado: Libraries Unlimited, Inc.

Lord, Albert B. (1960). THE SINGER OF TALES. Cambridge, MA: Harvard University Press.

Maes, Pattie (1989). *How to Do the Right Thing.* CONNECTION SCIENCE, 1(3), 291–323.

Maes, Pattie (1990). SITUATED AGENTS CAN HAVE GOALS. In pp. 43). Brussels, Belgium and Cambridge, MA: Vrije Universiteit Brussel and Massachusetts Institute of Technology.

Maes, Pattie (1992). BEHAVIOR-BASED ARTIFICIAL INTELLIGENCE. In SECOND ANIMAT CONFERENCE ON ADAPTIVE BEHAVIOR, (pp. 15). Hawaii:

Maes, Pattie (1994). MODELING ADAPTIVE AUTONOMOUS AGENTS. ARTIFICIAL LIFE JOURNAL, 1(Numbers 1 & 2).

Maes, Pattie, & Kozierok, oobyn (1993). *Learning Interface Agents.* In AAAI '93, (pp. 459–465). Washington, D.C.:

Mamet, David (1991). ON DIRECTING FILM. New York: Viking.

Martin, Rafe (1996). BETWEEN TELLER AND LISTENER: THE RECIPROCITY OF STORYTELLING. In C. L. Birch & M. A. Heckler (Eds.), WHO SAYS?—ESSAYS ON PIVOTAL ISSUES IN CONTEMPORARY STORYTELLING (pp. 141–154). (chap. Little Rock, Arkansas: August House, Publishers.

McKee, Robert (1993). STORY STRUCTURE. In ROBERT MCKEE'S STORY STRUCTURE, (pp. 37). New York, NY: Two Arts, Inc.

Miller, Randl, & Miller, Robyn (1993). MYST. In Broderbund.

Mitchell, W.J.T. (Ed.). (1981). ON NARRATIVE (2 ed.). Chicago: The University of Chicago Press.

Mohl, Robert (1982). COGNITIVE SPACE IN THE INTERACTIVE MOVIE MAP: AN INVESTIGATION OF SPATIAL LEARNING IN VIRTUAL ENVIRONMENTS. Ph.D., Massachusetts Institute of Technology.

Moulthrop, Stuart (1990). HYPERMEDIA • RECURSION • LITERATURE No. University of Texas at Austin.

Moulthrop, Stuart (1991). VICTORY GARDEN. In Cambridge, MA: Eastgate Systems.

Murray, Janet H. (1991). *Anatomy of a New Medium: Literary and Pedagogic Uses of Advanced Linguistic Computer Structures.* COMPUTERS AND THE HUMANITIES, 25, 1–14.

Murray, Janet H. (1997). HAMLET ON THE HOLODECK—THE FUTURE OF NARRATIVE IN CYBERSPACE. New York: The Free Press.

Murtaugh, Michael Luke (1996). THE AUTOMATIST STORYTELLING SYSTEM: PUTTING THE EDITOR'S KNOWLEDGE IN SOFTWARE. M.S., MIT.

Nelson, Theodor Holm (1987). LITERARY MACHINES. Available from the Author at P.O. Box 128, Swarthmore PA 19091.

Nelson, Victoria (1993). ON WRITER'S BLOCK—A NEW APPROACH TO CREATIVITY. Boston: Houghton Mifflin Company.

Niesz, Anthony J., & Holland, Norman (1984). INTERACTIVE FICTION. CRITICAL INQUIRY, *11*, 110–129.

Oren, Tim, Salomon, Gitta, Kreitman, Kristee, & Don, Abbe (1990). *Guides: Characterizing the Interface.* In B. Laurel (Eds.), THE ART OF HUMAN-COMPUTER INTERFACE DESIGN (pp. 367–381). (chap. Reading, Massachusetts: Addison-Wesley.

Papert, Seymour (1993). MINDSTORMS: CHILDREN, COMPUTERS, AND POWERFUL IDEAS (2 ed.). New York: Basic Books.

Pavic, Milorad (1988). DICTIONARY OF THE KHAZARS (Christina Pribicevic-Zoric, Trans.). New York: Alfred A. Knopf.

Pearson, Carol S. (1989). THE HERO WITHIN – SIX ARCHETYPES WE LIVE BY (2nd ed.). New York: HarperCollins Publishers.

