Mobile Camera Gaming: Using camera enabled mobile phones for photo playing

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Abstract: As the mobile phone's camera is becoming the most widely available consumer tool for media creation it also opens new possibilities for casual and social form of mobile gaming. This paper presents a concept of using photos in a guess-the-word type of games, describing the design and development process of one such a game line, and how the game concept and design evolved during the process. The games are intended as proof of concept for using mobile photos in games.

1 Introduction

The mobile phone is becoming the most common computer platform for media creation, media sharing and gaming available for the consumers. As the camera has become a standard feature in mobile phones, new possibilities for visualizing personal communications and social interaction have emerged. Expressing emotions and joking are among the most common activities the mobile phone's camera is used for, especially, but not exclusively, among younger users [Mä00, HST05]. This kind of user-originated playfulness with the camera and digital images taken with it is hinting in favor of using the camera and the photos in applications inherently designed as playful or even as full-blown games.

At the same time digital play is shifting from the adolescent male-oriented entertainment into more diverse experiences and playful activities serving other functions [Pa09]. This trend has been noticed in several platforms; e.g. PCs have web browser based games or small downloadables, consoles have XBOX Live Arcade and Wii's mimetic user interface.

Mobile gaming has had many characteristics of casual gaming since the beginning with Nokia's Snake. With the development in mobile phone technology the game designs started to resemble the traditional console and hand held console games; some of them appealing to the more "hardcore" players. However, the mobile games' role as quick time wasters is still holding on. Easy accessibility, short play sessions and simple gameplay are among the key design features that seem to be associated with mobile gaming and are becoming more and more popular in other platforms with the "casual revolution" or "normalization of digital play".

Mobile gaming field is dominated by similar games that are available for other platforms as well – most games are either remakes or use recycled themes and ideas. However, the mobile phone has many unique characteristics that even other mobile gaming platforms cannot offer. In addition to advantageous technical features, like wide reaching wireless network connectivity and built-in camera, the interesting characteristic are the phone's primary function, i.e. it is a device for social interaction and communication, and the availability of context information, e.g. location [Pa09, HST05]. Together with the camera these social features enable new kinds of game designs for mobile use. The use of camera alone in games in certain ways makes use of the social nature of the mobile phone, bringing out the behavior noted in [Mä00].

This paper describes the design and development of one such a camera game that combines the playful interaction around mobile photos with the casual gameplay experience.

1.1 Related gaming and technology

Camera technology has been used in various forms and different platforms of gaming in the past with varying success – the breakthrough to mainstream still waiting. This section gives some examples on games and playful applications that utilize camera in some way.

Nintendo Duck Hunt and other similar light gun games are not commonly perceived camera games, but the technology used for targeting is comparable to camera sensors. The light gun's sensor detects the change of light in rapidly flashing frames when the trigger is pressed while the gun is pointed at the screen. This way it can determine where on the screen the gun was pointed.

Sony Eyetoy[1] is a camera device for PlayStation 2 console. It has been succeeded by *PlayStation Eye* for the PlayStation 3. Eyetoy is amongst the most well known camera gaming devices. The games usually use player's movement as input. The latest developments in console gaming suggest that camera will have a big role in future game applications, for example see *Microsoft's Project Natal*[2].

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[1] www.eyetoy.com
[2] www.xbox.com:80/en-US/live/projectnatal/

MAR (Mobile Augmented Reality) Toolkit [TK07] is an augmented reality toolset built on top of MUPE[3] (www.mupe.net). MAR Toolkit's POT (Physical Object Tagger) component provides a way to bring tagged objects from the real world into the virtual world by using the camera of the mobile phone to read 2D VisualCode tags. A game called *Mupeland Yard* demonstrates the use of the toolkit's functionalities. The basic game-play is deprived from the board game "Scotland Yard". The POT is used to provide players information at game specific locations, e.g. clues at a crime scene. Capturing a criminal takes place if a detective arrives and reads a tag within few minutes after the criminal has activated it.

Mozzies was a game pre-installed on the Siemens SX-1 mobile phone. The game augmented the video feed by superimposing mosquitoes on it. The player's task was to shoot down mosquitoes by moving the phone to aim.

Hot Shot Photo D.A.R.T.S.[4] uses mobile phone's camera to sense movement like Mozzies, but doesn't use augmented video feed. It has various games where you aim and throw objects, for example darts or tomatoes, at a target. The camera is used to track the phone's movement when aiming. It also allows the user to take a picture, of a person for example, and use it as a target in the game.

ARhrrrr[5] is an augmented reality game designed for mobile platform. It is a concept demonstration of first-person shooter game where the mobile device provides a window into a 3D town overrun by zombies.

