Mister X mobile – An Innovative Location-Based Multiplayer Game

Mark Schmatz  
University of Bonn  
Bonn, Germany  
schmatz@cs.uni-bonn.de

Pascal Bihler  
University of Bonn  
Bonn, Germany  
bihler@cs.uni-bonn.de

Holger Mügge  
University of Bonn  
Bonn, Germany  
muegge@cs.uni-bonn.de

Yuri Veremeyenko  
University of Bonn  
Bonn, Germany  
veremey@cs.uni-bonn.de

Armin B. Cremers  
University of Bonn  
Bonn, Germany  
abc@cs.uni-bonn.de

ABSTRACT
In this paper we introduce Mister X mobile, an innovative hide-and-seek game which is part of the Adaptive Mobile Gaming research project of the University of Bonn in cooperation with and funded by Deutsche Telekom. It is an adoption of the famous German board game Scotland Yard by Ravensburger Spieleverlag GmbH. Besides being a location-based mobile version of Scotland Yard it comes with plenty of additional features concerning game flow, strategic planning, and sustainability. The latter is achieved by designing the game with respect to an emerging community which again enhances the fun of playing. To cover just a few highlights Mister X mobile includes communication features like conference calls and server-side SMS generation. Via a build-in game shop tools, services, and extra features, carrying special semantics and strategic avail, can be purchased.

Keywords  
Location-Based Gaming, Mobile Gaming, GPS, Multiplayer, Game, Localization, Scotland Yard, Mister X, iPhone, Rails

1. INTRODUCTION
There are several characteristics of LB games. They all have some means of localization in common which can be sensed by GSM, WiFi, RFID, or GPS. In order to play LB games suitable devices are needed, small enough to carry them. Basically, mobile phones and GSM/GPS are used. While having GSM localization built in they can be enhanced with GPS by respective devices connected via Bluetooth. Some modern phones already have GPS embedded.

The choice of visualisation splits up LB game players into two groups. The one preferring a map and the one which don’t. Both perspectives have advantages: playing with a map showing the exact\(^1\) and current position appeals the more technical affined players. On the other hand, not having a map activates imagination and allows for other game flows besides the real-world urban planning.

Although, many LB games are played alone – as for example with interactive city guides or quizzes – the amount of multiplayer LB games increases. It is the special attraction in playing together outdoor in e.g. teams and moving around. Multiplayer games in general – not only LB games – are predestinated for communities, even more if the games are set up for competitions where two or more teams play against each other. In such cases a very crucial part of these games are web portals where names, high scores, etc. are listed and visible to the world. The effect is simple: knowing that all achievements within the game are recorded and visible to others increases the appeal to play more often in order to improve steadily.

2. MISTER X MOBILE – THE GAME
2.1 The board game
Mister X mobile is based on the Scotland Yard board game in which a couple of detectives try to catch one Mr. X collaboratively. The setting is the city centre of London which is depicted as a coarse-grained map which is in turn pervaded with three different kinds of streets crossing each other (as depicted in the cutout picture 1). Depending on the kind of transportation you can move from node to node by bus, taxi, or subway. All players have to pay a chip for each move to Mr. X. Because of that Mr. X can move de facto unlimited times.

Mr. X always knows the exact position of the detectives (he can see their tokens) but reveals his own position only every five moves. In order to be able to retrace, Mr. X privately keeps track of his moves on a sheet of paper.

The game is over when either all detectives have run out of chips (Mr. X has won) or Mr. X has been caught which is the case if a detective’s token has been set on the same node where Mr. X is located (the detectives have won).

2.2 Adaptation for a mixed-reality world
Mister X mobile is developed within the Adaptive Mobile Gaming[4] research project of the University of Bonn in

\(^1\)Exactness is relative to the localisation technique.
cooperation with Deutsche Telekom and is an outdoor hide-and-seek game played on mobile devices with GPS support. It is an adoption of the well-known German board game Scotland Yard[2]. While one player – having the Mr. X role – advances, the mission of the other players – the detectives – is to hunt Mr. X.

All players have mobile devices running the Mister X mobile game which mainly provides a map where all participants are displayed according to their position. Like in the board game, Mr. X is only visible from time to time to the detectives while he is always able to track the detectives’ current position. Via conference calls the detectives can interact and discuss strategic plans.

Plenty of special features are available like e.g. wiretaps (which enable Mr. X to privily listen to conference calls), smoke bombs (which obscure the surrounding area), and sound screamers (which immediately attract attention to the addressed player in a crowded place). Those features can either be found and collected on the map or have to be purchased in the game shop. Because of the latter each detective has an initial amount of play money. The amount can be increased by collecting coins which are spread every now and then within the gaming area. The amount of each purchase is transferred to Mr. X’s account. This is the tribute to the board game where detectives pay their tickets (for transportation with bus, taxi, or underground) to Mr. X.

For further information on game design consult [1].

End of game is indicated by either each detective presses the “Give Up” button or Mr. X does so which happens by the time the detectives have caught him.

Usually, a Mister X mobile session is played by three to six people and lasts from 25 to 80 minutes, depending on the urban character and density of the population. Figure 2 depicts some common screens while playing Mister X mobile.

### 2.3 Implementation

Mister X mobile is developed as a native iPhone application having the complete game logic residing on the server-side. The server application is written in Ruby on Rails[3]. We’ve developed a specific XML-based protocol used for exchanging actions between clients and server. The protocol is generically designed so that it can be used not only for Mister X mobile but also for other location-based games.

