

# *SYGo* – a location-based game adapted from the board game *Scotland Yard*

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**Abstract.** In this paper we introduce *SYGo*, an innovative hide-and-seek game which is part of the AMOGA 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. 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 since the game is designed with respect to an emerging community which again enhances the fun of playing. To cover just a few highlights *SYGo* 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. The main focus of this paper is presenting results from accomplished user experiences, focus group tests, and professional test sessions carried out by us, Deutsche Telekom, and Ravensburger.

**Key words:** Location-Based Gaming, Mobile Gaming, GPS, Localization, Scotland Yard, iPhone

## 1 Introduction

There are several characteristics of location-based games. They all have some means of localization in common which can be for example 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.

Two camps of LB game players exist. The one preferring a map and the one which don't. Both perspectives have advantages: playing with a map showing

the exact<sup>1</sup> 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, it is possible to play alone – as for example with interactive city guides or quizzes – the majority of LB games are multiplayer games. 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.

In the following some related mobile games are presented. Section 3 describes our location-based mobile adaptation of the Scotland Yard board game. Section 4 covers our experiences we've made during two real-world game sessions with students and adults from Malmoe, Sweden and Remscheid, Germany. Section 5 relates to focus group tests carried out by Deutsche Telekom[1] in order to identify potential target groups and how the game is perceived by different people respectively focus groups. Section 6 comments on how professionals at Ravensburger[2] test new game prototypes. The last section summarizes this paper.

## 2 Related Work

Many location-based games are known with nearly all imaginable shapes. In the following some of them are depicted in short:

*BotFighters*[3] was one of the world's first location-based mobile game released in 2000 in Sweden. The mission of this game is to locate and destroy other robots. Once a target has been destroyed, the respective player earned credits for that and advanced on the high score list. The credits can be used for buying new weapons, recharge the robot's battery, and other upgrades of the robot on the BotFighters website.

*Pac-Manhattan*[4] Pac-Manhattan is a large-scale urban game that utilizes the New York City grid to recreate the 1980's video game sensation Pac-Man. A player dressed as Pac-man will run around the Washington square park area of Manhattan while attempting to collect all of the virtual "dots" that run the length of the streets. Four players dressed as the ghosts Inky, Blinky, Pinky and Clyde will attempt to catch Pac-man before all of the dots are collected.

Pac-man and the ghosts will be tracked from a central location and their progress will be broadcast over the internet for viewers from around the world.

<sup>1</sup> Whereas exactness is relative if having only GSM localization.

*On the streets*[5] is played in a part of a city that is divided into squares (fields). Players are organized in gangs of 2-6 players that are controlled by a boss who is located in the “homebase” (a desktop PC). The goal of the game for each gang is to gain power and influence in the city by capturing as much territory as possible or even to capture the homebase of all other gangs. All players have a virtual map of the game territory on their devices where they can retrieve detailed information about the field they are currently in and the eight surrounding fields. They also have access to their inventory and their character stats indicating their player and gang identity, their life energy and others.

When players enter an empty field it is automatically passed into their holdings. If one player enters an occupied field both attacker and defender can choose whether to fight for it by virtual means or to flee quickly. Fighting players and being hit will lose life energy, which can be recharged in hospitals. If a player misses to recharge himself soon enough he will become deactivated and can only reactivate himself in his homebase, as long as it is in the holding of his gang.

*Tourality*[6] Equipped with a mobile phone and GPS the challenge is to reach spots before the opponents do. A spot is a certain point on a virtual map that a player has to reach in reality. While moving by foot or via any kind of transportation the real position is tracked by GPS and shown on the display. Tourality shows the position of all participating players as well as the spots to reach on your mobile phone. Besides knowing all the spots still to reach, the players get information about they assert themselves compared to the others.

### 3 SYGo

SYGo is developed within the AMOGA[7] research project of the University of Bonn in cooperation with Deutsche Telekom and is an outdoor hide-and-peek 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 duty of the rest – the detectives – is to hunt Mr. X.

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

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), to mention just a view. 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 a 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.

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 SYGo 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 1 depict some common screens while playing SYGo.



**Fig. 1.** SYGo screenshots: the map builds the center of the game. Via menu items you have access to e.g. the shop.

### 3.1 The board game

As mentioned before SYGo 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 2). Depending on the kind you can move from node to node by bus, taxi, or subway. Detectives have to pay a chip for each move to Mr. X. Mr. X can move without paying.

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

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



Fig. 2. A cutout from the Scotland Yard board game.

### 3.2 Implementation

SYGo is developed as a native iPhone application whereat the complete game logic resides on the server-side. The server application is written in Ruby on Rails[10]. 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 SYGo but also for other location-based games.