Comeks[6] is a photo blogger that lets users create playful pictures by combining photos with speech bubbles and other comic-related accessories in a mobile phone or online. Comeks started as a comic story creator using MMS to deliver the comics to recipients. Comeks provides a playful way for communication using a camera phone and photos. [Sa07]

Assassin is a mobile multiplayer camera game that uses the photos taken with mobile phone's camera as the main form of player-to-player interaction. The goal of the game is to "assassinate" designated targets (other players) by taking photos of them without being noticed. The game is meant to be played in the background of other activities, such as a working day. The photo taken of an assigned target is sent to the target player for judgment. Thus, the game mechanic relies on player's honesty. Another option is to use peer review for judging the success of an attack. The experiences with Assassin suggest that mobile camera gaming is interesting and valid form of gaming [KRS06].

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[3] www.mupe.net
[4] www.gosub60.com/MOBILE%20GAMES/Hot%20Shot%20Photo%20D.A.R.T.S..html
[5] www.augmentedenvironments.org/lab/research/handheld-ar/arhrrrr/
[6] www.comeks.com

1.2 Utilizing camera in games

As the examples in Chapter 1.1 show there are several ways of using the camera in games:

As a sensor – The image/video feed can be used to sense motion, either the motion of something or someone moving in the video or the movement of the camera itself. The video feed can also be interpreted as an abstract signal that is used to represent something in the game, e.g. red color is the energy needed to cast a spell.

To augment reality – Phone's display is as a view into the game world. The graphical user interface and game elements and objects are superimposed on the camera's video feed.

To read barcodes or 2D-tags – The tags can be used to represent game objects in the real world for a quick-and-dirty location based gaming, or they can be used to bring the real world objects into the game world.

To take photos – Photos can be used as game elements or to verify that the player has completed a task, for example in treasure hunt type of games.

2 Designing and developing a mobile camera game

The basic concept for the game(s) presented here was to use photos taken with the mobile phone's camera to make picture quizzes for players to solve. A player composes a quiz by associating a photo he takes with a word. The photo is presented to other players who then try to guess the word.

The following is the original gameplay scenario written before the development of the first prototype. It describes some features that were not implemented in the prototype, but were added later and some that were not implemented at all, e.g. the SMS invitation, as the development platform did not support it at that stage.

Fred is hanging out at the mall spending his spare time when he gets an invitation SMS to the game. One of his friends has set up a game and is waiting for people to join. One more invited player joins and two wander in from the server. So, they have got a total of five players and the game is ready to begin...

Fred's turn is first. He gets the word "milkshake" from the game server. He now has 10 minutes (the time chosen when setting up the game) to take the photo to act as a clue for the word.

At first Fred thinks of going to the nearest burger restaurant and taking a picture of a milkshake, but it would be too obvious. Instead he runs to the nearest grocery store and takes a picture of his hand shaking a milk carton. It's a blurry picture, but he thinks it'll work. The picture is sent to the other players and Fred waits for their answers.

After 5 minutes (the max. time they chose for responding) the results are in. Three of the four other players got the right answer. So, Fred and the three others get points, but not as many as Fred had hoped for.

Now it is some other player's turn and Fred is one of the players who try to guess the word. He thinks he now has time for a quick burger, but when he's at the counter paying for his burger, he gets a picture and has five minutes to come up with an answer. "Wow, that was fast", he thinks looking at the picture while carrying his food to the table. He quickly tries to figure out the clue in the picture. Finally he settles for an answer and sends it. It turns out that no one got it right and the player, whose turn it was, loses points.

The game goes on until the chosen condition is met. In this case they chose to play for three rounds and the winner is the player with the most points.

2.1 MUPE

MUPE (Multi-User Publishing Environment) is an open-source platform for creating mobile multi-user contex-aware applications, such as games. The platform was originally created in Nokia Research Center.

The MUPE application platform has a client-server architecture, where the end user uses a MIDP 2.0 midlet to connect to servers in the Internet. MUPE Master Server can be used to advertise the servers and mediate the connection information to the clients. Thus, only a single client application is required to enable easy connection to different applications and services. The only component in a basic MUPE application that requires programming is the server; in the MUPE paradigm the server is the application. The client user interface (UI) is created with client UI scripts (XML) that are downloaded to the client from the server. All parts of MUPE are made with Java (J2ME and J2SE).

See *www.mupe.net* and *betalabs.nokia.com/betas/view/mupe* for more information.

