

User Powered Games for Research

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ABSTRACT

This paper describes how user-generated content can be harnessed to create compelling games for research purposes. We show that by entrusting the complicated processes of asset creation and management to the players themselves, research based games can still allow for rich, deep and unique experiences - experiences that would be impossible to create manually under the typical time and resource constraints found in research projects. It is contended that “user power” as a game design element is especially powerful for use by researchers who are most likely working on their own or in small groups with limited budgets, and for whom the research objectives may be more important than the design of the game itself. The paper explores the recent history of applications that take advantage of user-generated content and discusses how these principles have been used to develop two user-powered games: Gophers and Familiars. The worlds created by the users of these games are explored and the strengths and weaknesses of using user-generated content to power games are discussed.

Categories and Subject Descriptors

K.8.0 [Games] H.1.2 [Human Factors]

General Terms

Design, Experimentation, Human Factors

Keywords

User generated content, Game design, Games Research

1. INTRODUCTION

For years, games have provided a rich and flexible platform for conducting academic research, especially within fields related to digital technology. The “Magic Circle” [29] of play exists separately from real-life and creates the ideal laboratory for the study of everything from Psychology to Artificial Intelligence. Use of games in user trials is particularly advantageous, as they can be used to masquerade peculiar academic research concepts with something they that is much more familiar and perhaps more approachable for participants. As a result, these games are perhaps more likely to engage users and retain their interest through the

duration of a trial. However - the design of games in academic work is primarily driven by the research aims of the study. Through measuring how users interact with these games, through ethnography for instance, successful academic games allow researchers to explore and reveal answers to one or more research questions.

1.1 Games for Research

A common aim is the exploration of *new and emerging technologies*, which may have entered the consumer or research market, and a proof of concept is developed to explore the possibilities and technological boundaries associated with such technology. Examples include the investigations of RFID technology for user interactions in PAC-LAN [26], the use of GPS for real-time location tracking in CatchBob [22] and the use of pervasive Bluetooth technologies for presence sensing in Insectopia [24]. The role games can play in creating engaging *performance arts* experiences is another direction of research. For example the art group Blast Theory have been involved with the design of several research games (Uncle Roy [4], Day of the Figurines [13]) that are as much about the impact of the games as art as they are about “serious” games research. Other notable areas of research to which these games have made contributions include the study of human factors such as psychology and human-computer interaction [10] and related areas of *computer science research* such as CSCW and ubiquitous computing. Since the primary design constraints are normally determined by the research question at hand, this means gameplay design and the creation of in-game content is often treated as a secondary concern: -

Limitations in Gameplay. This is particularly evident where the choice is made to “re-imagine” old games - an old board game (e.g. [21]) or retro arcade game ([7], [26]) that is recreated with a twist around a research concept. While research games built on existing designs may still be perfectly fun it is rooted heavily on novelty value of playing a familiar game in a new way. The trials of these games have a tendency to be short, or require staff and complicated resources to set up, moderate and manage. The experience of the players is therefore limited to the “honeymoon” period and the game never gets to stand on its own merits. There is perhaps a missed opportunity to explore new opportunities for sustainable games that have great designs of their own.

Limitations in Content. Whatever the area of research, researchers who create games are likely to be severely limited in access to resources, whether this is time, technology, access to staff, support or a combination thereof.

Research games tend to be developed by individuals or very small groups of researchers who may have only limited experience in developing games and the different skills required by the process.

This is in stark contrast to the experience of commercial games developers, who usually have access to teams of people with specialist skills in parts of the process of the development such as graphic design, sound, interaction design and testing.

Through necessity, research game developers are forced to take on all these roles, and of course the design of the game and the final product itself are limited by their skills. This inevitably leads to the creation of games that lack the polish of even small independent commercial offerings.

Although games have become established as an exciting and modern platform for research, there is room for improvement in the design of research games from a ludological perspective. It is proposed that for research, where the background of the designer is only very rarely game design, “user power” can be an effective central focus for the game, saving time and effort in the creation and maintenance of a content-filled game world.

1.2 User Power in Web2.0

Web2.0 is a popular term used to describe the new breed of web applications that treat the web as a platform rather than a device. In particular a major theme of Web2.0 is *participation*, in which users become the producers as well as consumers of online content. Many popular sites and applications are built from user contribution and rely on users to maintain the content. Probably the most well known example is the user maintained encyclopaedia *Wikipedia*. Other popular examples include the social news sites Digg [8] and Reddit [27] and photo sharing services such as Flickr [12].

