Navigation Experiences – A Case Study of Riders Accessing an Orientation Game via Smartphones

Annika Worpenberg and Barbara Grüter

University of Applied Sciences Bremen, Flughafenallee 10, 28199 Bremen, Germany
{annika.worpenberg,barbara.grueter}@hs-bremen.de

Abstract. Usability and playability of a game are two dimensions merging into each other and affecting the experience. Within this paper we study the navigation experiences of a small rider group playing an orientation game by means of smartphones. The players are inexperienced in using smartphones and try to reach the first game station. Studying their navigation process we learned how the players adopted the game device, solved a navigation problem and entered the game world. The case study illustrates three development stages of navigational behavior of the rider group in the analyzed mobile game.

Keywords: Mobile Game, Location-based Game, Play Experience, Evaluating Mobile Games, Navigation.

1 Introduction

In consequence of the increasing distribution of smartphones with integrated GPS-sensors more mobile applications and games enter the market, offering experiences in mixed worlds. Using the geographical position and the physical movement of the player as one condition of the interaction mechanics these games combine the everyday world with virtual dimensions. Digital maps are often a core element of the visual interface, integrated to assist the user navigating in the game world. (e.g. GPS Mission, Mister X mobile, Shadow Cities, Ingress). A game is entered through the game controls [2]. This includes also the mastery of the game mechanics, seen as the interface between the player and the game world [9].

Orientation and navigation, finding and tracking a path, are conditions of moving in space. Navigation is an important element interacting with a mobile application. Bouwer et al. (2012) observed the navigational behavior of study participants on a fair. The researchers organized a test with predefined way finding tasks to determine how a mobile application can serve as an aid for orientation and navigation in a fair context and what problems in terms of way finding and usability may occur. The results show that it was difficult for many participants to associate their own view of the map with their perception of their immediate environment. [1] The orientation problems expressed the fact that the users were not able to situate themselves within the mixed world: the real space linked to the digital map.

M. Kurosu (Ed.): Human-Computer Interaction, Part II, HCII 2013, LNCS 8005, pp. 323–332, 2013.

Rukzio et al. (2009) conducted a similar study with pedestrians, comparing navigation behavior using various media, including paper maps and mobile devices. The participants were asked to find predetermined routes in the environment. Results show that many participants did not perceive their direct surroundings and even blind out traffic and other pedestrians. Furthermore they had difficulties establishing the relationship between the information provided by the map and the environment. [10]

The problem is a usability problem. The problem has to be solved to ensure the users access to the mixed world. Our question is, however, if focusing on the usability of a software supporting navigation in space really is enough. Most approaches of usability testing focus the user interface as the direct contact of the user with the system. They single out and test functional relations of particular interface elements and risk to miss the whole. To ensure meaningful measures the entire functional architecture of the system and the complex cognitive and emotional scale of the users might be taken into consideration. [5] Mobile games and applications are used in dynamic fragmented contexts and this might affect the behavior and the perception of the player. [4,6]

This paper applies a more holistic approach in studying the user experience as a moment of the activity process unfolding in time [7]. We analyze the navigation experiences of a group of riders performing an orientation ride. The process-oriented method allows us to analyze synchronized data-streams to reconstruct the user's activity in time and to develop an understanding of the user's experience. The study focuses the rider's navigation process in order to determine how a mobile application, in this case a mobile game running on a smartphone, can become a medium of navigation (and following a medium of game play) for riders who so far navigated by means of paper maps only.

2 The Game Event

The mobile game "Orientierungsritt Ziemendorf" has been developed by the BMBF[1]-research project Landmarks of Mobile Entertainment at the University of Applied Sciences in Bremen in cooperation with the "Vereinigung der Freizeitreiter und –fahrer"[2] Germany (VFD).

