Familiars - Manipulating Social Networks with Mobile Gaming

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ABSTRACT

This paper presents the mobile multiplayer gaming application Familiars. Familiars leverages social networking and locative technologies to create a reactive social experience for the game's participants over extended periods of time. The game is based around the concept of each player owning a Familiar –a virtual sprite or creature somewhat similar in concept to Pullman's *dæmons* - which has a visual appearance and a location in the real world. A player's interactions with their own, and other players', Familiars is used to directly inform the state of the game and status of the player – inviting them to become more aware of the impact of their social activity, and to discover novel strategies for becoming more socially effective in computer-mediated environments. We begin by explaining the design for the game and the unique challenges of the mobile medium as a platform for social gaming. We discuss the theoretical and technical background of the social and contextual analysis system used in the mobile mediated environment and go on to describe how this informed the implementation of the mobile and server applications that power the game. Finally we discuss the findings of the application test groups, lessons learnt during development and important design considerations for mediated mobile social gaming.

Categories and Subject Descriptors

K.8.0 [**Games**], H.1.2 [**Human Factors**], H.4.1 [**Groupware**]

General Terms

Documentation, Design, Human Factors.

Keywords

Mobile games, Architecture, Games Technology

1. INTRODUCTION

Mobile platforms present unique challenges to game designers due to fundamental differences from traditional video gaming platforms in terms of play style, environment and audience. In particular, mobile phones present several unique challenges and opportunities. The most striking is the ubiquity of the devices – with an estimated 3.5 billion mobile phone users by the end of 2008[14], gaming-capable devices are never far from our grasp and there is a constant opportunity for play. These unique properties have challenged game developers to form new patterns and develop new styles of games that are suited to the mobile context [5]. Games are designed to fit in with the typical "casual" play style where the experience is defined by short play sessions during breaks in normal activities [1].

Social networking sites such as MySpace and Facebook have rapidly grown in popularity and now claim over 500 million users globally [4]. This has generated a movement to harness the benefits of social applications away from the computer desktop and converge them with mobile applications. MoSoSos (Mobile Social-Software Services [18]) combine the community aspects of the social networking applications with the locative nature of mobile devices in order to create social software centred around activities in real-world locations and content sharing facilities. As users are increasingly exposed to their "social graph" there is a growing need for them to be able to understand what this information actually means, and how their social behaviours change the shape and structure of their social networks.

2. FAMILIARS

Familiars is a MoSoSo game that is built around mobile interactions between players. Based on the context and content of their interactions a social network is built which determines the score of each player. This is then exposed and challenges the players to reflect on their experience and change their behaviour in the game in order to affect their standing within the network.

2.1 High-Level Concept

Familiars are creatures that roam around the real world completing tasks for their owners. They are similar to Pullman's dæmons [17] as personal intelligent animal companions that are linked to their owner yet have individuality and freedom of will, except familiars may travel in order to complete tasks for their owner. These tasks can be anything, from "Visit your favourite restaurant" to "Collect pictures of people's pets".

Other players can search for familiars using their cell phone. They

are shown a list of familiars near to their current location, along with the current task each familiar is trying to complete.

A player may then choose to pick up a familiar, and provide it with text or photos in order to assist with its task. The familiar travels to the player and adds the content provided to its current travel blog, which is viewable online.

As players interact with each other's familiars, a social network of interactions is built up. Depending on the shape and size of each player's local social network, they are assigned a score. In order to rise in the rankings players must learn how to create tasks for their familiar that are attractive to other players, and maintain existing relationships through continued interaction.

The scores are weighted so that players with medium sized social networks with relationships that are well maintained will score higher than players with large networks of remote friends with whom they rarely interact.