A more complex example is Second Life [30], a multi-user 3d virtual environment that is built on similar principles of user empowerment. Nearly everything that can be found in the world has been built by the users from primitive 3d shapes and textures.

All these applications rely entirely on the content that has been provided by the users. The development staff responsible for creating and maintaining the services themselves have control over only the shell of the application – it is the content and the community that keeps the services running.

Research games developers (and game developers in general) can learn from this model of participation and use it to create engaging and powerful social game experiences. By harnessing the players themselves to generate the content for the game, researchers can spend more time concentrating on the research and less time developing and micro-managing the content of the game.

1.3 User-Generated Content in Online Games

Developers recognise that allowing the players to invest in the game world leads to a sense of ownership and makes for a more engaging experience [28]. User-generated content does appear in many online games, however the scale tends to be limited.

Massively multiplayer games have long recognised the importance of letting players affect the game world in some way. Apart from character customisation (an important form of self expression by players) the most widespread feature is guild or clan systems that allow players to create formal organisations within the community. Games like *Ultima Online* [33] and *Star Wars: Galaxies* [32] offer more personalisation options through player owned property that appears in the common game environment.



Figure 1 - Player dressed as an Orc in Ultima Online

A shared feature of the user-generated aspects of modern social games is that they tend to be limited to the meta-game – aspects of the game that act as support to the main focus. For example the organisation of guild systems allows players to coordinate themselves and stage wars, etc. but does not allow them to create fundamentally new experiences.

Many games have sizeable communities of role-players who use the game as a canvas to create and enjoy stories and adventures but this tends to be in spite of the game – there are no tools that allow them to create non-player characters, place monsters or create dungeons. Players use the possibilities of the game creatively but aren't given the support of the developers towards having a grand impact on the game.

A good example of this creativity can be seen in Ultima Online where groups of role-players create guilds of characters that are supposed to belong to the fantasy race of orcs (e.g.[5]). However, since the game only allows players to be human they improvise with masks and costumes (e.g.). The genuine orcs within the environment of the game are not programmed to recognise these characters as belonging to their race (they are attacked on sight like all player characters) so the orc players account for this by inventing back-stories of warring clans and broken alliances.

Despite this willingness of the players to create worlds, the vast majority of *content* in online games is still created by the game developers and requires an immense amount of effort in the creation and management of assets and design of worlds, quests and everything else needed to keep a demanding player-base engaged.

Small groups of developers such as game researchers cannot hope to replicate this effort in designing new games so their efforts seem shallow in comparison. Although it is unlikely that small development team could, with user-generated content, create a game world as compelling, expansive and rich as modern online games, they may be able to create games that don't rely on novelty and give the players the tools to maintain a game world in which they have high emotional investment.

1.4 Human Computation in Games

The concept of using user-generated content in games for useful purposes beyond the sake of entertainment is a theme beginning to be explored by researchers. This may involve finding the answer to a difficult question, or performing tasks that are difficult to automate – For example image analysis. Luis von Ahn's experimental games ([1], [2]) demonstrated this concept and now

Google Image Labeler [14] is investigating whether it is possible to commercialise this technique to create a user powered game that also gathers useful data – Both applications are two player cooperative affairs where each user is presented with the same photograph or image from the web. The users are then asked to simultaneously describe this photo and guess what the other player is describing. When players' guesses match, the players score points and the database stores the matching word against the image to be used as a keyword – Image labelling is a difficult task for a computer so by using user power through the game they gather useful data.

2. GOPHERS AND FAMILIARS

As part of separate projects and with different research goals, two research games were built (*Gophers* and *Familiars*) under typical time and resource constraints. However, both were built using the concept of user-generated content as a core foundation of the design. Taking cues from the successes of Web2.0 the games relied on the support of the users to help maintain the game world.

With content catered for by the users, the focus of development was on creating the application “shell” which provides the players the outline structure for the experience and the tools to begin building their worlds.

Empowering the users in this way allowed the games to be much richer than could have been accomplished had the design required that the developers create the content.

2.1 Task-driven Agents

Both games use the central design concept of “task-driven agents” around which the game is built. These agents are virtual entities (the titular Gophers and Familiars) that roam around the real world. Each agent is given a “task” by his or her creator, the objective of which may be anything at all. The agent is then released into the world. Other players may then “pick up” an agent and interact with it by providing text and images, which are stored by the agent with all the other contributions in a blog-style diary.