2.1 The Game

The game is an orientation ride in the surrounding area of the hotel "Pferde- und Freizeitparadies" in Ziemendorf, a tiny village in the sparsely populated former German border region. It is running on smartphones as a mobile application. An orientation ride is based on the game mechanics of a scavenger hunt [11]. A group of riders

[1] Federal Ministry of Education and Research.
[2] Association of Leisure Riders and Drivers Germany.

moves on a predefined route from station to station and solves tasks. Traditionally, performing an orientation ride needs many volunteers organizing the stations and the tasks during the ride. In this case, the smartphone organizes the play action. Sound and haptic signals alert the riders approaching a station. On arrival the rider receives a task. The fulfillment of the task and the performance is detected by the game system. The way to the next station gets visible, when the task is performed. Beyond that, the game provides a rough overview of the whole route for the players if wished.

The main design goal was to support the experience of riders in the surrounding nature, and to the strengthening the relationship between rider and horse and between the members of the rider group. This aim was accomplished by specific tasks and a system of sensory, auditory and tactile, signals.

2.2 The Play Test

The play test took place during a rider camp in Ziemendorf organized by the VFD. 35 players participated organized in 11 groups. For studying navigation experience in the way it happens we focus on one the groups. The group consists of three women, one of them, Kate, older (52) than the other two, Jane and Mary (14 and 16). The group has a leader, who handles the device and acts as communicator between game on smartphone and group. This role changes during the ride, but has been taken mainly by the 16 year old, Mary. To support the common game and the experience in nature, each group disposes one device.

3 Methods

The method of data collection aims to capture the (game) experience and game activities as a process that develops over time. The collected data include game activities in space and time in form of log files and communication of the players in form of audio files. The players know, that their use of the device, their movements and the total conversations are recorded. They take along a flyer, which explains functionality and interface of the game.

The method of data analysis is process-oriented. The activity of players is monitored, studied and explained with reference to time. The goal is to understand the play experience and its development in the game process. The tool used to analyze the data is ChronoViz[3]. The program allows us to analyze the data streams synchronously and in their temporal sequence. For example the riders are approaching a station; the synchronized data streams allow us to understand the particular event happening; it can be seen where they are, what they say or what task is presented. The temporal order of the data allows us to understand how an activity event started, how it happened, how it ended and what consequences it had for the next step.

[3] "ChronoViz is a tool to aid visualization and analysis of multimodal sets of time-coded information, with a focus on the analysis of video in combination with other data sources." [3]

4 Results

4.1 Overview on the Whole Ride

The following descriptions are results of the ongoing analysis. They are used as a framework for the specific results presented in this paper. The total ride lasts 4.5 hours and can be divided into four phases that are aligned to turning points in the game.

- The first phase marks the entry into the game world,
- The second phase is dominated by social dynamics within the group. The dynamics proceed over the entire course, but have particular influence in this section,
- The third phase is characterized by routine in the game procedure,
- The fourth phase describes the phase-out of the game world.

To provide a better understanding we introduce two visualizations formats of the ride, one in space and the other one in time. The Figure 1 presents the orientation ride of the three women in space. This allows the reader to allocate the observations in space. The Figure 2 introduces the same orientation ride of the group of women in time. The temporal visualization helps the reader to understand the empirical observations within the temporal order of the process.

