Civic Engagement Meets Pervasive Gaming: Towards Long-term Mobile Participation

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Abstract
An increasing number of smartphone applications to engage and involve citizens in themes of urban government is available and enables mobile participation on-the-go. However, the current functionality of so-called "m-participation apps" is often restricted to one-way reporting of issues by citizens, and thus more strategic long-term participation is not supported. To enhance traditional m-participation approaches and encourage continuous engagement, we investigate their fusion with location-based games in a user-centered research process. In this paper, we present the results of a web survey among 33 gamers which uncover the main motivators for playing location-based games. Based upon these findings, we derive a new long-term m-participation concept named *Community Circles* and introduce a first functional prototype to be used in future focus group studies.

Author Keywords
M-participation; e-participation; participatory sensing; location-based games; pervasive games.

ACM Classification Keywords
H.5.2 [Information interfaces and presentation (e.g., HCI)]: User Interfaces.

Introduction

Around the globe, municipalities as well as private organizations increase their efforts to involve citizens in urban governance and political decision-making processes through contemporary information and communication technology. Typical "e-participation" tools include community-driven collaborative web platforms such as *Better Reykjavik*[1], *Community PlanIt*[2], and *MindMixer*[3]. More recently, smartphones have been identified as powerful ubiquitous participation enablers due to their increasing penetration and evolving technical features. One promising application field for citizen participation through mobile devices ("m-participation") is urban planning where the communication, visualization and localization features of today's smartphones are utilized to distribute information on planned reconstructions or collect citizen feedback following a so-called "participatory sensing" approach.

One of the first respective research prototypes was *MobileDemocracy* [1], a smartphone application for "situated engagement" [5], i.e. in-place reflection while being physically close to a planning zone. The map-based application featured location-based contributions, discussions and up/down voting. The related m-participation prototype *Mening@park* [6] allowed smartphone users to attach location-related comments by capturing visual codes. Research on advanced mobile visualizations includes *Scene Memo* [4] for annotating and sharing user-generated photos and *ARCity* [5] utilizing an augmented reality view to visualize planned changes of the cityscape.

In the meanwhile, first participatory sensing apps for the citizen-driven reporting of urban issues to city representatives have become publicly available, e.g. *FixMyStreet*[4] and *Citizens Connect*[5]. However, recent research [3] overviewing these m-participation apps points out that existing approaches are mostly limited to dissemination or reporting purposes (one-way communication) and do not leverage strategic actions and long-term participation.

To foster active long-term participation and encourage vivid interactions among citizens, we investigate the extension of m-participation approaches with *pervasive gaming* aspects in our current work. Pervasive games are location-based apps carrying the digital world into a real setting giving them a new meaning and blurring the border between these worlds by "expanding the contractual magic circle of play socially, spatially or temporally" [7]. In the remainder, we give an insight into our on-going user-centered research process towards a novel m-participation concept named *Community Circles*. We present the results of a web survey highlighting the motivational elements of state-of-the-art pervasive games and derive appropriate rules for an engaging m-participation game. Further, we introduce a functional software prototype providing the envisioned interactive game features and dynamics for focus groups participants.

Studying Pervasive Gaming

As basis for creating an encouraging and attractive m-participation concept, we studied successful pervasive games and their players to uncover typical usage behavior and enjoyable and motivational game elements.

[1] https://betrireykjavik.is/
[2] https://communityplanit.org/
[3] http://www.mindmixer.com/
[4] http://www.fixmystreet.com/
[5] http://www.cityofboston.gov/doit/apps/citizensconnect.asp

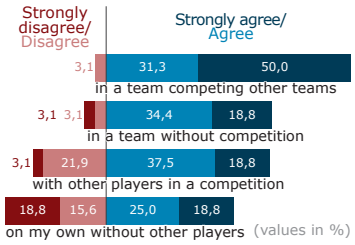

Figure 1: Preferences concerning single/multiplayer game modes

Methodology

We designed a web questionnaire consisting of 27 questions[6]. Starting with a short demographic section and a few general questions on digital games, we asked about the players' experiences with location-based games and the causes of fascination. The next questions targeted the usage behavior such as the average daily play time and the integration of gaming activities in daily life. Highlighting the most extreme moments, we then asked for very positive, negative and the most memorable pervasive gaming experiences. Finally, we asked the participants about the relevance of social interactions as well as to rate the importance of 13 aspects of location-based games, based on results from O'Hara's study on motivational aspects of Geocaching [8] such as *going outside with friends*, *discovering places* or *healthy activity* on five point Likert scales.

To recruit suitable participants we posted the study invitation and the link to the questionnaire in two Web forums for the very popular pervasive game *Ingress*[7], which enables players to collaboratively claim virtual "portals" at real-world locations, and collected the feedback during the following three weeks.