This central concept is also used successfully in the Hitchers [9] and MobiMissions [15] projects. Although all these games use the same central “ludeme” (an atomic element of game design [19]) the rest of the games differ significantly in several ways and each explores a different area of research for digital games.

2.2 Gophers

Gophers is an open, pervasive gaming experience based around task-driven agents [6]. Players that accumulate sufficient points can create an agent (Gopher), that is assigned a name, avatar image and task to complete.

Gophers are overlaid on top of the physical world and their physical locations are represented by their proximity to mobile cell masts. When players are in a nearby location with their mobile phone, they are able to pick up a gopher. Using key words, messages and camera images, they are able to exchange information with the gopher and help it in its mission. When a player is satisfied, they are able to drop it at their physical location, where it will remain until another player decides to pick it up.

Success of a gopher's task is judged by a community-based peer reviewing system – again, taking advantage of user contribution to drive the gameplay. Players are selected to participate in a voting

system referred to in the game as ‘jury service’. In this, the players review gopher missions and decide whether the mission is in fact complete, and if so, how difficult they perceived the mission to be and which contributors helped most with the task.

Player ranking in the game is based around the level and quality of contributions. Player score in gophers is calculated from jury service responses and based upon the amount a player helped in completing a Gophers task. In addition, players receive points when their own Gophers have been at finishing their tasks in the past. This promotes creation of valid content by players and also creation of realistically achievable tasks.

2.3 Familiars

Familiars is another example of social game based around task-driven agents (this time “familiars”) who roam around the world collecting data from other players [18]. Familiars differs from Gophers in that each player only has ownership of one Familiar at a time, and therefore only one active task.

Tasks are not judged by other players in Familiars; instead the owner decides where and when the task is considered complete and chooses to end it manually. Since there is no judgement players are invited to explore with different concepts for tasks in order to get interesting feedback.

The player score in Familiars is calculated based on the social activity of the users. The game engine uses social network analysis to gauge the shape and size of the players' social networks and ranks them accordingly. Therefore the players are provoked to create more interesting tasks in order to attract more players to form in-game relationships by interacting with their familiar.

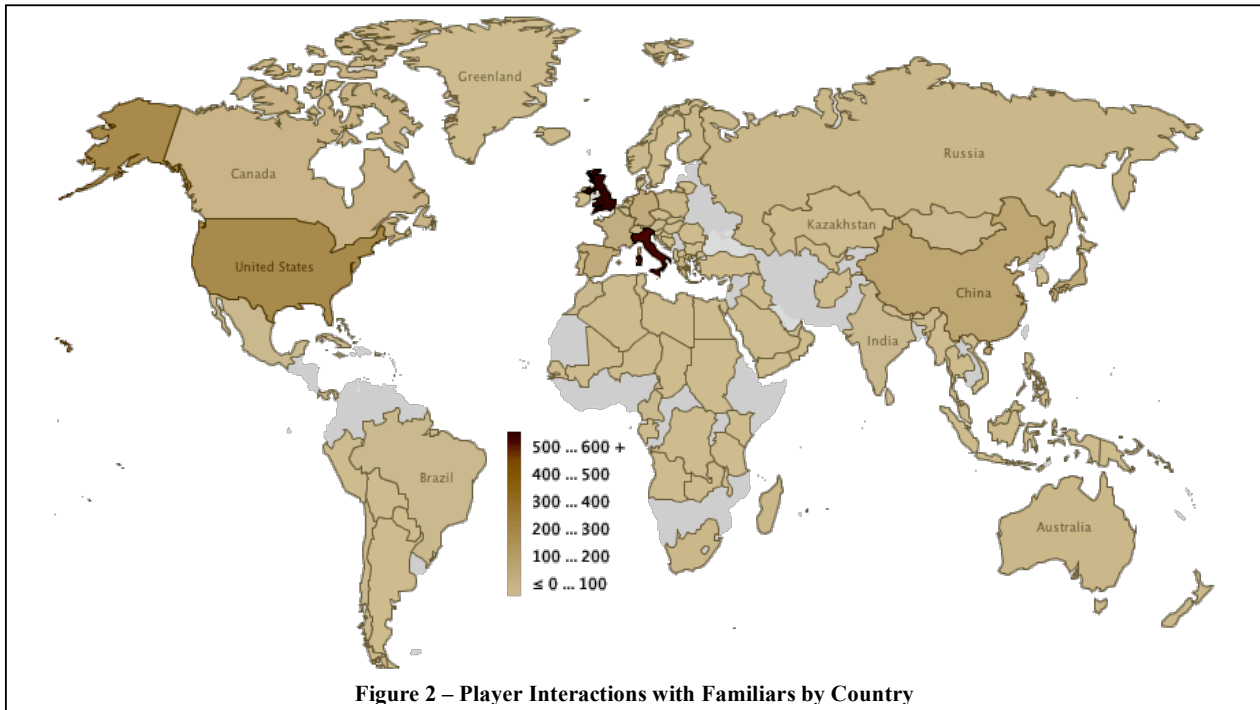
Familiars is not as pervasive a game as Gophers - The game is entirely playable using the web in addition to the mobile phone client. In addition, the players self-report their locations and a truthful location report is not required. Where in Gophers a user would always be linked to their current location, in Familiars lying about location is possible and by design there is no punishment for being dishonest about location – it is seen as another way in which the users can choose to express their creativity.