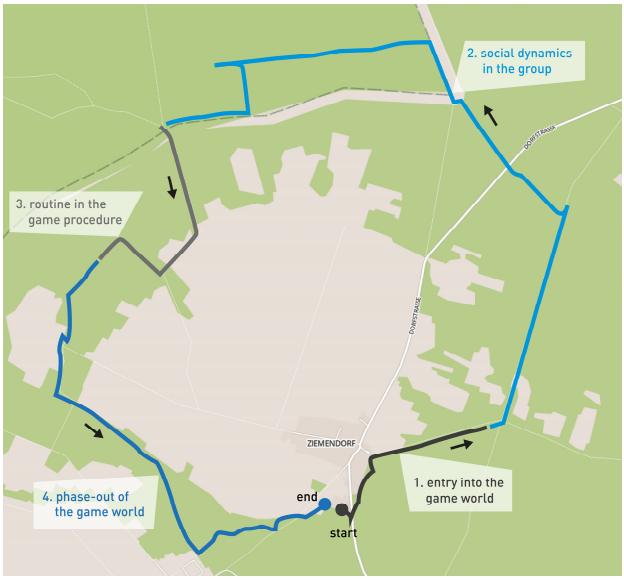

Fig. 1. The four phases of the ridden route in space displayed on Google Maps

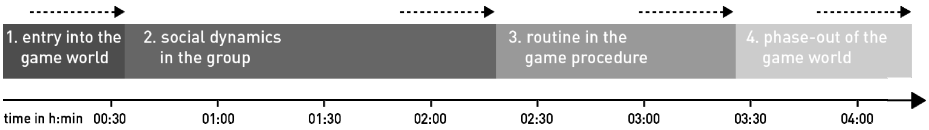

Fig. 2. The four phases of the orientation ride event in time

The following analysis focuses the first one of the presented phases. It covers the first half hour of the game, in which the group of players tries to enter the game and to understand its requirements. Defined in the games' core mechanics, the immediate objective of the players is to arrive at the first station. In the course of this activity a navigation problem arises.

Starting point - According to the data we characterize the situation of the players as follows: The players know the game mechanics of an orientation ride, they have minimal experience with the game device, a smartphone, and they have a rough idea about the environment; the older rider in the group has some experience in the region. This minimal knowledge is insufficient to solve the navigation problem directly.

Endpoint - At the end of the first phase they are on the right track, they are able to understand the relation between themselves and the mixed game world with its real and its virtual dimension and perform first play activities.

Main question: How do they solve the navigation problem? How do they develop competencies in handling the navigation device? How can a mobile application become a medium of navigation? In the following we present the data allowing us to mark generalizable characteristics of the developing navigation activity of the players.

- A basis navigation activity cycle becomes repeated and refined over time
- A change of the focus from the game goal to navigation and vice versa
- Three states, which can be distinguished in the development of the navigation.

4.2 Navigation Activity Cycles

The process unfolds as a succession of four navigation cycles. One navigation activity cycle, cf. [8], consists of the determination of the own geographical position, the determination of the target point, the determination of the path between these two points, the movement to the target point and the interpretation of the results. The cycles are presented referring to the empirical data of the analysis. The tables show abstracts from the audio protocol translated from German into English.

First Navigation Cycle. During the first cycle the group leader, Mary gives a direction and the group moves in this direction. Mary proves the position on the digital map and after recognizing that it is wrong, she corrected it.

Table 1. Abstracts from audio protocol related to the first navigation cycle

00:07:06-8	(Mary) I believe we have to go right. But I am not sure where that leads.
00:08:55-4	(Mary) No, I believe that is wrong.
00:08:57-5	(Mary) We have to go there.

Interpretation: This first cycle displays the first impression that the riders get from the game situation. They do not know what to do and act without a plan.

They are trying to locate themselves in space. This process belongs to the use of maps or mobile devices for navigation. In this special example the players are not used to mobile devices and do not know the environment. Furthermore familiar landmarks are too rare to be used for navigation. The presented example shows the generic process of localization in space using mobile devices.

Second Navigation Cycle. The second cycle indicates a selective experiment of localization. The group rides a particular distance and observes the change of their position on the digital map. They permanently observe the position displayed on the map. After this cycle they are still on the wrong way.

Table 2. Abstracts from audio protocol related to the second navigation cycle

00:10:30-9	(Kate) And if we, we ride straight ahead for a while and then we will see if we are wrong or not, aren't we?
00:11:31-4	(Mary) We are totally wrong.

Interpretation: The performance of the group is more controlled and the experiment gets to a higher level of navigation. The sensible observation of their movement on the digital map indicates, they recognized, that navigating with the device is different to the navigation with paper maps and that they have to learn first. In the first cycle they think, they are able to navigate, this second cycle shows that they try to learn the navigation by setting a sub goal. This includes the try to get their position on the route on the digital map (see change of focus).

