Studying mobile gaming experiences

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ABSTRACT
For studying mobile gaming experiences and for evaluating mobile games concepts and methods are needed, which take into account the characteristics of the phenomena under study. Experiences emerge and change as a moment of mobile play activity. Underlying attributes of mobile games are the physical movement of players within a mixed game world, the changing contexts of use, the spatial distribution of the collaborating actors, the differences of users, and usage levels, and the complexity of the technologies deployed. At the core we face the issue of the unpredictable context of use. To handle this methodological problem a process-oriented method is outlined, allowing the study of mobile dynamic phenomena by combining two different views, the representational and the interactional view.

Categories and Subject Descriptors
H.5.2 [Information Interfaces and Presentation (e.g., HCI)]: User Interfaces – E*valuation/methodology*

General Terms
Measurement, Human Factors, Theory

Keywords
Mobile games, context, experiences, process-oriented method

1. INTRODUCTION
Mobile gaming experiences are predefined and at the same time situated phenomena. They are predefined by the game as it is conceptualized, perceived and enacted by the player. And they are situated in the context of use, which emerges and changes within and throughout the ongoing play activity. Mobile gaming experiences are foreseeable and unforeseeable, predictable and unpredictable. They are dynamic. For evaluating mobile, pervasive, ubiquitous games and technologies novel concepts and methods are needed [20], [17], [2]. The model one user, one application, one computer under controlled variation of conditions is not sufficient to evaluate mobile technologies. One user among many spatially distributed, moving through changing contexts and using different devices and services sometimes at the same time – have to be taken into account. And as technology becomes interwoven with everyday life enquiries into Human-Computer Interaction become studies of human culture [4]. Activity Theory, Situated Action, and Distributed Cognition have been recognized as resources for building the models [7]. User evaluation of mobile systems is still an immature discipline [16], [15]. It presents particular challenges, because the context of use is usually unpredictable and dynamic. [2]. According to Johnson [12] ‘‘... HCI has developed a good understanding of how to design and evaluate forms of human computer interaction in ‘fixed’ contexts of use... This is not the situation of use for mobile computing’’. Debates on alternatives to laboratory studies have become revived with the upcoming of mobile technology [17]. Field studies are recommended for evaluating mobile technologies [2], [15], [17]. But the support for in-situ contextual evaluation is still rare [17]. However, game researchers studying mobile, pervasive or ubiquitous games deploy traditional HCI methods and seek to adapt them to the novel situation. The play tests are usually done in the field. Scholars use and often mix questionnaires, interviews, audio and video protocols and log-files to evaluate those games [18]. Heuristics regarding playability and usability of mobile games has been developed [13]. But, usability evaluation in the field is time consuming, complicates data collection and reduces experimental control [12], [15]. Still the majority of empirical studies on mobile computing are conducted in static or idealized conditions [15], [2]. The situated, dynamic character of the phenomena under study whether they belong to mobile, pervasive, ubiquitous games or more general to mobile, pervasive, ubiquitous technology is still an open methodological issue. In this paper I outline a process-oriented method, we deploy and further develop within our games studies, e.g. [9]. Our method belongs to the group of methods, called protocol [7] or interaction analysis [11]. The difference to similar methods of this group is the focus on the dynamic character of experience and the combination of several protocols, which only together allow to study mobile, pervasive and ubiquitous interaction. In the next chapter I introduce a definition of mobile gaming experiences with regard to the debates on context and two alternative views, the representational and the interactional view. In the third chapter the process-oriented method is presented.

2. MOBILE GAMING EXPERIENCES
Mobile gaming experiences are characterized by attributes of the underlying play activity. They are defined by bodily and mental sensations, instrumental and social dimensions, as well as spatial and temporal relations. In the following we particularly elaborate the dynamic character of experience, which emerges and unfolds within the play activity cycle.