Besides the iPhone implementation an Android and a web-based variant is being developed. All clients (iPhone, Android, web browser) use the same protocol to communicate with the server which in turn has no client specific code and therefore can be utilized generically.

### 3. CLIENT SERVER COMMUNICATION

Mr. X server communicates with the clients using the HTTP protocol as a transport for the application-specific data. On the application level, there is another simple and extensible protocol, called the Action Exchange Protocol. It was introduced to match the following considerations:

**Ease of processing.**

Ease of processing means the protocol should be easy to parse and interpret on both, client and server sides. This most probably limits the choice to the text-based protocols, since it’s relatively easy to write a parser in comparison to a binary protocol; moreover, the text-based protocol can be easily read and understood by a programmer without any special tools. This comes in handy during debugging. Since the protocol is XML-based data can be utilized by a number of XML parsers for virtually any language. Mapping a data structure into XML is normally an easy task.

**Correspondence to the game flow.**

On the abstract level, the game can be described as a series of actions performed over time. Picking items, moving, starting and leaving game are action examples. The protocol must be well suited to easily convey a series of actions from a client to the server and back. The protocol is action-based. Each action is encapsulated in a tag. The action-specific parameters are mapped as tag attributes, and the tag value contains the principal information this action conveys.

**Extensibility.**

As the game development progresses, more new actions are added. The protocol has to accommodate for the changes resulting, and make it easy to modify existing actions. For each new action, one has to design its XML representation and include it into the schema. The tag name corresponds to the action ID, so it’s easy to organize parsing and processing of the actions on the server side in a uniform and generic way.

**Fault-tolerance.**
The mobile clients tend to lose connection to the Internet frequently. Therefore the protocol has to be robust with respect to the transmission errors. A two-way acknowledgement scheme is incorporated into the protocol. Both the client and server have to confirm every action they received, and expect the confirmation from the party they send information to. In case an acknowledgement is not received, the corresponding request will be resent until the acknowledgement arrives.

4. RESEARCH TOPICS

We evaluated our recent prototype by many gaming sessions with teenagers, teachers and gaming experts, and we arranged a set of focus group test[5]. Currently we are performing a systematic evaluation of gaming experience both quantitatively and qualitatively.

The main problem of transferring the board game to the mobile outdoor setting has been solved by a combination of technical and non-technical features. First, the telecommunication features, in particular the conference call option, enables to share gaming experience between players. The jointly used in-game market for game features enforces cooperation among the detectives. Having two players share one device instead of letting them all play “alone” supports cooperation and enhances the game experience, as we noticed in several sessions. For the design of further multiplayer games we concluded, that the game mechanics should enforce real meetings of players to proceed (e.g. puzzles that can only be solved placing multiple screens next to each other). We integrated a game observation client that enables live game spotting and interaction with the game mechanics. Analyzing how the auditorium could meaningful interact with an ongoing game is one of our next goals. Another open question is, how the gamer community can be supported adequately. A main aspect of long-term player motivation are comparable performance values (high-scores) and persistent game artefacts. Hence, we plan to analyze how long-term player status and inventories can be designed.

5. DEMONSTRATION

In the demonstration we want to present and play the game interactively. At least three people are needed; two playing detectives and one having the Mr. X role. During the demonstration we’ll go over all typical scenarios which can occur in the game play. This covers hiding (as Mr. X), seeking and catching Mr. X (as the detectives), and finding and applying items. The demonstration will show that the different items available can be applied in arbitrary situations to gain advantage and influence the game flow and strategic planning of the players.

6. EQUIPMENT, SPACE, SETUP TIME

For the game as many iPhones as players (at least three) are needed. We take care to bring the iPhones. Additionally, a stationary computer connected to the internet is required for maintenance.

Concerning the gaming area, it would be ideal if it is a bit confusing in the sense that the players cannot see each other by looking around. Narrow streets and lanes are perfect. A circumference of approximately one kilometer (0.6 miles) is adequate.

All iPhones must be connected to the internet via UMTS (temporarily having GPRS would be acceptable). Furthermore, a clear GPS signal is mandatory. About 45 minutes are required in order to prepare the devices and advise the players.2

7. CONCLUSION

In this paper we’ve introduced Mister X mobile, a location-based mobile multi-player game which is developed within the Adaptive Mobile Gaming research project of the University of Bonn in cooperation with Deutsche Telekom. Mister X mobile is based on the game concepts and ideas of the German board game Scotland Yard published by Ravensburger.

The game flow and strategic elements were seen as very good adapted from the board game[5]. The main differences compared to the board game relate to communication (not sitting around a table vis-a-vis but running outside not seeing each other) and non-discrete paying for movement (instead of paying a single chip for transportation). Both, gamers and Ravensburger considered these differences as successfully transferred.

Due to the lack of more devices, all game sessions were carried out with four to six iPhones in total. Since we have borrowed all our devices for each game session long queues occurred with gamers waiting for their session to begin.

The generic protocol was created with respect to the aim of building a generic gaming software development kit. By now it’s used to develop different concrete games. Mr. X is one manifestation of it.

Mister X mobile is still in work in progress and will be published later this year in Apple’s AppStore. The gaming SDK will be published in late 2010.

8. ADDITIONAL AUTHORS

Ronald Fromm, Katja Henke (ronald.fromm, katja.henke@telekom.de), and Daniel von Heynitz (daniel.vonheynitz@t-systems.com) all from Telekom Laboratories, Berlin, Germany.

9. REFERENCES


2Given that all players have never played Mister X mobile.