Results

We received 33 responses for our online survey. The participants (6 females) were aged between 15 and 51 years (mean=29, median=30). 55% reported to play location-based games for one to two hours per day, 34% play less than one hour, 7% between two to three hours. According to our participants, location-based games have a surprisingly high impact on the daily routines of the players. 94% report that they play between their daily activities (e.g. when going to work), 87% play in their spare time and only 26% stated to actively allocate time, e.g. by postponing other activities. To reach game-relevant locations, the majority accepts to walk instead of taking public transport or to take another route.

Concerning single vs. multiplayer game modes, the participants clearly preferred a competitive team mode over an isolated single player mode highlighting sociability as a central element in pervasive games (Figure 1, without neutral answers). This teamwork and competition aspects are emphasized again by the answers regarding the important aspects of location-based games, as shown in Figure 2. Further, participants often stated *discovering new places*, *meeting new people* and *taking part in challenges* as (very) important game elements. The open-ended questions on fascination, positive, negative and most memorable experiences were partially overlapping, thus we summarize and group the findings in the following relevant categories:

Sociability. Again, social interaction was the most prominent factor when asked for the fascination (mentioned by 61%). The players appreciate meeting other players, feel really bond to the community, like to have conversations during the game and in general enjoy the team play. Community events, such as organized *Ingress* missions, enforce this relationship. Also when asked for positive gaming experiences, socializing is mentioned: the participants often remembered moments where collaboration was required and they felt as a part of the whole. They enjoyed the good spirit of the community. On the other hand having this social relationship can lead to tension between players and within the community. As negative experience a few participants pointed out that some other players take the

[6] https://www.surveymonkey.com/s/6Z59JZ7.
[7] http://www.ingress.com

Figure 2: Subjective importance of pervasive gaming aspects

game too seriously and "cannot distinguish between reality and virtuality". Players also complain, that in case of *Ingress* the game play seems to be stuck: high level players make it difficult for newcomers and to proceed in the game it still requires a lot of time to level up.

Exploration. Having the city as a playground is a challenging and exciting aspect in pervasive games. Our participants highly welcomed the opportunity to (re-)discover their neighborhood and felt more engaged with their environment. They were excited, when they had the ability to see new places and explore the city. For some players this also meant going to another city or even abroad to play and proceed in the game, e.g. one player reported that playing *Ingress* is a good occasion to discover interesting places in another city.

Activity and achievement. Location-based games require the player to go outside what is considered a good way to stay active and healthy by our participants. E.g. often the players reported that they combined the game with weekend activities. The most memorable moments of the players were often associated with adventurous experiences. E.g. one player reported the she was "walking 27 km through the whole city from 2 a.m. until 11 a.m." during a game session. Additional to such real-world activities, players enjoy virtual achievements. Beside social factors it is rewarding for players to fulfill a game objective, e.g. it was described as satisfying when they reached a higher level and improved their virtual powers or had the chance to take part in organized missions.

Novelty. Also the novelty and technological sophistication of pervasive games makes them attractive for players. In the case of *Ingress* this is actively supported by futuristic visualizations. The novelty of the game-play blurring the border between the virtual and real world led to several interesting incidents such as conflicts with officials, e.g. when outsiders who observed players got suspicious. This novel aspects of presentation and game-play are additional motivators for a technology-affine young user group.

Community Circles

Based on the literature review and results from the presented online survey, we derived a game concept entitled *Community Circles* that significantly expands the functionality of traditional participatory issue reporting apps by appreciated pervasive gaming elements.

Similar to *Citizens Connect*, etc., user-generated georeferenced contributions such as unsolved issues are central to the map-based application concept (see Figure 3). Other citizens can browse these contributions, up/downvote them and add textual comments (see Figure 4). In contrast to existing issue reporting apps, *Community Circles* supports additional contribution types such as ideas, opinions, and polls. Each contribution has a certain impact radius (visualized as a surrounding circle on the map), derived from its activity and responses from others. For example, if a contribution is voted up or someone posts a comment its impact increases. Each citizen contribution has a lifetime and will disappear if it is considered as irrelevant (meaning there is no activity). Contributions in a certain distance to each other form communities (cf. Figure 3), which has again a positive effect on the contributions' ranges. Besides a points system for players (e.g. for writing a comment) as a traditional gamification element [2], the players are continuously informed about the size and activity of their communities and are encouraged to grow the community areas by adding new contributions. This basic game concept is designed to create a dynamic network of citizen contributions where players are motivated to actively

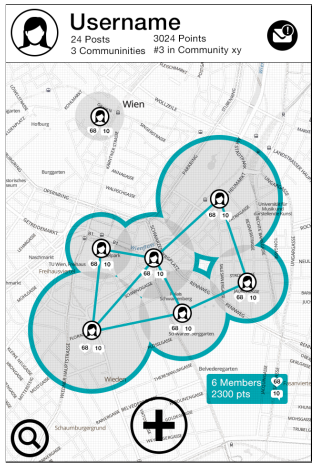

Figure 3: Map view with several user-generated contributions forming a community

Figure 4: Contribution details

engage and to continuously participate. The long-term goal of this game is to grow the community and keep contributions and therefore a community alive. The following key features of *Community Circles* address the key motivators in pervasive games learned from our survey results and further extend the functionality of traditional reporting apps:

1. *Social interactions* among citizens play a central role in our game design and are actively promoted through the concept of growing and shrinking impact (i.e. geographical range) of contributions. To be successful in the game, a player needs to create valuable contributions and keep these activities alive by discussing them or credit other contributions with votes. Forming communities by interacting with other players and merging communities is rewarded as well.