Perlmutter, Martin (1982). MURDER, ANYONE? In Cincinnati, Ohio: Vidmax Inc.

Perlmutter, Martin (1983). MANY ROADS TO MURDER. In Cincinnati, Ohio: Vidmax Inc.

Piaget, Jean (1954). THE CONSTRUCTION OF REALITY IN THE CHILD. New York: Basic Books.

Propp, Vladimir (1968). MORPHOLOGY OF THE FOLKTALE (Laurence Scott, Trans.). (2 ed.). Austin, Texas: University of Texas Press.

Reisz, Karel, & Miller, Gavin (1968). THE TECHNIQUE OF FILM EDITING (2 ed.). New York: Hastings House.

Rhodes, Bradley, & Maes, Pattie (1995). *The Stage as a Character—Automatic Creation of Acts of God for Dramatic Effect.* In AAAI '95 SYMPOSIUM ON INTERACTIVE STORY SYSTEMS: PLOT AND CHARACTER. Stanford, CA: AAAI.

Ricoeur, Paul (1981). *Narrative Time.* In W. J. T. Mitchell (Eds.), ON NARRATIVE (pp. 270). (chap. Chicago: University of Chicago Press.

Rieger, Chuck (1985). An *Organization of Knowledge for Problem Solving and Language Comprehension.* In R. J. Brachman & H. J. Levesque (Eds.), READINGS IN KNOWLEDGE REPRESENTATION (pp. 487–507). (chap. San Mateo, California: Morgan Kaufmann Publishers, Inc.

Robinson, Richard, Cook, Devin, & Tanimoto, Steven (1995). *Programming Agents with Visual Rules.* In VISUAL PROGRAMMING LANGUAGES '97, (pp. 13–20). Germany: IEEE.

Roemer, Michael (1995). TELLING STORIES: POSTMODERNISM AND THE INVALIDATION OF TRADITIONAL NARRATIVE. Lanham, Maryland: Rowman & Littlefield Publishers, Inc.

Rosenberg, Jim (1996). *The Interactive Diagram Sentence: Hypertext as a Medium of Thought.* VISIBLE LANGUAGE, 30(2), 102–117.

Rousseau, Daniel, & Hayes-Roth, Barbara (1996). PERSONALITY IN SYNTHETIC AGENTS No. KSL 96-21). Knowledge Systems Laboratory, Stanford University.

Rousseau, Daniel, & Hayes-Roth, Barbara (1997). IMPROVISATIONAL SYNTHETIC ACTORS WITH FLEXIBLE PERSONALITIES No. KSL 97-10). Department of Computer Science, Sanford University.

Rubin, Benjamin (1989). CONSTRAINT BASED CINEMATIC EDITING. Master of Science in Visual Studies—Media Arts and Sciences Section, Massachusetts Institute of Technology.

Schank, Roger, Bareiss, Ray, Fano, Andrew, Osgood, Richard, & Ferguson, William (1992). AGENTS IN THE STORY ARCHIVE (Technical Report No. #27). Northwestern University.

Schank, Roger C., & Abelson, Robert P. (1977). SCRIPTS, PLANS, GOALS AND UNDERSTANDING -- AN INQUIRY INTO HUMAN KNOWLEDGE STRUCTURES. (1 ed.). Hillsdale, New Jersey: Lawrence Erlbaum Associates, Publishers.

Schank, Roger C., & Abelson, Robert P. (1995). *Knowledge and Memory: The Real Story.* In R. S. Wyer Jr. (Eds.), KNOWLEDGE AND MEMORY: THE REAL STORY—ADVANCES IN SOCIAL COGNITION (chap. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Screenplay-Systems (1994). DRAMATICA. In Burbank, California: Screenplay Systems.

Sharman, Jim (1975). THE ROCKY HORROR PICTURE SHOW. In 20th Century Fox.

Sharples, Mike, Hogg, David, Hutchison, Chris, Torrance, Steve, & Young, David (1989). COMPUTERS AND THOUGHT -- A PRACTICAL INTRODUCTION TO ARTIFICIAL INTELLIGENCE. Cambridge, Massachusetts and London, England: MIT Press.

Sherman, Eric (1988). DIRECTING THE FILM -- FILM DIRECTORS ON THEIR ART. Los Angeles: Acrobat Books.