Mobile, pervasive, ubiquitous games are systems, which organize player’s behavior by means of rules, the game logic or game mechanics as we may call it. Underlying the game system is the game technology, an implementation of all rules or some of them. The game dynamics describe the foreseeable system behavior in run-time. The game aesthetics describe the experiences – from the perspective of this formal approach to game design - as far as they are enabled by the mechanics and dynamics. This formal approach to game design and game research reflects on games as systems [10]. However, to study mobile gaming experiences and to design for meaningful mobile play [19] the solely application of the formal approach falls short. Games organize players’ behavior, but the players appropriate the games within their context and consequently

influence the game system within and through their actual game play.

System and Context: The ongoing debate on context is old – it emerged as an issue in many areas of informatics in the early 1960s. Currently the debate is characterized by the difference between two basic models, the representational view on context and the interactional view. Many computer scientist prefer the representational view, as it is defined for example by Dey and Abowd [6]. They understand context as a predefined situation of an entity relevant for the same entity. Thus context-aware systems are built and function by means of anticipating potentially relevant situations. The representational idea of context today is further developed and refined within adaptive systems, which model context, sense the context of users, learn and adapt to it. This concept of context is static, even if we take into account a learning system adapting to change. The relationship between the model of a context and the context in use remains fix in the end. According to the interactional view context is unforeseeable, emerging and becoming relevant within and by the interaction of an entity with conditions, persons, and environments [8]. Computer scientists, supporting this definition, refer to the work Lucy Sucmann [21] and to the phenomenological tradition in Computer Science [5]. While the former understand context as a predefined, static situation, the latter understand context as an emerging, dynamic phenomenon.

For our purposes we combine both different perspectives within the following definition of context. Context is defined by the framing conditions of a system in use. The representational view on context is covered by the system. For running a system actors are required, as well as devices and further objective conditions. All these conditions, the actors, the devices, the objective conditions are predefined by the system as function bearers, interact with each other in foreseeable ways and are as such exchangeable. It follows, that the application system defines the user and the game rules the player [1]. But at the same time all the mentioned conditions, the actors, the devices, the objective conditions are unique and interact with each other in unpredictable ways – and as such they constitute the interactional view on context. The introduced definition combines two different perspectives, the system perspective and the framing conditions perspective, in our view the context. The difference between both perspectives reflects the empirical tensions of a system in use, the tensions between the system logic and its context.

Double character and activity cycle: We find both perspectives mirrored in the double character of an activity. The representational view characterizes the rational goal-oriented structure of play activity. The interactional view points to the situated, bodily, intuitively unfolding character of a play activity. – The activity cycle provides a form of motion for the conflicting, co-acting and sometimes merging tensions. Players look around within the game world; players take action according to their goals; and they use the result of their action. The representational view dominates the orientation phase of play activity and structures play action. The interactional view emerges during action and dominates the use. As soon as the player takes action the game becomes contextualized and the actual meaning of play action emerges as a result for the player.

Emergent game play and gaming experience: During game play the tensions between the game logic and the context develop and result in emergent game play, in different modes of play, the game designer and the system developer could not foresee. Experience unfolds in time as a moment of activity. We use the term "moment" deliberately to point to both, the determined and the determining character of experience.

Within our studies we found many empirical examples for emergent game play. Most obvious are those between players from different cultures. Comparing two play tests of our mobile game prototype *On the Streets*, one with Chinese players, the other with German players, different fight modes have been observed. The fight mechanics, a component of the game logic, and the underlying technology have been used from both player groups. However, the German players fought in an offensive, expressive manner pestered each other, and focused on both, the virtual and the real level. The Chinese players fought in a charily manner, kept physical distance to each other and focused on the virtual level [3]. The interplay of both different perspectives, the representational and the interactional one, becomes visible in the different effects the fight mechanics has within different cultural contexts. The mobile gaming experiences in both cases are determined by the fight mechanics, but situated in different contexts. – In the next chapter I outline the process-oriented method we have deployed and will further develop in the course of our game studies.