3. EMERGENT GAMEPLAY STYLES

Because players don't need to make meaningful tasks (e.g. Collect N items of type X) in Gophers or Familiars they become a vehicle for creativity. A task with an interesting title is more likely to get responses than a task with a mundane one. In Gophers, players were awarded more points for participating in more challenging tasks, encouraging the proliferation of interesting content. In Familiars there is an extra incentive for innovation in task creation because the player's score will grow due to the increase in size of the social network.

Gophers was trialled with 19 users over two sessions [6]. Over the course of the trial, 72 agents were created and in 116 tasks created for them. Users interacted with the gophers, leaving information 588 times.

In comparison, Familiars was trialled with 161 users in a single public trial from May to August 2008. 441 individual tasks were created for 136 familiars, which resulted in 3092 interactions. Players were recruited through advertising at Goldsmiths College, Telecom Italia, in Rome Istituto Auxologico in Milan and the University of Lincoln. Familiars is available (at [11]) in both the



English and Italian languages; of the players recruited 90 (55.9%) chose English over the default of Italian (44.1%).

3.1 Interaction Location

Gophers is a pervasive game that is deeply tied to the location of the players - every interaction is assigned a location automatically through mobile cell positioning technology. Since the trial was based in Lincoln in the UK, as expected most interactions took place in and around the city. The cell positioning method of calculating location is only relative based on the nearest cell tower, and changes in location are recorded when the mobile phone connects to different cell mast. The shape and size of the area covered by a cell tower is variable over time [9] and therefore not easily mapped onto a standard geographical map (although some initiatives such as the OpenCellID project [23] are making good progress in this area). Figure 3 shows how the paths of a handful of gophers intertwine through the wireless landscape of the city.

During the trials of Gophers, players encountered 430 mobile cells in and around Lincoln and travelled between these cells in 2,218 unique ways – some which were encountered only in passing (for example a car journey) and some which formed central hubs of interaction with the game (for example the school attended by players in one of the trials). The mean travel distance for a gopher was 3.96 cells, calculated from the number of unique locations within which user-gopher interactions occurred. This gives the impression that movement was an important element of task completion in Gophers.

In contrast, Familiars used self-report as a tool to gather location information. On both the mobile and web clients, players can search for a location by postal code or name, or on the web they may search an interactive map and click on their location manually. This allowed players to be creative when providing their location. For example one player gave their familiar the task

“Icebergs”. This popular task resulted in 13 interactions from other players providing pictures of icebergs and related items (Igloos, the Titanic). Only two of the interacting players reported plausible locations (Colchester, Douglas), the other 11 claimed to be in the middle of the ocean or in the Arctic or Antarctic.