## 4 Experiences with SYGo

In the following we present user experiences with SYGo. Basically, we've introduced and explained the game to the students and adults and invited them to play one or more sessions. After playing we've interviewed every player. The following sums up the oral reports.

#### 4.1 Nordic-Gaming convention Malmoe, Sweden

At the Nordic-Gaming convention in Malmoe we've had a first opportunity to present our game to local school-children. A professional actress gave an introduction to the game and performed on a background story line while playing and acting as Mr. X. She also moderated the game and led the detectives through the gaming area. The groups averaged at about 2 to 3 participants per device, sharing 4 to 5 devices (1 Mr. X and 3 to 4 detective groups). All participants were predominantly children of both genders aged from 10 to 14 years.

The first day, briefed guides accompanied the groups, assisting in handling the devices and shorten the technical briefing before start. The setting, the old city centre of Malmoe around Gustav Adolf's Torg, contained narrow streets, many junctions, and crossings. While providing a rich diversity of alternative routes to escape and prevent a too easy encircling Malmoe shaped up as an excellent location for hide and seek like games.

Although accompanied by the actress and set in a nice surrounding story line, the participants' initial motivation was low. In the first place, this was due to a video games trade fair taking place at the same time nearby. Potential players were attracted by announcing a prize for the best team. The overall motivation was very high. Most participants who finished a session, wanted to play once again.

#### 4.2 Games convention Akademie Remscheid, Germany

At the games convention in Remscheid the game was presented to a more mixed audience. Our participants were introduced to the game concept and device handling with printed guides and a short briefing before start. The groups averaged about 5 to 9 participants sharing 4 devices (1 Mr. X and 3 detective groups). The participants' age varied from 14 to 54 years.

A high initial acceptance from younger participants could be observed. Even in bad weather conditions game sessions could be performed outside, resulting in happy but exhausted and wet players. Lower initial and overall acceptance due to minor handling difficulties and unawareness of the new technology was noticed on older participants. All participants appraised the combination of the new iPhone technology and location-based gaming concepts as an absorbing innovative and compelling experience.

In both occasions, the use of tactical finesse and planning increased significantly in groups which already had attended a game session before. Tactics like misleading the detective groups by making use of exact timing of the revelation countdown and changing the direction thereafter and a concerted encircling approach by the detectives were recurrently observed to be autonomously developed by the different participant groups. While some groups chose a more tactical approach by encircling Mr. X, others relied on their fitness and running

skills to chase him. The game rules were either recollected from earlier board game experiences or quickly adapted after being shortly briefed. The gadget features were used extensively. Especially the money-collecting feature presented some inducement to the players which lead to unexpected gaming approaches, resulting in some groups merely trying to collect all the virtual money piles.

## 5 Focus group tests

In order to get realistic estimations whether the game has chances to come on the market from a commercial point of view Deutsche Telekom has arranged so called focus group tests. They give evidence who would play the game respectively what has to be changed in order to expand the community.

Mobile Gaming is still a new concept. In order to create successful games the user's likes and dislikes in respect to both game design and monetary aspects have to be taken into account. The investigation of driving the user's attitudes towards new concepts and billing models is a complex task. Therefore we used a qualitative approach and conducted five focus groups with different user segmentations (eight subjects per group). The characteristics of *location-based* and *strategy multiplayer* games<sup>2</sup> were explained and contrasted. The participants discussed both concepts intensively while verbal protocols and audio/video data were recorded. In addition, four items of the *AttrakDiff 2.0*[11] questionnaire were used to estimate the attitude towards the considered game concepts. Finally, a two minutes video clip of SYGo was presented.

The focus group data was analyzed by grounded theory methods[12]. The focus within this paper is on findings on an atypical user group which we characterize as board gamers. The participants were chosen because they are highly affine to board and other non-digital games but barely respectively never play digital games. Besides other defined criteria the subjects play digital games less than once a month while playing board games regularly and more than once a month and are 33 years of age (on average).

Two questions we investigated in are discussed here:

1. Is the concept of mobile gaming attractive to board gamers?
2. What are the likes and dislikes of the mobile gaming concept from their perspective?

### 5.1 Results

As depicted in figure 3 the acceptance of SYGo in the board gamers group was mainly positive (see items *Gut* vs. *Schlecht* and *Angenehm* vs. *Unangenehm*<sup>3</sup>).

<sup>2</sup> like e.g. *Seafight*[8] and *Travian*[9].