3. THE PROCESS-ORIENTED METHOD

Studying mobile gaming experiences and evaluating mobile, location-based, games researchers face methodological issues, which rule out naive applications of evaluation methods. The physical movement of players within a mixed game world, the spatial distribution of collaborating users, the changing contexts of use, the different users, and usage levels, and the complexity of the technologies in use – all of them are underlying characteristics of mobile play activity. All of them contribute to the methodological issue at hand: How to study mobile gaming experience?

The process-oriented method I introduce focus and builds on the mobile play activity cycle, within which gaming experiences unfold, by means of combining two different views on the empirical phenomena, a representational and an interactional perspective. The theoretical distinction between the representational and the interactional view goes together with a methodological distinction between "non-contextual" and "contextual" methods, compare Marsland et al. [14]. Non-contextual methods like quantitative and formal methods seek for generalizability (e.g. economy surveys). Contextual, qualitative methods aim to understand the particularity of a phenomenon with regard to the situation, within which it emerges, exists and possibly ends (e.g. ethnographic studies). The here proposed process-oriented method aims to combine both. After a brief introduction of our game prototype, I present the related methods of data collection and data analysis.

3.1 The mobile game *On the Streets*

The mobile game prototype On the Streets has been played by meanwhile more than 500 players. Beside some game events we have organized with 14 to 17 years old students from a high school we conducted several play tests

The mobile game *On the Streets* is played in a real world environment that is virtually divided into squares, we call fields. Players are organized in gangs. A gang consists of one to five runners and a boss who is virtually located in the home base. The goal of the game for each gang is to gain power and influence by capturing as much territory as possible that means fields, and particularly the home base of the other gangs. All runners have a virtual map of the game

territory displayed on their PDAs where they can retrieve detailed information about the field they are currently in as well as about the eight surrounding fields. – The game is based on a client server system. The system comprises two servers for two different tasks: The game server manages all of the game events, and the tracking server visualizes the player movements during a running game for an audience and can be recorded for further research purposes. On client side again different types of clients are used: PDA clients for the runners and PC clients for the boss of each gang as well as an admin client to administrate the game. The runners' technical equipment consists of three elements: a PDA, a GPS mouse and a PoC[1] phone. The PDA is the platform for the game software, it is controlled via touch screen. The data link between the client and the servers is established by a TCP/IP connection via GPRS using the integrated radio module. The position data of the player is provided by a GPS mouse, which is connected to the PDA via bluetooth. Via the PoC phones all players within one gang may communicate with each other.

3.2 Methods of data collection

Conducting a mobile game event requires an organizational effort like a theatre production nobody of us has been aware of before we started. Conducting a play test, the effort required is even doubled, taking into account the experts and the technology needed to collect and record the data. With regard to the novelty of the test situation and the complexity of the technology in use the whole socio-technical test system, the game system, the recording system, the expert activity system, is error-prone. One single unexpected, but essential fault may result in the need to repeat a complete test. Play tests in the field may bring not only small research groups like ours to their knees. The difficulties and the effort required pile up when it comes to data analyses.

Process-orientation: The dynamic character of the phenomena under study has to be taken into account by the data collection methods. We had to make sure that the chosen methods maintain the time-based character of the phenomena. Thus we aimed to record different process data streams: logfiles, audio-, and video-protocols, which allow a combination of quantitative and qualitative analyses.

Activity cycle: A god-like overview of the whole game play is an illusion. Nobody, no designer, no researcher, no player, no game master is able to get that. Also data collection methods striving for recordings of the complete game are impossible. And even if that would be possible, one would drown in data. Instead we strive to gain insight in the particular nature of the game by means of accessing the *activity cycle.* An activity cycle exists at different levels: moment-to-moment interaction loops, action loops or complete activity loops. The empirical example we refer to within this paper is an action loop. Activity cycles in a mobile game are further nested. There is the single player, there is the joint activity of two players, there are groups, there are all actors of a running game, and there is the gamer community. We looked for the minimum of data-streams, required to understand the game at the level of the whole game, the level of the gang, and the level of the single player: a replay-able visualization of all runner movements and game logical events during the game play on the map of the game world, video-recordings of at least one runners' play activity, video-recordings of the facial expressions of one boss, automatic screen-capture of the boss' PC; audio-recordings of the internal gang communications. For some play test we reduced the complexity further by trying to maintain only those features, without which the particular nature of the game would have been destroyed. We tested the core mechanics of the game: two gangs, with two players each, one boss and one runner, and four fields. Later we conducted a slightly modified version of the core-mechanics test: two gangs, with three players each, one boss, two runners, and eight fields. The following table gives an overview of particular game features and related data streams we usually record.