At the end of this cycle the older rider (Kate) takes the leading role and gets the device.

Third Navigation Cycle. After some time of getting to know the handling with the device Kate makes a suggestion about the route. In this third cycle doubts about the right handling of the device come up and theories about the inaccuracy of GPS occur. During the process Mary gets back the device and recognizes that the group is on the right route.

Table 3. Abstracts from audio protocol related to the third navigation cycle

00:13:22-7	(Kate) Show me. I want to see it now.
00:13:44-1	(Jane) Has it started correctly?
00:14:13-7	(Kate) Over here…
00:14:17-7	(Kate) …and then to the left.
00:16:56-5	(Kate) What does the green dot, has it moved?
00:17:57-5	(Kate) We just go on and have a look in a moment again, to see what happens.
00:20:08-0	(Mary) We are riding the right way.

Interpretation: Again, the group makes use of a selective experiment of movement. The experiment is successful and they meet the sub goal. The position is shown on the route on the digital map.

Fourth Navigation Cycle. After a short time of certainty the group loses its way again.

Table 4. Abstracts from audio protocol related to the fourth navigation cycle

00:25:41-1	(Jane) Yes, we are totally; we have to go back again.
00:27:04-0	(Kate) Turn around; we don't care about the station now.
00:27:08-8	(Kate) Go on, we ride on the route and observe what happens. If nothing happens, that's it.
00:28:33-0	(Mary) We are not riding on the right way.
00:33:48-2	(Mary) Yes, we are right.

Interpretation: The fourth cycle is indicated by the search of the correct route again. At the end of this cycle they found the right way.

4.3 Change of Focus

The developing navigation activity is initiated, accompanied and finished by four changes of the focus of the players. The game goal is to reach the first station. The focus on this goal is replaced by the focus on the appropriation of the navigation device and the other way around. After difficulties of localization and using the device,

the group sets a sub goal; the correct representation of their own position on the route on the digital map.

First Change of Focus. The first change of focus happens between the first and second cycle of activity. The focus changes from the game to the own position on the digital map.

Table 5. Abstracts from audio protocol related to the first change of focus

00:10:30-9	(Kate) And if we, we ride straight ahead for a while and then we will see if we are wrong or not, aren't we?
00:11:00-3	(Mary) We ride parallel to the route. I believe we have to ride along the street, not on the sandy way.

Second Change of Focus. After the third cycle they recognize that they are on the right route. The focus changes directly from the sub goal to the game goal and they are looking for the next station.

Table 6. Abstracts from audio protocol related to the second change of focus

00:21:39-2	(Mary) Indeed we are on the right way, but somehow the station is not displayed; the flag.
00:24:40-2	(Kate) What is displayed there, how far is the next station? That is displayed at the top or not?

Third Change of Focus. Another change of focus takes place before the fourth cycle of activity, when the group is on the wrong track again. The group decides to ignore the station until they are on the right way.

Table 7. Abstracts from audio protocol related to the third change of focus

00:26:43-5	(Kate) Ignore the stupid flag it doesn't matter. We are the test persons.
00:27:04-0	(Kate) Turn around; we are not interested in the station right now.
00:27:08-8	(Kate) Go on, we ride on the route and observe what happens. If nothing happens, that's that.

Fourth Change of Focus. After the fourth cycle the group is on the right way again and not far away from the next station; the focus changes to the game goal.

4.4 Three Development Stages

The transition from the navigation problem to the solution of the problem and the mastery of the device takes place as a process of iterative approaches.

Comparing the succession of navigation activity cycles three stages in the development of the navigation activity and the growing navigation competence can be distinguished: At first, the players try using trial and error to get on the right track. Then, they carry out targeted experiments. The systematic comparison of digital map and real world environment is one characteristic of the third stage in the development of the navigation activity.