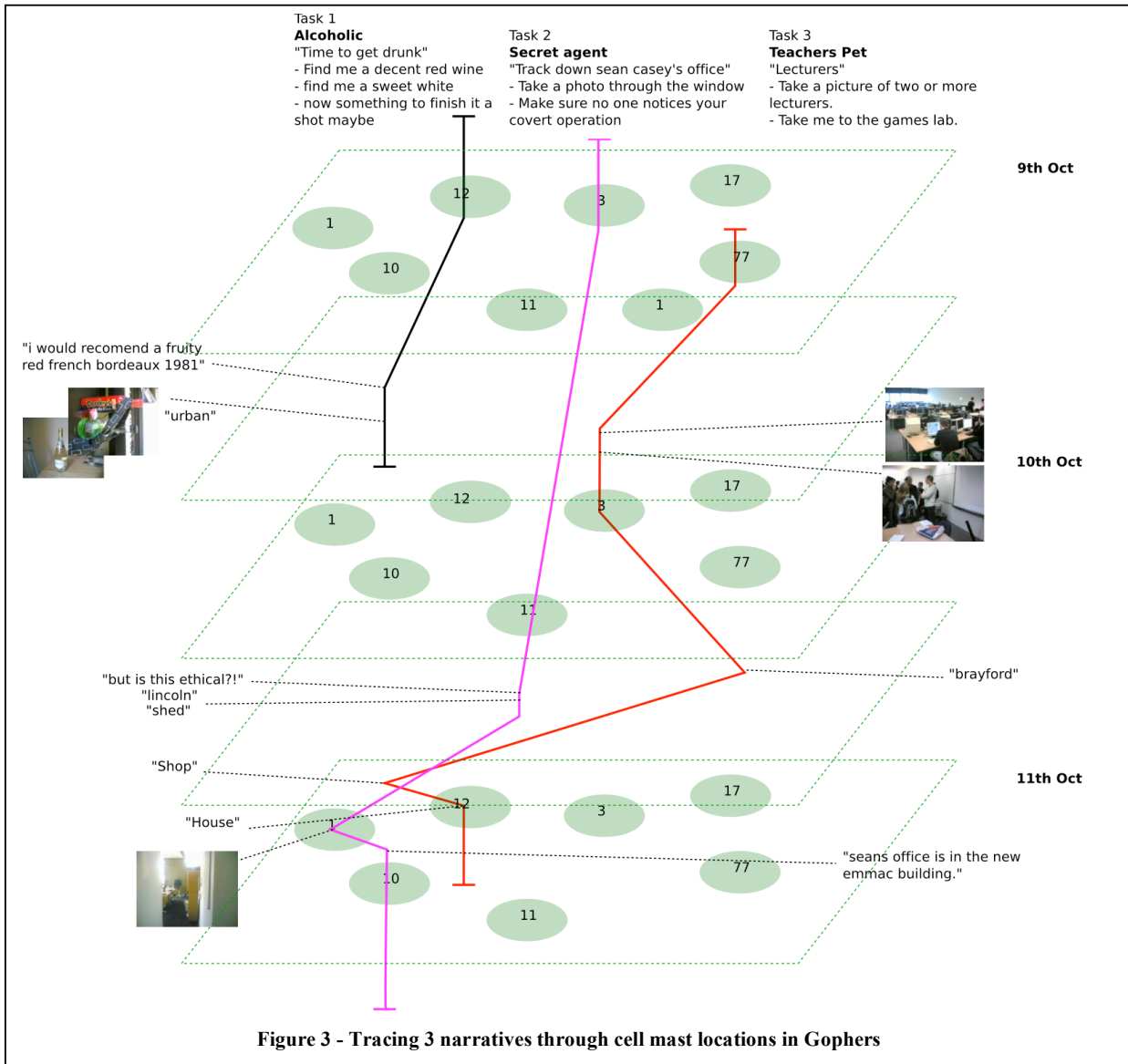
The players that were recruited for the trial of Familiars were all based in Italy and the UK, however additional volunteers were recruited through word of mouth, and via the integrated Facebook application. The (optional) tutorial that players are asked to complete when they register for the game includes a section where they are asked to report their actual current location. 140 users completed the tutorial and just over half claimed to be in the UK or Italy (25% and 26.4% respectively). The other users claimed to be from 30 other countries, notably the US (7.8%) and China (7.1%).

Figure 2 shows how the 3092 interactions in Familiars were spread over 110 countries. This does not include interactions where the location was not tied to a nation – i.e. in the middle of an ocean or at the poles. As with the player locations, just over half the interactions were recorded in the UK and Italy (30.2% and 26.1%). The variety of other countries represented illustrates how the users exploit the self-report location system to use interesting locations as part of their creative contribution to a familiar’s task.