Table 1. Procces data streams

Mobile game attributes	**Non-contextual** Client & Server	**Contextual** Audio-, video-recordings:
Mixed world	Logfiles	○ Runner observation or head-camera ○ Boss, face & Screen capture
Physical movement, selected physical context	Logfiles	○ Runner as above ○ Visualization of the runners' movements at the map
Distributed players, selected social context	Logfiles	○ Gang communications ○ Visualization as above

After the test the collected process data become digitalized and synchronized.

3.3 The method of data analysis

To provide an insight in our method of data evaluation, our presentation of the method is organized again around significant characteristics.

Process-orientation: The process-oriented method offers a view on change as it is actually happening. The method consists of an iteration of the *analysis cycle* encompassing the following steps: (1) Understand the process of the game play and the steps by which it is unfolding; (2) Identify game events, which either change the conduct of the game, the cause-effect relation of the game mechanics and/or the scientific understanding of mobile game play; (3) Identify the process states before and after the changing events; (4) Differentiate the dimensions of the play activity: the goal oriented structure of the activity, the game mechanics, on the one side, and the embodied situated dimension of the play activity on the other side; (5) Explain the changes by means of the results gained in the steps 3 and 4.

Access: We access the data, still a huge amount, in the beginning as follows. We repeatedly take a look at the single player videos and the visualization and repeatedly listen to the audio recordings of player communications. The goal is to get a first impression and understanding of the whole game and at those events, which, at the first glance, strikes us most. We then select particular interesting episodes for deeper analyses.

Categorization and empirical analysis In the early phases an iterative cycle of categorization and empirical analysis is conducted. The obvious differences between the Chinese and German fight modes lead us for example to develop particular categories, which express the difference: the focus

[1] Push-to-talk over Cellular

of a player, the body posture, and the facial expression. The categories are used then to empirical analyze the whole episode. By means of the iterative categorization and empirical analysis cycles we gradually achieve a deeper understanding.

Presentation: We present our empirical findings in form of tables filled with time-based information about the process episode of the activity and the relevant context that may have been the trigger to the change of the activity. One example of a game event, which did not change the game course, but changed the cause-effect relation of the fight mechanics and the way we conceptualized our understanding of the game play has been the fight events of Chinese and of German players already mentioned above

Validation: In the current state of developing this research format we aim for two forms of *validation*. First we seek process-validation: The changing event has to be understood as a consequence of the process-state before the event and to explain the process-state after the event. Second we seek intersubjective validation: two researchers conduct the qualitative analyses and develop "thick descriptions" – they report their results to a third researcher.

Evaluation tool: We use a software tool to establish categories and to conduct the empirical analysis. It allows the synchronous analysis of different data-streams with regard to different subjects. The tool is helpful to organize the work of conceptualization and analysis. It provides possibilities for quantitative and qualitative analysis. The problem with this tool and all others we tried out, they fail when it comes to analyze change and its impact on different levels of activity.

4. SUMMARY

We proposed a definition of mobile gaming experiences as dynamic phenomena, which takes into account both the representational and the interactional view. The representational view mirrors the game system, which structures the players' activity and thus defines the experience. The interactional view considers experiences as situated in the context of the play activity. The theoretical distinction between the representational and the interactional view on dynamic phenomena goes together with the methodological distinction between "non-contextual" and "contextual" methods Studying mobile gaming experiences and systems in the context of their use the process-oriented methods seeks to combine both approaches: the automatic analysis of the sequence of interactions enabled by the game mechanics, and the qualitative study of the situated mode of interaction.

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