2.2 The first iteration – The working prototype

The essential features of the first working prototype are:

Session based – The game server can run multiple instances of the game. The players can either create a new game and wait for players to join in or join a game others have created by selecting a game on the list of available games. A game instance is played for a certain number of rounds (set by the player who created the game instance).

Minimum of four players required – This is for the point scoring system to work. The optimal number of players being around six. Maximum number of players is defined by the server's abilities and the MUPE platform, but more than 10 is not advised because of the flow of the game.

Scoring – The quiz creator's object is to get as low number of correct answers as he can while still getting at least one correct answer. The players with correct answers and the quiz creator are dealt points according to how many get the correct answer. The more correct answers, the less points. If there are no correct answers or all the players get it right, the quiz creator loses points and others get none. Player can choose to give an own word for the quiz or take a risk and be given a random word from the server. The random word giving him double points (the negative points are also doubled, if that is the case).

Other key features – The game works in a turn based game mode, where one player at a time creates a quiz and others answer. A chat option is provided while players are waiting. The number of letters in the word is given out as a clue. The game has a simple graphical interface for prototyping purposes (show in Figure 1).

Figure 1: Screenshots from the first working prototype

2.3 Second iteration – CamQuiz

There were some notable changes in Cam Quiz compared to the first iteration (see Chapter 3. for reasons behind the changes). Two most important ones, timers and new round mode, were added to address the issue of waiting times during the playing. Timers, set separately for creating the quiz and answering, indicate the maximum waiting time left until the game proceeds to the next phase. The game creator can choose the new All-At-Once mode, where all players create quizzes at the same time. After they are done the game proceeds to the answering phase where all the players answer all the quizzes created by others. Another available option is to set how many times the Random Word is available for the players: Not Available, Once, Always. Lastly CamQuiz had new graphical look and UI (Figure 2).

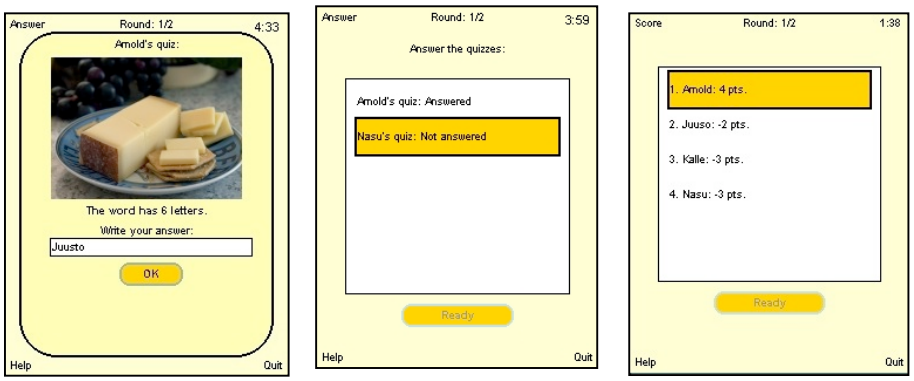

Figure 2: Screenshots from the second iteration

2.4 Third iteration – CamQ

The third iteration brought along major changes (see Chapter 3. for reasons behind the changes). The basic concept of using photos to make quizzes stayed, but otherwise the game could be classified as a different game. The biggest change was that CamQ was persistent and asynchronous instead of session based. There is only one game instance that keeps on "living" on the server and all players take part in the same game, the number of players being limited only by the capabilities of the platform and the server. Player can login anytime to play and his playtime isn't limited on either end and is not dependent of other players.

The player can now create as many quizzes as he wants. They are added into the quiz database for other players to answer. Each player is randomly given a quiz to answer. After answering a quiz he gets another one. The player does not have to answer the current quiz immediately and can even leave the game and come back later to answer. Quizzes are now created by taking a photo and giving three words to describe it (no random words from the server). An optional textual clue can also be given. When answering, the player is presented with the photo, the optional clue (if given), and the number of letters for each answer. He then gives 1-3 words (blank answers are allowed) and an optional comment about the quiz or message to the quiz creator or other players. The comments given can be viewed by the quiz creator any time or by other players after they have answered the quiz. The objective for the quiz creator is to get an equal amount of correct and false answers. When answering, the objective is to get as much correct answers as possible.

Graphics and user interface were redone completely (figure 3).

Figure 3: Screenshots from the third iteration

3 Evaluation

The game was evaluated and tested in various ways and the experiences and feedback from the tests were taken into account in all development iterations.

3.1 In-house testing and evaluation

The in-house testing started by prototyping the basic game concept with SMS and MMS messages with one person acting as a game master and running the game. This simple prototyping pointed out some problems, most notably that the quizzes needed something more than only the photo to be solved easily enough. This led to using the number of letters as a clue. The prototyping also helped in balancing the point scoring system.