<sup>3</sup> *Good* vs. *Bad* and *Comfortable* vs. *Aggravating*

The majority of the participants said that they “like the idea”, called it “funny” and “exciting” and would “like to try it out”. Considered as a very positive difference to common digital games is that mobile gaming with respect to SYGo has a strong social component (see item *Bringt mich den Leuten näher* vs. *Trennt mich von Leuten*<sup>4</sup>), is played outdoors and physical, and is ambient-interactive. Furthermore, the fact that SYGo is user-interactive via several communication and collaboration means was positively rated, too.



**Fig. 3.** Ratings of mobile game concepts *strategy multiplayer* (left) and *location-based* (right) with AttrakDiff 2.0 items. A value below zero represents a more negative, zero neutral, and above zero a more positive attitude. Same color indicates same participant.

Although some participants reported about similar game concepts this specific one was experienced as something new by all subjects (see item *Neuartig* vs. *Herkömmlich*<sup>5</sup>). The features of such games were differentiated from common game concepts. One female participant (40 years old) first had stated that she would never play digital games but changed her mind at the point she learned about that concept and watched the SYGo clip. The strategy multiplayer concept was declared as common and has been refused by the majority of the group. Two participants kept rejecting digital games in general.

The costs of mobile internet services, the risks in traffic, the need for a high-end mobile device, and the weather dependency were rated negatively. A complete comparison can be seen in table 1.

## 5.2 Conclusion

All participants differentiated between common game concepts and the concept of location-based games. While all of them declined common classical games the features and the game-play of location-based games was seen as attractive to several participants. This fact led to at least three conclusions.

<sup>4</sup> *Brings me closer to people* vs. *Seperates me from people*

<sup>5</sup> *Novel* vs. *Usual*

Positive	Negative
Socialising	Cost of mobile internet
Innovative	Risks in traffic
Outdoor activity	Addiction risk
Bodily activity	Only for high-end mobiles
Interactive with environment	Weather dependency
Communication possibilities	

**Table 1.** Positive and negative aspects mentioned by participants

1. The concept of location-based games is attractive to a new customer group who is usually not interested in digital games.
2. The attractiveness is strongly related to the possibilities emerging by the technical evolution (e.g. mobile internet, GPS, etc.) of mobile devices.
3. The positively rated aspects of the concept can be picked up and integrated in future game design.
4. A cost transparency for mobile internet usage is seen as a key barrier for this and all other groups we tested.

The focus group tests were accomplished in spring 2009 in Berlin, Germany. They took place in standard test rooms with mirror wall and audio/video recording.

## 6 Test sessions

Tests in several different environments are crucial for a real-life outdoor game like SYGo. To know about the chances and obstacles of rural regions, narrow streets, densely populated or industrial areas, etc. is important for the development of the game.

This section covers the testing procedure for game prototypes which is accomplished by Ravensburger, a game publishing company. This procedure was applied by a couple of editorial journalists who played SYGo for a while. The test took place in Ravensburg<sup>6</sup>, a more rural region in the south of Germany. The results mainly led to some useful improvements concerning the UI design.

The default testing procedure consists of the following four types of tests[13] which were applied during the SYGo test:

1. Functionality tests with *friendly users*. These players can be work colleagues or close friends but should not be the software developers themselves. These tests can be done with simple prototype versions which only provide single

<sup>6</sup> The birthplace of the original Scotland Yard board game.

aspects of the game like game initializing, establishing a conference call, or handling the interface.

2. Game mechanism tests with *game experts* (10 to 20 persons) for computer or board games. These tests should be done with a playable version. A feedback going beyond “I like it” resp. “I don’t like it” can be expected as well as new ideas for improving the interface and the game mechanism.

The above mentioned test in Ravensburg was an expert test.

3. Acceptance tests with a higher number of more *common* people (50 to 100 persons). They give rather basic feedback on what they like and don’t like. Quite often it is not anticipatable how they play the game and which different game flows thereby arise. New and different problems may occur, developers and experts never have come across. These tests help to find out which elements are still difficult to handle or understand for a larger group of people. The focus should always be more on the points which have been depicted by many testers and not so much on single opinions.
4. *Try to break it test* with beta testers (500 to 5000 persons) who test extreme situations and see how the software reacts and whether or not the game mechanism still works. The goal is to find out about bugs in the software and game design.

Typically these four tests should be made in the mentioned order. In some circumstances tests 2. and 3. can be swapped.

## 7 Conclusion

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

Since SYGo will be commercially published three different kinds of tests were applied. First, we collected oral reports from users directly after they have played the game. Secondly, Deutsche Telekom carried out focus group tests to gain information about who will be the target group. Finally, Ravensburger applied their standard testing procedure to tell whether the game complies with different required aspects like UI design, game complexity, and strategic balance. All tests led to some useful improvements mainly related to UI design.

The game flow and strategic elements were seen as very good adapted from the board game. 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.

SYGo is still work in progress and will be published later this year.

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