To control the groups' position Mary, as the group leader, observes the map and tries to make suggestions about the environment. Kate controls these suggestions in relation to the real environment.

Table 8. Abstracts from audio protocol related to the comparison of map and real world

00:19:44-8	(Mary) Is here a route on the right?
00:19:49-6	(Kate) Here is a way on the right.
00:29:41-3	(Mary) …has the way a slight hiccup to the right?
00:29:44-0	(Kate) Yes, it goes slightly to the right.
00:31:57-8	(Mary) It goes straight ahead forever.
00:32:01-1	(Kate) Yes, this here is everlasting straight, too.

Their behavior changes from a relatively desultory strategy over targeted experiments to an ongoing systematic action until they have solved the navigation problem. During this development, the players learn to control the game device and are able to navigate at the end of the first phase.

5 Summary

The illustration of this process reconstructs the localization of the rider in the game world. The players go through a lengthy and progressive process of locating in space, not knowing their environment and the handling with the device. This locating process must be done by anyone who navigates using a mobile device. This process is influenced by context and personal experience. Detailed case studies provide a wealth of valuable information on navigation.

In the transition phase conditions for the game are build, but the game itself is not realized yet. The core mechanics of the game define finding and reaching stations. In the moment, the player start to search for a station, they successful entered the game world.

Acknowledgments. A special thanks goes to the riders of the play test, for participating and allowing us to evaluate the data. We want to give another thanks to our partner David Wewetzer from the TZI Bremen, who is also a member of the VFD. We thank to the members of the research project 'landmarks of mobile entertainment', especially Prof. Dr. Barbara Grüter and Prof. Dr. Heide-Rose Vatterrot.

References

1. Bouwer, A., Nack, F., Ali, A., El, A.: Lost in navigation: evaluating a mobile map app for a fair. In: Proceedings of the 14th ACM International Conference on Multimodal Interaction, pp. 173–180. ACM, New York (2012)
2. Brown, E., Cairns, P.: A Grounded Investigation of Game Immersion. Extended Abstracts on Human Factors in Computing Systems (CHI EA 2004), pp. 1297–1300. ACM, New York (2004)
3. ChronoViz Website, `http://chronoviz.com/` (accessed on February 22, 2013)
4. De Sá, M., Carriço, L.: Designing and Evaluating Mobile Interaction: Challenges and Trends. Foundations and Trends in Human–Computer Interaction 4(3), 175–243 (2010)
5. Dix, A., Finlay, J., Abowd, G., Beale, R.: Human-Computer Interaction, 3rd edn., p. 237. Prentice-Hall (2003)
6. Dourish, P.: What We Talk About When We Talk About Context. Personal and Ubiquitous Computing 8(1), 19–30 (2004)
7. Grüter, B., Oks, M., Lochwitz, A.: System and Context – On a Discernable Source of Emergent Game Play and the Process-Oriented Method. In: Yang, H.S., Malaka, R., Hoshino, J., Han, J.H. (eds.) ICEC 2010. LNCS, vol. 6243, pp. 240–247. Springer, Heidelberg (2010)
8. Leontev, A.N.: Activity, Consciousness, and Personality. Prentice-Hall (1978)
9. Rigby, S., Ryan, R.: The Player Experience of Need Satisfaction, `http://www.immersyve.com/downloads/research-and-white-papers/PENS_Sept07.pdf`
10. Rukzio, E., Müller, M., Hardy, R.: Design, implementation and evaluation of a novel public display for pedestrian navigation: the rotating compass. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI 2009), pp. 113–122. ACM, New York (2009)
11. Talton, J.O., Peterson, D.L., Kamin, S., Israel, D., Al-Muhtadi, J.: Scavenger Hunt: Computer Science Retention Through Orientation. In: Proceedings of the 37th SIGCSE Technical Symposium on Computer Science Education, pp. 443–447. ACM (2006)