2.2 Player Experience

The player experience is split between two major interfaces – the web *orchestration* interface and the mobile *interaction* interface. The main function of the web interface [7] is to orchestrate the player's game experience. It is here they "adopt" their familiar, and choose tasks for it to complete. It houses the familiar's blog and allows the players to follow a familiar as it travels around the world collecting digital content from the community.
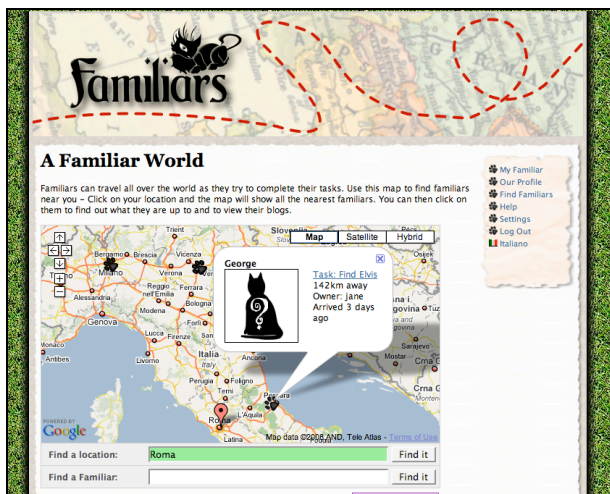

Figure 1 - *Familiars* **Web Interface**

The web interface is also used for typical account management functionality such as registration, password changes and other housekeeping activities too rarely used and complex for small devices.

The mobile interface is where all the significant game interactions occur. Players can search their current location for familiars or directly pick up familiars that belong to close friends on their social network.

Once picked up, a user can provide a text message, attach photographs taken with the on-device camera, and drop the familiar at their current location. The familiar will then update its

travel blog with this information, contact its owner and move to the player's location.

Figure 2 - *Familiars* **Mobile Client**

2.3 User Generated Content

Familiars uses user generated content as a central feature of the game. Allowing users to generate the bulk of the content for the game as a community encourages a sense of ownership and increases engagement in the application [13]. The content is created in two ways. First the user creates tasks of their own design. The task is simply in the form of text but with this short description must be created with consideration since it must inspire the other players to participate. Secondly, the other players provide content in the form of text, images and geographical locations in response to a familiar's task. On the mobile client this can be captured from the on-device camera and GPS (or self-report). On the web client photographs can be uploaded and location is chosen using an interactive map.

This task-based method is complementary to other research games that use task-based elements as part of the game design. *Gophers* [3], *Hitchers* [6] and *MobiMissions* [8] all use this design element as a core feature around which the rest of the game is built. Taking advantage of user-generated content for games is particularly useful for research applications where development resources cannot compete with commercial efforts that can create a large amount of compelling content to entertain users [12].

3. EXPOSING SOCIAL BEHAVIOURS

Familiars exposes players to the shape and structure of their own social network and crucially, it compels them to explore how changes in their context and game activities affects their relationships both inside and outside the game.

Through normal play, data is collected on the patterns of interactions that the players follow. Through analysis by the PASION Server, key information about the nature of the players' interactions are extracted and presented back to the users on their profile pages.

A profile page displays a wealth of information about the user and their familiar. It shows a history of all tasks created and has a large area dedicated to the social nature of the player in the context of the rest of the game community. The social information includes an interactive graph displaying the local social network weighted by social distance (relative distance between nodes corresponds to in-game social distance).
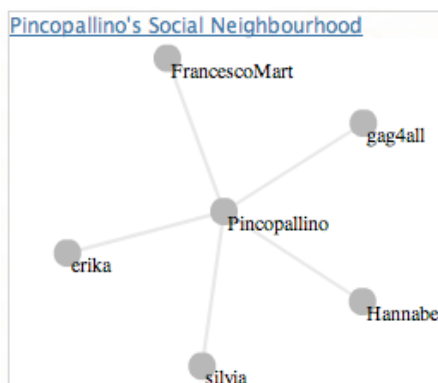

Figure 3 - Social Neighbourhood

The rank of the player and socially close players are shown along with the social network analysis of the *reciprocity* and *centrality* in the network. The scores and therefore ranks are calculated based on a combination of these values and the recent intensity of player activity. Centrality (1-degree) is calculated based on the number of other players that have interacted with a user in the past week. Reciprocity is based on the ratio of reciprocal relationships the user has been involved with. These values are referred to as "Popularity" and "Friendship" respectively in order to not confuse users with technical social network analysis (SNA) terms.