The in-house testing continued throughout the development process to find problems in both the gameplay and the technical implementation.

3.2 Concept and gameplay evaluation using the working prototype

The first working prototype was used in a focus group session where outsiders played the game. A group of 5 players played the game 3 times in a row. The playing was observed and the players were allowed and encouraged to comment on anything related to the game during playing and afterward in a freeform group interview session. The general opinion was that the concept of the game was good – they found the idea of using photos in a word guessing game fun and interesting.

The most important notes and observations of the session are summarized as following:

Number of players – Game should be aimed and optimized for groups of 4-5 people. Originally max. 10 players. However, groups of 10 players are highly unrealistic. Platform and game needs to be tested for tens and hundreds players playing simultaneously in different game instances.

Mode of play – The advantages and disadvantages of persistent, session based, asynchronous and synchronous gameplay need to be examined in more detail. Waiting times in the prototype are too long.

Social aspects – Getting help from people not in game (friends, strangers) is an interesting social feature. Playing in the same physical location vs. playing away from each other creates different kinds of play experiences, both having interesting social aspects. Seeing other players' wrong (and funny) answers is an essential feature. Chat feature adds to the game and makes the waiting times more tolerable.

After the findings in the focus group and in-house testing the game concept was taken into two different directions - first CamQuiz (described in chapter 2.3) and then CamQ (described in chapter 2.4).

3.3 Evaluating the final iteration

The final prototype was tested using two different approaches. The first was a test run of one week with five players. The objective was to evaluate the game's appeal to players. The test players were of the opinion that the game was "too simple", "not enough gamelike" and "hard to grasp". However, the player's impression of the game was likely affected by technical problems during the test period. According to the players, the game needs more "flashy" and appealing presentation to be more gamelike. This is an issue that is partly due to the restrictions of the MUPE development platform. One of the most problematic areas in the platform was taking photos, as the full camera controls that the players were used to in the phone's camera mode were not available. The players also commented on the game concept not being interesting enough, but when presented with the concept of the second iteration, i.e. synchronous session based version, they showed more interest. They also needed more content for the game, as starting with an empty server and only 5 players didn't result into many quizzes being created. They found creating quizzes to be a difficult task and needed more examples – an issue we anticipated, but didn't want to address at this point to see the players' reactions.

The second test was an event-based game during a Nokia Spring Day event for Nokia Research Center's employees; the game was open for play over a weekend, but most of the playing was supposed to happen over a 7-hour time span on the day after the weekend. From the opening of the server until the end of the event 67 players registered into the game. Their combined number of logins was 136. The players created 25 quizzes and submitted 297 answer words in 137 answer submissions, showing that the answering side of the game is clearly more approachable by first time users. The test was done for technical testing and to gather some usage data. No user interviews were conducted.

To summarize, the most important finding was that the answering side of the game is clearly more approachable by first time users than the quiz creation. The essential difference in the tests was that in the second test the users were colleagues and at least somewhat familiar with each other. This probably led to a more relaxed and open attitude towards creating the quizzes and answering them – joking, displays of opinions and playful attitude etc. was observed. The kind of social interaction noticeable in the second test is similar to what is commonly noticed around mobile phone pictures and snapshot photography [Mä00, Sa04, HST05].

4 Discussion

The testing revealed some issues in both the game concept and the technical implementation. The basic concept of using photos in a guess-the-word type of games was generally viewed as interesting and fun, so as a proof of concept the games were successful, but the games need more usable and attractive implementation to be interesting enough for the users. One of the biggest difficulties for new players was the creation of a quiz. This can be overcome in CamQ by having pre-made example quizzes on the server for players to see and answer.

The choice of MUPE as the development platform was good for quick-and-dirty prototyping, but proved to be inadequate for creating an appealing polished game product, because of the restrictions in building a graphical UI and other technical issues resulting in instability and glitches. However, these problems were to be expected as the platform was in development at the time. With the new touch screen mobile phones, the games could benefit from more intuitive navigation and controls in the game, for example when browsing through answered quizzes. Another interesting topic for future work could be a cross-platform implementation between mobile phone and web, for example Facebook. The game could be also used for a playful tagging application for photos the users have already taken – the most frequent answer words used as tags in Facebook, Flickr etc.

As a conclusion, using photos taken with a mobile phone's camera in casual and social type of games, like the ones presented in this paper, is an interesting and appealing concept. Mobile and cross-platform camera/photo gaming is an interesting topic worth looking into considering all the buzz and playful activity around photo sharing and mobile photography. However, as in all game development the game concept and implementation need to fuse together to make a finished product.

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