2. *Challenges* can be created in *Community Circles* by both players and the city. City representatives can start georeferenced contests, e.g. calling for ideas for the reshaping of the town square, and players who are located nearby are invited to share their opinion. On the other hand, *Community Circles* enables players to start location-based multiple choice polls to learn about the opinion of adjacent citizens and uncover so far unknown or neglected concerns and citizen views.

3. *Teamwork* is not only encouraged by spatially growing a community but also by jointly making contributions on-site. For example, when inserting a contribution, the creator can add other members as supporters if they are in close vicinity (i.e. going places together). Such team contributions have a higher impact and spatial range.

4. *Competition* between teams is addressed in our concept by allowing players to build communities with their contributions and comparing community attributes such as size, number of contributions and active members to other nearby communities. Further, players can be especially rewarded with points for contributing to another community than their home community.

5. *Exploration* of the urban environment is another highly relevant reason for playing pervasive games and we learnt that users are willing to adapt their daily routes to progress in the game. The concept of *Community Circles* fosters this explorative character by the overall goal of growing communities. Players are actively encouraged to explore the border areas of their communities and make contributions there to increase the size of their communities. Further, we plan to link into a user's daily routines by providing meaningful notifications such as alerts at community-relevant locations or when being close to potential collaborators.

Mockups and Prototypes

To illustrate and further develop this basic game concept, we created prototypes. First, several low-fi paper prototypes were designed. Figure 3 depicts an example of the home screen with a map showing citizen contributions close to the user's current whereabout and other features, such as an add-button to easily create a new contribution. Its design is based on related social apps that support posting on-site with social features, such as comments or voting mechanisms. Further, we designed mockups that illustrate the creation of a contribution, different approaches to browse contributions or user profiles, and rate and comment contributions (Figure 4). To demonstrate the game mechanics, especially to explore the dynamics of adding contributions, forming communities, the "lifetime" of contributions and the impact of comments and votes, we created an interactive

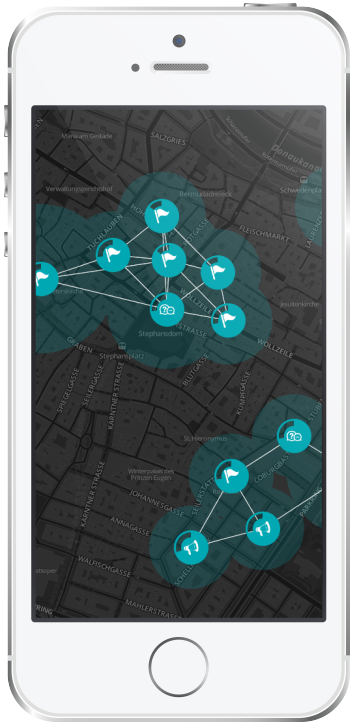

Figure 5: Hi-fi prototype developed with the rapid-prototyping toolkit *Processing*

hi-fi prototype. This prototype has a sophisticated configurable graphical appearance (Figure 5) and allows to place different types of contributions on the map and to modify the comment and vote count to experiment with meaningful impact parameters. We used this interactive prototype in a preliminary focus group study with two game-affine participants where it animated them to active discussions. The idea of having a "home community" was developed to allow constructive competitions and motivate community building in the game. Overall, the feedback (especially with regard to the game dynamics and the screen design) was highly positive and led to several new ideas which will be integrated in the next iteration.

Conclusions

We introduced our on-going research on supporting long-term citizen engagement through mobile devices by linking the traditional participatory sensing concept with pervasive gaming elements. The paper's core contribution are the results of a web survey which highlight the motivational aspects of advanced location-based games and can serve as input for other researchers and practitioners in the field. Further, we presented our m-participation concept *Community Circles* with innovative game features exploiting the survey results.

Society consists of heterogenous citizen groups with different requirements and skills, thus there cannot be a "one-fits-all" participation solution. Ludic m-participation apps (or participative pervasive games) like *Community Circles* might help to involve especially young technology-affine citizens in urban government and planning. After positive feedback in a preliminary focus group with young gamers we plan to further iterate our concept with young, yet less gaming-affine, test persons and conduct in-depth interviews.

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