Rank (out of 94)	Player	Familiar	Popularity	Friendship level
1	erika	Gigi	Very Popular	Low
2	silvia	Baki	Quiet	High
3	Pincopallino	Pincopallino	Popular	Very Low
4	FrancescoMart	Katchoo	Quiet	High
5	Welela	Amarok	Quiet	High
6	rbatts2000	Yassassin	Quiet	High
6	shaun	Nangster	Quiet	High
8	Ciottolino	Ciottolino	Quiet	High
9	Hannabell	Nonni	Quiet	Very Low
9	gag4all	Gag4all	Quiet	Very Low
11	test2	Testy	Very Quiet	Very Low

Figure 4 - Rankings and Social Attributes

By observing the values and networks that successful players have built in the game as well as the type of tasks they create, users can learn how to better play the game and gain higher scores within the game environment. For example, noticing they have low Friendship/Reciprocity they may decide to interact with users they do not know but have picked up their familiar. The strategies must change over time based on the activity in the game – for example the preferences of the aggregate player-base may change from enjoying tasks about "food" to tasks about "music". Therefore players must learn to be reactive and adjust their behaviour accordingly in order to fit in more with this new social preference.

This exposure gives the players great freedom to invest in the game community and explore different social behaviours in a truly reactive environment.

4. LOCATIVE GAMING CONSIDERATIONS

Familiars takes advantage of the locative possibilities of mobile devices much like other MoSoSo games. However the locative possibilities of mobile devices are still limited by technology. MobiMissions [8] and Gophers [3] both use cell ID positioning for location, access to which is limited by the device and is not exposed in a standard device agnostic manner.

Other games take advantage of the GPS or other locative features appearing in modern cell phone devices, accessed by a standard Java API. This functionality is available in *Familiars* but relatively few devices have the hardware capable of providing reliable data yet.

A self-report method for location determination was implemented for *Familiars* that allowed users to provide location information using postal codes, road, town or region names (i.e. to search for nearby familiars). A Web 2.0 "geocoding" service [20] then returns the associated latitude/longitude pair.

This self-report facility is significant not only because it widens the possible market of the game to users with older devices, but because it allows the players to enter in *false* information in order to pretend to be elsewhere. For example, when a player is at home, they may pick up a familiar collecting restaurant reviews and enter the address of a restaurant they visited while abroad as a self-reported location. The familiar then moves to that restaurant and updates the blog with more relevant location data than it would have if the real, home, location of the player was used instead. In the extreme it allows outlandish tasks requiring familiars to visit the centre of oceans or other inhospitable places that would not be possible with truthful location reporting.

This also helps mitigate one of the main issues many modern MoSoSos face – people tend to use the services in boring locations and tend to only play in a few spaces. 83% of interactions in MobiMissions occurred in just three classes of location (Home, College and Pubs/Cafes) [8].

Allowing players the option to enter false locations does not make the game any less locative, but allows greater richness and flexibility in their game contributions.

5. PASION

Familiars has been designed and developed in the social gaming strand of the PASION project [2]. PASION (Psychologically Augmented Social Interactions Over Networks) is a major

European project focused on improving the efficiency and effectiveness of goal-oriented groups engaged in social (many to many) communication in mediated environments. The project has a particular emphasis on large groups in which communications are maintained on a long-term basis (e.g. professional communities, game players) creating a social network.

Familiars exists only because it takes advantage of the capabilities offered by PASION through the PASION service environment (PSE). The PASION technical architecture collects communication events occurring to the group of users of the applications, elaborating them, and providing augmented communication services.

These services are requested by the applications and are designed to empower communication, coordination and collaboration between group members. From this viewpoint, there is no restriction to the type/number of applications that can be augmented by PASION services, provided that these applications support computer-mediated, human-to-human communication.