3.2 Task Themes

In both Familiars and Gophers, the task descriptions are entirely decided by the creator of the task. Given a blank canvas, several themes emerged as players created tasks that are designed to entice other players to interact with them.

Collection - These tasks focussed on gathering opinions on a wide variety of subjects, and were not limited by location. “Collect



Coffee Cups”, “Take a picture of a blue suede shoe”, and “learn five italian curse words”.

Travel/Discovery – These tasks are focussed on the locative aspects of the games, asking people to share favourite locations or engage in locative play: “find the world’s best place to live”, “Get from coast to coast”, “Where is the nearest beer festival to my location?”, “show me where the football pitch is”, “take me to school”, “go to the highest point in Lincoln / show me the setting sun over the city”, and “where can I buy sushi?”.

Humour – These tasks are silly and sometimes surreal, provoking funny responses from other players. “Find the uncontroversial[sic] prove of the existence of other life forms outside the Earth”, “Find a jazz band of cats”, “WHERE’S WALLY / WHERE’S WALDO?”.

No Objective – These tasks seemed to have no theme or basis in the game world and don’t seem to invite other players to interact with them at all.

On a couple of occasions in Familiars these tasks became the target of experienced players. Since the scores in the game are based on social networks, experienced players would look for new players and help them get involved in the game – this has a mutually beneficial outcome since the new player gets tuition from an expert and the experienced player gets an increased score due to the growth of the social network.

An example of this is the first task created by a new player that was simply “Delta”. 12 days after its creation, it was found and picked up by an experienced player who interacted with the familiar 5 times in quick succession to try and uncover the new player’s intent – “what do you mean by delta?? Delta Airlines”, “we’ve got Delta Dental!” and provided pictures of various logos for companies called Delta. Soon other players discovered the task and added further examples – “You probably refers[sic] to the greek letter. It literally means change...”, “Lancia Delta”. The new

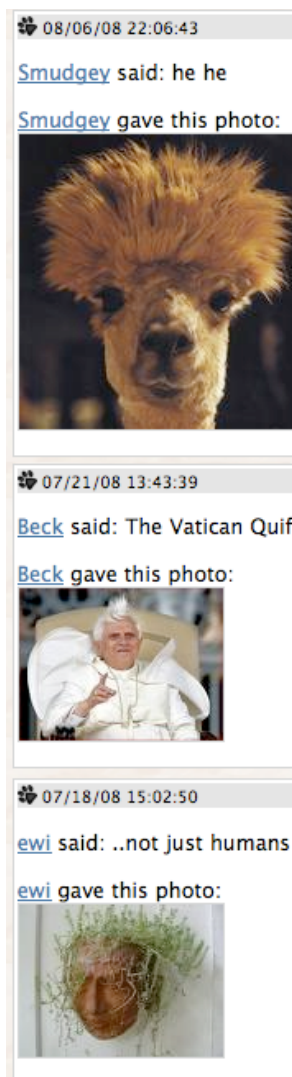


Figure 4 - Responses for a "Bad Hair" Familiar task

could only be initiated from the mobile handset and collected in-situ, via camera phone photos or text messages. Because location was contextually sensed, all interactions provided a location, 146 were images and location, 110 messages and location and 332 were spatial "geotags".

3.4 Play Styles

In [3], four main styles of play were identified. Based on the trials of both Gophers and Familiars, players of all types have been observed.

Conqueror: *Conqueror play involves winning and 'beating the game'.*

Conquerors were observed to be orienting their play around the scores used in the games. In Familiars, where the score is a function of their social network activity, the conqueror players would be extremely active and purposefully seek out players to interact with in order to improve their score. In particular, the top

player that created the task got involved in this exchange and provided examples of their own – "River Delta".

The most successful tasks in Familiars collected up to 60 individual responses and of the 10% (44) of tasks that had the most responses, 15 are Italian language, 27 are in English and 2 are dual language (for example the most popular task in the game: "Pretty things / cose graziose!").

3.3 Contributions

In Familiars, each task elicited an average of 7.64 responses (median 5). These could be a combination of text and images either provided from the computer or directly from a camera enabled mobile phone. Of all the interactions, 421 were empty and just provided a location, 210 contained just an image and location, 824 contained just text and a location, and 1703 contained all three.