Smith, Alexander McCall (1989). CHILDREN OF WAX—AFRICAN FOLK TALES. New York: Interlink Books.

Smith, Frank (1994). WRITING AND THE WRITER (2nd ed.). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Strohecker, Carol, Brooks, Kevin M., & Friedlander, Larry (1999). TIRED OF GIVING IN: AN EXPERIMENT IN NARRATIVE UNFOLDING (Technical Report No. TR99-16). MERL—A Mitsubishi Electric Research Laboratory.

Tarantino, Quentin (1994). PULP FICTION. In Miramax Films.

Tecuci, Gheorghe (1998). BUILDING INTELLIGENT AGENTS. San Diego, CA: Academic Press.

Tello, Ernest R. (1989). OBJECT ORIENTED PROGRAMMING FOR ARTIFICIAL INTELLIGENCE: A GUIDE TO TOOLS AND SYSTEM DESIGN (1 ed.). Reading, Massachusetts: Addison-Wesley Publishing Company, Inc.

Thompson, Roy (1993). GRAMMAR OF THE EDIT. Oxford, England: Focal Press.

Thompson, Stith (1955–58). MOTIF INDEX OF FOLK LITERATURE. Bloomington: Indiana University Press.

Thompson, Stith (1977). THE FOLKTALE. Berkeley, California: University of California Press.

Torrance, Mark, Thomas, Glyn V., & Robinson, Elizabeth J. (1996). *Finding Something to Write About: Strategic and Automatic Processes in Idea Generation.* In C. M. Levy & S. Ransdell (Eds.), THE SCIENCE OF WRITING: THEORIES, METHODS, INDIVIDUAL DIFFERENCES, AND APPLICATIONS (pp. 189–205). (chap. Mahwah, New Jersey: Lawrence Erbaum Associates.

Tsarkova, Natalia (1997). DYNAMIC COLLAGE—AN INTERFACE FOR DIGITAL STORIES. M.S., Massachusetts Institute of Technology—Media Laboratory.

Vogler, Christopher (1992). THE WRITER'S JOURNEY—MYTHIC STRUCTURE FOR STORYTELLERS & SCREENWRITERS. Studio City, CA: Michael Wiese Productions.

Wagner, Jane (1986). THE SEARCH FOR SIGNS OF INTELLIGENT LIFE IN THE UNIVERSE. New York: Harper & Row, Publishers.

Wallace, Martin (1986). RECENT THEORIES OF NARRATIVE. Ithaca: Cornell University Press.

Wavish, Peter, & Connah, David (1997). *Virtual Actors that can Perform Scripts and Improvise Roles.* In W. L. Johnson (Ed.), AUTONOMOUS

AGENTS '97, (pp. 317–322). Marina Del Rey, California, USA: ACM Press.

Way, Eileen Cornell (1991). KNOWLEDGE REPRESENTATION AND METAPHOR. Boston: Kluwer Academic Publishers.

Weitzman, Louis, & Wittenburg, Kent (1994). *Automatic Presentation of Multimedia Documents Using Relational Grammars.* In MULTIMEDIA 94, (pp. 443–451). San Francisco, CA, USA: ACM.

Weizenbaum, Joseph (1966). *ELIZA—A Computer Program For the Study of Natural Language Communication Between man and Machine.* COMMUNICATIONS OF THE ACM, 9(1), 36–45.

Weizenbaum, Joseph (1976). COMPUTER POWER AND HUMAN REASON. San Francisco: W. H. Freeman.

Wilson, George M. (1986). NARRATION IN LIGHT. Baltimore and London: The Johns Hopkins University Press.

Winograd, Terry, & Flores, Fernando (1986). UNDERSTANDING COMPUTERS AND COGNITION. Norwood, New Jersey: Ablex Publishing Corporation.

Zettl, Herbert (1990). SIGHT, SOUND, MOTION: APPLIED MEDIA AESTHETICS (2 ed.). Belmont, California: Wadsworth Pub. Co.

Zipes, Jack (1987). THE COMPLETE FAIRY TALES OF THE BROTHERS GRIMM (Jack Zipes, Trans.). Toronto: Bantam.

Zipes, Jack (1989). BEAUTY AND THE BEAST—AND OTHER CLASSIC FRENCH FAIRY TALES (Jack Zipes, Trans.). New York: Penguin Books.