5.1 PASION System

The PASION system upon which *Familiars* is built uses a service-oriented architecture (SOA) (Figure 5) to receive information about events mostly from applications and media providers, and provides augmented communication services to the application, to be forwarded to the users after a value addition.
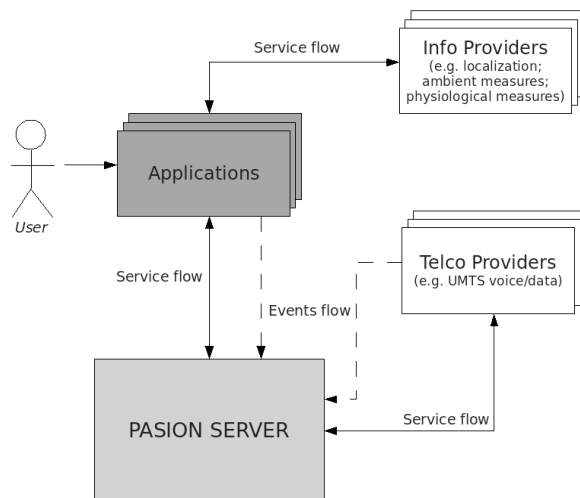

Figure 5 - Generic concept for PASION: arrows represents information flows (events, control and business data) associated with components interaction (i.e. services)

Users can make intra-group communications thanks to media offered by the application and media offered by Telco providers (e.g. UMTS voice/data traffic). PASION lends more attention to media offered by the application. Embedding information is collected by the application itself. Most of the embedding is defined according to the application business rules; the remaining part comes from external sources, such as the user location, provided by specialised localization providers. Physiological

information about the users is treated as for the contextual information: measured by external sources, logically regarded as specialised information providers, collected by the application itself.

5.2 PASION and Context

The core design of *Familiars* is built around the social activities of the players. These mediated social interactions are used to build the content in the game and to determine the relative scores of each player.

Context is an extremely important factor in mediated social interaction. Differences in the context between the two parties in the interaction lead to misunderstandings based on divergent expectations and environments.

At an early phase of PASION off-the-shelf technologies are used to capture individual behaviour and to provide contextual information and emotional cues to users: e.g. non-obtrusive sensor technology for the detection of emotional arousal and attention; high resolution, high accuracy eye tracking for avatar control and attention feedback in e-learning applications, low-cost sensor technologies for increase emotional involvement and social presence in net-communications; PC-based Automatic recognition of attention profiles and emotional user states as input for adaptive systems (agent systems and ambient intelligence; non-intrusive methods for displaying information to users.

These capabilities are all available to applications through a simple integration layer provided by PASION. The PASION Service Environment (PSE) provides all the necessary calculations and analysis leaving application developers free to utilise the data gathered in a meaningful and platform-appropriate manner.

5.3 PASION Service Environment

The PASION Server is a core component in the PASION environment (Figure 5), mainly responsible to augment Applications' mediated communication services according to augmentation requirements; augmentation is computed by periodically and systematically analysing information/data/events incoming from Applications and Telco Providers to use them in line with Social Interaction Information metrics, measures and algorithms. A media communications broker (MCB) provides data abstraction functionalities on the basis of events collected from its Media Communication (e.g. an Application, a Telco Provider).

The PASION Service Environment (PSE) exposes the capabilities of PASION to 3rd party applications such as *Familiars*. This is done through a series of HTTP services that use SOAP formatted messages to exchange information about interactions in the application and to provide social network indices (amongst other information) for individuals and groups of users back to the application. The use of a service-oriented architecture paradigm allows the capabilities of PASION to be harnessed by large numbers of target applications in a very "mashable" way.

6. FAMILIARS ARCHITECTURE

The *Familiars* game sits above PASION in the application layer. The application is made up of a centralised server system and client applications for mobile devices and the web.

All communication with the PSE (PASION Service Environment)

is mediated by the game server and conducted over dedicated HTTP (SOAP) interfaces.

6.1 Familiars Client

The mobile client takes the form of a distributable package suitable for installation on mobile phones. The application is written in Java for J2ME and uses as basic and generic functionalities as possible in order to have a high level of compatibility across a wide range of common devices.

J2ME is typically implemented as a layer above the phone operating system. Common interfaces have been defined in the J2ME standard to allow exposure of low level phone capabilities, such as access to the camera device and data services. The game uses these exposed interfaces to add camera and data services to the game.

Despite J2ME being a standard, the exact implementation varies between manufacturer and device. Therefore despite the game application working correctly under the recent Nokia device implementations, the same cannot be guaranteed for other devices from other manufacturers.