In contrast, the tasks in Gophers attracted a mean of 5.07 responses (not including the act of picking up and dropping a gopher), noticeably less than Familiars. Each type of gopher interaction required a separate interface, thus interactions could not be combined and users were also prevented from supplying blank entries. Unlike familiars, interactions

handful of players would only rarely interact with one another – preferring to choose to interact with players on the second or third page of the high score table. By interacting with lower scored player they not only increased the size of their social network and therefore their score, but also intentionally chose to deprive the other top players of their own frequent interactions and therefore not increase their score.

The downside of this is that in the search for quantity, the quality of interactions suffers with one-word short interactions being common ("here!", "cool", "Hi!", etc.)

Conquerors in Gophers deduced that an individualistic play style could provide the optimum point gain. This was demonstrated by players who, rather than participating in others tasks, would mainly create their own tasks, then complete and submit the challenges themselves. However, unlike Familiars, the quality of these interactions was still good and meaningful – possibly a result of being monitored by 'jury service'. The winning player followed this play style by successfully completing 3 of the 4 tasks she created.

Manager: *Manager play revolves around a strategic or tactical challenge.*

The managers in the task based games focussed on balance and control in the game, using carefully created tasks and interactions to optimise their play. An example of a manager-like play style would be the users in Familiars who defined their tasks in both Italian and English, in order to be attractive to a larger segment of the player base, for example "Pretty things / cose graziose!" or "Best Colour? / Miglior Colore?".

Being attractive to large portions of the player base appeared less important when creating gopher tasks, since performance was not measured by social interaction.

Wanderer: *The player who enjoys Wanderer play is a player in search of a fun experience*

Wanderers seem to enjoy the variety of tasks and agents that inhabit the world. In Familiars they are fairly easy to spot because they interact with a large number of other familiars yet still have a fairly low score. The score is based partly on reciprocal relationships and these are the ones that suffer under wanderers who aren't interested in maintaining social connections.

This class of player was also visible in Gophers. Usually they were more interested in the novelty of creating lots of fun, original tasks, or finding and hoarding large collections of 'fun' gophers on their phone. Despite this, they rarely interacted with the characters and provided little content of use for the game. Generally, these players ranked very low in the leader board.

Participant: *They want to participate either in the story the game is offering or with other players in some emotional context.*

Participants in Familiars appeared to play in an opposite style to the wanderers – their objective was to have a few good friendships rather than many shallow ones. They tend to have a high value of network reciprocity yet a fairly low score.

In Gophers, these were the players who provided the majority of interesting content. Participants tended to interact with a few key gophers and provide meaningful content to progress the narrative of their tasks – a few of these players were also prepared to travel in order to meet task objectives, although these were in the minority (one, for example climbed to the top of a hill in order to photograph a sunset over the city).

4. LESSONS LEARNT IN USER POWER

The task-driven agent “ludeme” [19] is a versatile way to foster a sense of ownership in game content by providing the players with a virtual being they can invest in within the game environment. However, there is an unlimited number of other ways to take advantage of user generated content to *power* online games.

For a long time online games have encouraged the creation of user-generated content as added value to the game itself, usually in the form of “mods” (partial or total modifications), additional assets (such as new maps or textures) but these possibilities are still secondary to the game itself, and the game still relies primarily on developer generated content.

Based on the experiences of creating and running two research games built on the principles of empowering users, the following lessons were learnt.

4.1 What Worked

The central concept of giving the users control of the content was without a doubt a success. Given the tools, the players did create a sustainable, vibrant community of play. Through play, several individual play styles were observed and players were free to behave how they saw fit rather than being constrained by the design.

Both Familiars and Gophers used an abstract way of generating scores for the players – since gaining score requires a “human touch” in peer review or incentives to interact, players can’t find easy ways to game the system, as they might if scores were generated procedurally based on something like activity.

In a social game there needs to be an incentive to interact with other players, to avoid situations as was found with *MobiMissions* where a player would tend to mostly interact with their own agents [15]. *Gophers* introduced the idea of travel, so agents would come to the players rather than requiring the players to go out and find them. *Familiars*, however, uses the scoring system as an incentive to seek out other players’ agents.

Once the players had started to interact in the game world it resulted in a stream of content that needed to be maintained and kept up to date by players. This prevented the game world from stopping evolving and therefore making the play become stagnant.