Players must pre-register in order to have a valid user and password pair as is required by the application. The client package can be downloaded from the website and installed on a supported device.
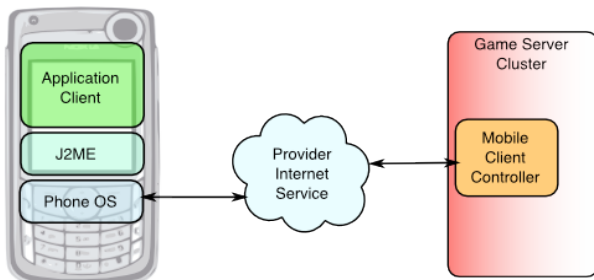

Figure 6 - Simplified Client Architecture

Once logged in on the client application, the game uses the data transfer capabilities of the handset in order to exchange game state and interaction instructions with the game server. This is done transparently through the phone operating system and the data services provided by the user's phone tariff. This communication is entirely using the HTTP protocol with messages in JSON (JavaScript Object Notation [9]) for compactness and to save transfer costs for users compared to using traditional but more verbose XML-based formats.

There are three main features of the mobile client. The user can view the recent activity of their own familiar, view their current local social network and search for familiars nearby. Familiars can be picked up and given photos or text in order to help with their task. The familiar is finally dropped at the player's current location. All interactions are communicated to the server and stored in the game database. Changes appear immediately on the travel blog maintained by the familiar.

6.2 Familiars Server

The *Familiars* Server is a cluster of several sub components (shown in Figure 7) that allow the delegation of server tasks

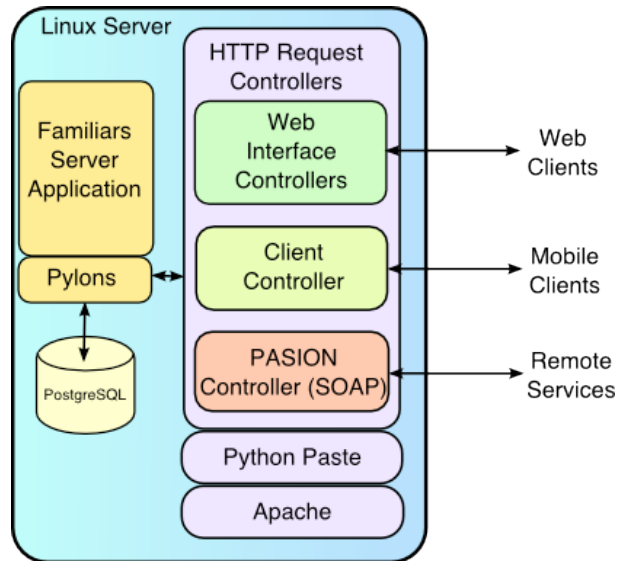appropriately. The server is built using Python on Linux with Apache.

Figure 7 - Simplified Server Architecture

The server application component itself is the most important subsystem within the game. It handles and maintains the game state that the players affect via interactions using client applications. Game data is stored in a private game database system to which only the game server component has direct access.

All client interaction with the game is conducted via the controller layer. This is device agnostic and features all the functionality and sanity/error checking regarding user input into the system. Since the component is built in a generic manner, it is possible to add new interfaces for new platforms very simply using this existing functionality as a "gateway" to the game server itself.

The game connects to the PASION service environment and accesses the enhancement services through a PASION controller that uses a SOAP interface to provide communication event information and request social network indices from the PASION server.

Both the mobile and web clients interact with the game via the client controller layer. Since the interface appearance and interaction flow for the mobile clients is handled on the device itself, the mobile clients connect directly to the client controller, using a thin verification layer to ensure compatibility.

7. FINDINGS OF FORMATIVE EVALUATIONS

Familiars has been developed with a rapid iterative, user centred methodology [15]. At several stages through development the application has been studied in a series of formative evaluations with a variety of users in a series of focus groups in Italy and the UK. Groups have played the game in the existing form for periods between an hour and a week, and reported their opinions both in questionnaires and group interviews. Based on this information the game was revised and improved. In addition to the expected

language and usability tweaks, the following specific difficulties were found that are applicable generally to all social games.

7.1 Focus Groups

PASION partners in Milan carried out two rounds of focus group testing. The first group was conducted in August 2007 with 7 participants all of whom had some experience with games. The session involved a recorded structured guide of the game and interview sessions.

The second focus group, also in Milan, involved 6 players taking a revised version of the game and using it for a week, followed by a structured interview session.

Based on the findings of both sets of formative evaluations, the game was revised to address open issues before the official release to the wider public as part of the summative evaluation in the summer of 2008.

7.2 Graphical Style

As with many games developed for research purposes, the graphical style is not the highest priority during development. However, the expectations of the users in the focus groups made this an issue of utmost importance. The *Familiars* game has gone through several graphical adjustments based on user comments. However, as a highly subjective aspect there is no way to satisfy all players with the design so a compromise between styles was reached.

Figure 8 - Graphical Iterations

For example in Figure 8 early focus groups found the logo "childish", while the second group found later versions culturally inappropriate due to the black cat being an animal associated with evil and witchcraft.

7.3 Coherent Introduction

Each focus group has found the basic introductory page of the game website [7] too complicated and failed to grasp the overall objective of the game. Each time the game was fully explained in the introduction but the users would not read so much text. Each successive version has seen the amount of text on this page reduced. In its current version the landing page of the website is only three short sentences. An introductory tutorial has been created that teaches new players game concepts interactively.

7.4 Self-Reported Contextual Information

Collecting contextual information through self-report (i.e. for mood/emotional states) has proved difficult. The game design cannot use emotional context to inform play since that provokes users to lie in order to gain in-game advantages. However if the information is not used in the game the players do not feel compelled to answer honestly. In particular asking a player to choose a specific emotion that reflected their current state led to confusion (one comment was "Why would I feel *scared*?"). In lieu of automatic reporting the latest system uses a 9-point Likert scale to gauge enjoyment. Interaction is designed to be as quick

and unobtrusive as possible by utilising the standard phone keypad with each numeric key mapped to the appropriate point on the scale [11].

8. SUMMATIVE EVALUATION

The summative evaluation of the game began in May 2008 and is ongoing for the summer. This evaluation is open to the public[7], but was seeded with players – Over 100 Italian players were invited via email to start playing in May. This was followed by an invitation to 50 English users to join the ongoing game in June. The invitations were open and players are free to extend the invitation to their friends and family, as they feel appropriate. Upon registration, and after trial completion, trial participants are contacted via email to complete a short questionnaire administered by the trial managers. In addition to the questionnaire responses, data is collected through normal usage of the game in order to study social behaviour in the game.

8.1 Usage Information

The summative evaluation is ongoing but early analysis shows that there is already a sizeable community of players inhabiting the game, which is especially good considering the sample size of comparable games.
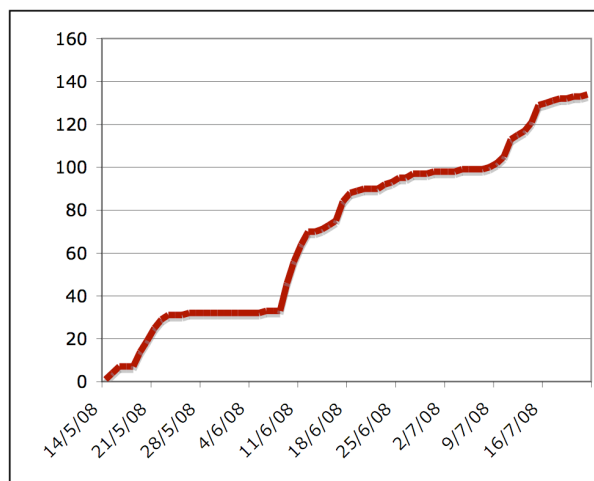

Figure 9 - Total Registrations

Figure 9 shows the cumulative number of registrations since the summative evaluation began. The stages of the invitations are clearly visible at mid-May for the Italian seed players, and mid-June for the English seed players. The further growth in the number of registered players is most probable to be due to the natural expansion of the player-base due to existing players recommending the game to friends and family.