4.2 Potential Pitfalls

When users are given creative control in a game they will inevitably push the boundaries. For example in June 2008 Electronic Arts released a tool ahead of its new game *Spore* [31]. The *Creature Creator* allowed players to design alien creatures to be used in the game from body parts such as legs, wings, eyes, claws, etc. Perhaps inevitably, a genre of creations known as *Sporn* [34] (The name is a portmanteau of “*Spore Pornography*”) emerged, where players worked to create the most lurid and anatomically improbable creatures they could with the tools of the game (e.g. Figure 5).

This highlights the potential for mischief by players using the powers of content creation to make things other players may find in poor taste or worse. The solution to this is likely to involve some kind of moderation system, but it would need to be controlled by the users in order to leave power in their hands.

The other issue of content user provided content is that of ownership. Given free ability to upload content there is no

guarantee that the players will not provide “second-hand” content they have taken from other sources without proper permission. Similarly, if a user does create content them self and uploads it to the game, there is potential for issues around ownership to appear – i.e. is it the player or the developer that owns the content?

Another major issue is that of “Critical Mass”. Any social game that relies on the players to entertain one another faces a problem at the start of the deployment where there are only a few players, and therefore very little content. Once this hurdle is overcome the players will run the game themselves and growth is likely to be quick, however initially the game might require more involved management.

The learning curve for both *Familiars* and *Gophers* was fairly steep – in approaching a game which relies entirely on user-generated content, players were confounded and were not sure where to start. This was particularly apparent in *Gophers*, where players would request advice when interacting with the game “how the hell do i work this game!”, “is this how i tell you stuff? this game is haprd![sic]”. It is clear that an extensive tutorial is required to ease players into the game and get them started with drive rather than confusion.

Context of use will affect the content players provide and is important for reinterpreting this content when forming research observations. This is particularly relevant in more pervasive play environments, such as *Gophers* where all content is collected in the real world and the mobile setting inevitably influences play. One example of this is the much higher proportion of photos used in *Gophers* over *Familiars*, which implies that the use of cameras is a preferred style of interaction when communicating content in a more mobile gaming setting (effectiveness of using camera phone images for communicating information in mobile settings is also demonstrated in [17]). The more pervasive play style could also explain the reduced number of interactions, as a result of the extra ‘effort’ required to harvest this data. The fact many players do not like this style of real-world content gathering is highlighted by the fact many images were often second hand, captured from published media, such as the Internet, television and magazines.

Finally the most important factor of dealing with user-generated content is the unpredictable nature of users. When designing a game using these concepts the designer must be ready to adapt and to expect the unexpected from users who will almost certainly see the game from a different angle than the developers.

5. CONCLUSION

Many current online games support the creation of user-generated content but this is limited to a supporting role while the main focus of the game is based on content generated by the developers. Players are given some flexibility in being able to create an impact in the game world through self-expression but the possibility for genuine impact on the game experience for other players is limited.



Figure 5 - User-generated Mischief in *Spore*

Designing a game from the ground up to be *user-powered* hands the responsibility for the game experience to the players, while the development effort is focussed on facilitating the creation of content by users and acting in a supporting rather than a guiding role. User-powered games are an example of a “3rd Generation User Content System” [20], compared to the 1st generation that was limited to unofficial fan-sites and the 2nd where user-generated content is supported by the developers but not integrated into the experience.

It is proposed that user-powered games are the perfect platforms for online research games, where only limited resources are likely to be available for development and maintenance. Granting the players power to manage the game world in their own way fosters community and user investment that would perhaps be difficult to replicate without larger budgets.

The game design concept of task-driven agents has been presented and its use in two recent user-powered games, Gophers and Familiars, has been discussed. In exploring the worlds created by the users the nature of their interactions has been investigated.

Several key themes have been identified as important considerations when designing user-powered games:

- Community – Fostering a sense of community and offering incentives for new users to become involved.
- Control – Users are the owners and curators of the game. The developers are simply facilitators.
- Context – The user-supplied content is reflective of the setting and device type they use to play the game.
- Moderation – User control of maintaining the game environment they want. Encouraging the use of good content that will create an interesting gaming experience.
- Flexibility – Adapting to the unpredictable nature of users.
- Sustainability – The supply of user-generated content should be self-sustaining. The environment created should allow new gameplay styles to emerge and flourish.

Creating a user-powered game comes with issues, but allowing the players some control over their game experience helps them become invested and sometimes evangelistic about the game. In research, where games are developed by small teams whose skills and background isn't necessarily in games development, user power can take care of the game so the researchers can take care of the research.

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