Figure 10 shows the pattern of game activity during the starting months of the trial. The graph maps players' interactions with familiars, in that each interaction represents a decision to pick up a familiar and contribute to its ongoing task by providing text and images.
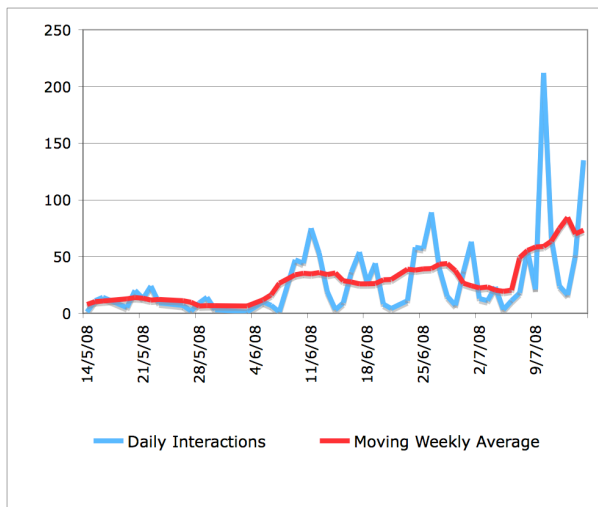
Figure 10 - Interactions per day

8.2 Comparison to Similar Applications

There are a handful of research games that are similar to Familiars in design. Gophers [3], Hitchers [6] and MobiMissions [7] all use the "task-driven agents" concept as a central part of the design. The applications differ in the complementary design elements and research objectives. While Familiars focuses on the social relationships formed during the game, and gives users tools to monitor and manage their social relationships in the game. Gophers focuses on peer review and rewards in mobile games and Hitchers and MobiMissions are about exploring the nature of the local wireless environment through locative play.

Game	Participants	Trial Length
MobiMissions	11	5 weeks
Hitchers	47	Unknown
Gophers (2 trials)	6, 13	8 days, 18 days
Familiars	>134 (ongoing)	ongoing

Table 1 - Trial Comparison

Table 1 shows a summary of the sample sizes used for trials in these related games. It is not appropriate to compare the applications based on size alone since the different applications had different research objectives. Familiars also has a major advantage for recruitment in not relying on a particular class of mobile device for the mobile client application.

8.3 Preliminary Social Activity Statistics

The main objective of the Familiars application (and the PASION Project of which it is part) is to add value to social play when mediated by technology through augmentation. The approach has been to expose the social networking data to the users in order to provoke more socially aware behaviour in the game.

In the first two months of the summative evaluation (15th May – 15th July) there have been 1613 distinct interactions on 292 tasks between 134 individual users.

The average number of users that each player has been involved with in an interaction is 8.82 (median of 14), which means the density of the social network in the game (the percentage of possible social connections that have been made) is 6.63%.

These preliminary results are encouraging and highlight the social nature of the game. In particular the continued growth of the player base without intervention, and the steady increase in the number of interactions shows that it is possible to create a social multiplayer game that is self-sustaining through user generated content.

CONCLUSION

One of the most important ways humans communicate socially is through play. Social games aim to harness this important aspect of play and empower the players to become more aware its impact on their game experiences, both in social games and in general. They aim to encourage player experimentation with their social behaviour to see how they can affect their network without fear of real punitive consequences.

Familiars explores two main aspects of play – how social play changes where communication is mediated by mobile devices, and how exposing a player to the nature of their "social graph" can make the player more aware of how important context is in communication.

Through integration with socially enhanced PASION technologies, the game allows relationships to be visualised, allowing players to develop strategic connections to important players, encourage novice players, and generally better manage their network of mediated acquaintances. Harnessing user-generated content as a central point of the game allows a depth of experience that would be prohibitively expensive to replicate in an entirely developer-driven game.

This paper has described the series of formative evaluations has refined the design and interface of the game considerably and prepared the application for general release in a series of public summative evaluations. The first summative evaluation started in May 2008 and includes hundreds of volunteers in an extended trial of the game. Such a significant sized community of players creates a great opportunity to study how their social behaviour and strategies evolve.

The usage data from the summative evaluation of the game shows a strong self-sustaining community of players that is growing every day and giving us valuable insight into the nature of social play in games mediated by technology.

In the course of this process of social experimentation, the volunteers in the trial and future public players gain insights into the effects of their normal social behaviour in game environments. By applying successful strategies learned in the game for managing their social network outside the game, the players become more empathic social communicators.

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