Conquering the City: Understanding perceptions of Mobility and Human Territoriality in Location-based Mobile Games

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With the increasing popularity of mobile video games, game designers and developers are starting to integrate geolocation into video games. Popular location-based games such as Ingress or Pokémon Go have millions of users, yet little is known about how the use of such games influences the nature of a user's interaction with other users and their physical surroundings. To investigate how location-based games are integrated into a player's daily life, how they influence a player's mobility through the city, their perception of places and the role of human territoriality in this context, we have developed a location-based mobile multiplayer game called CityConqueror. In this paper, we present CityConqueror and the results of a study, which has focused on participants playing the game over a period of two weeks. The findings show that location-based games can be designed to give the player the illusion of playing in the context of the "real" world rather than a virtual or hybrid game reality. Our findings also suggest that location-based games can have a strong influence on a player's mobility and perception of urban space and that human territoriality can be expressed through location-based games. Based on our findings we propose a series of design implications for the design of mobile location-based games.

CCS Concepts: • CCS → Human-centered computing → Ubiquitous and mobile computing

KEYWORDS

Location-based mobile games, locative media, location based services, multiplayer games, locative media, hybrid reality games, hybrid spaces, playful spaces, image of space, player mobility, territoriality, game design

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1 INTRODUCTION

With the emergence of social networks and mobile computing, location-based services are growing in popularity. Well known social networks such as Facebook and Twitter have already integrated location-based services like geotagging content and 'checking-in' (to locations) into their existing catalog of services. There are also social networks that are primarily built as location-based systems. Examples are the campus-based social network application Jodel[1] and the location-based chat

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system Yik Yak[2]. These systems combine social networking with location-based services to build location-based social networks. Some location-based social networks such as Foursquare, employ gamification, and in the process create location-based games (LBGs). This technique is used to create more engaging and playful experiences, as "*gamification is generally defined as the use of game elements and mechanics in non-game contexts"* [56]. Foursquare is divided into two services: (1) Foursquare City Guide and (2) Foursquare Swarm. Foursquare City Guide is a location-based social network, where users can share recommendations about places with a community of other users and find information about newly discovered places respectively. Foursquare Swarm is a location-based game in which users can 'check-in' to a location, publishing their location and thereby sharing it with other users. By checking in, a user gains points (and gets a score), earns badges or becomes the mayor of a place.[3] *"More than 50 million people use Foursquare City Guide and Foursquare Swarm each month* […] *with an average of 9 million check-ins a day on Foursquare Swarm."*[4] While Foursquare adds gamification to a location-based social network to create a location-based game, other location-based games are designed and developed with the sole focus on gaming and playing, but without the social networking component. Ingress is a location-based massive multiplayer online game "[…] *that uses players' real-time geographic coordinates and social networking platforms to enable players to cooperatively contain a fictional invasion of digital 'alien matter.'"* [47]. One of the defining elements of LBGs is spatial representation and navigation. By making a player's location part of the game mechanism, games like Ingress combine the physical, "real" world with the digital, virtual world of the game, creating a hybrid space. These games are described in the literature as pervasive games, ubicomp/ubiquitous games, immersive/alternate reality games (ARGs), hybrid reality games (HRG), and mixed reality games (MRG) [5, 14]. Players of LBGs are engaging with the game and the physical environment when playing with and exploring the boundary between the separate landscapes while they play together in distinct (and often separate) physical spaces [26, 5, 28; 44].

In 2016 Pokémon Go was launched, drawing attention to such games (although earlier incarnations of LBGs can be identified in the literature [18] and [23]). Pokémon Go is a hybrid reality game, which takes the combination of real and virtual reality even further by adding augmented reality to the user experience. Players see virtual projections of game components in their "real" surroundings through the camera of their mobile devices. De Souza et al. [15] have identified three properties of hybrid reality games that deserve analysis: (1) the connection between play and ordinary life, (2) the relevance of the play community, and (3) surveillance.

In this paper, we focus mainly on the first property, the connection between play and ordinary life. While parts of our work also refer to the other two game properties, we recognize them as relevant but we are not investigating them in depth within the context of this specific study. To do so we have developed and designed a location-based mobile game and conducted a study to investigate how location-based games are integrated into a player's daily life, how they influence a player's mobility, path navigation through the city, the perception of places, and the role of human territoriality in this context.

In the following section, we give a deeper introduction into the different aspects of the topic by discussing relevant related work. In the section CityConqueror we give a detailed description of the location-based mobile multiplayer game that we have developed and justify its features and why we developed our own solution rather than making use of existing systems. Next, we describe our methodology and present the results of our study. We discuss our findings and methodology critically and conclude by identifying three design implementations for location-based games. Finally, we focus on and identify future work

2 RELATED WORK

One of the most popular location-based social networks is Foursquare. Lindqvist et al. [40] studied how people use the foursquare check-in system. In interviews and two surveys, the authors found that some users used Foursquare to share their location or what activities they were engaging in with their friends, whilst other users used it to discover new people or to have fun, engaging in activities such as collecting badges. They also found a strong element of self-representation in the use of Foursquare and the locations that people do or do not check-in. Some participants expressed that they would not check in to locations where they would be embarrassed to share with others, or that they were there or where they would find it boring

[1] https://www.jodel.com/, accessed 12/21/2016
[2] https://www.yikyak.com/home, accessed 12/21/2016
[3] https://support.foursquare.com/hc/en-us/articles/201065220-Mayorships, accessed 12/21/2016
[4] https://foursquare.com/about, accessed 12/21/2016

to check-in. While check-ins at restaurants and bars were very common, *"most people do not check-in when seeing a doctor."* Another interesting finding was the bimodal distribution of check-ins for home. While most people said they never checked in at home, a large number of people checked in 1-2 times a day. *"Three participants said that they checked-in to their own home and friends' homes because they wanted to become mayor of that location."* The different territorial layers of places can be explained according to the Proxemics Theory suggested by Hall [31] who has theorized that personal space can be divided into several distance zones: intimate, personal, social, and public zones. Each of these zones relates to one's preferred social, interpersonal distance. This is in line with Könings and Schaub categorization of territorial privacy within the context of ubiquitous computing based on Hall's definition, that human territoriality is a behavior where one claims space as their own and communicates this claim to others [31, 38]. They define three categories of human territory: physical territory, extended territory, and private territory. Physical territory refers to the environment characterized by material objects and physical boundaries. Extended territory encompasses the physical territory as well as the remote entities connected via ICT. Lastly, the private territory is a subset of extended territory, but not necessarily a superset of physical territory ([21], [38]). These conceptualizations are central to this study and they suggest that the cyberspace is a meta-territorial domain whose online characteristics are entangled with the physical properties.

In addition to understanding common uses of location-based networks and territoriality, it is also important to investigate how locative media can represent a place in general and how locative media shapes *"construction and formation of Image of place"* [21]. 'Image of place' has been defined by Boulding as a *"mental picture that is a "product of attitude, experience, memories and immediate sensation"*. Fazel et al. [21] studied how people get information about a place using Foursquare and how this gathering of information influences their decision to visit a place. 'Image of place', in this case, explains how the congregation (convergence and, accumulation) of blocks of local information (local knowledge) added to a virtual medium contributes to developing an expectation of places, and gives recognition to places through defining its identity and consequently growing a sense of that place. The authors conclude that an 'image of place' can exceed a virtual representation in location-based media by communicating with real places. The 'image of place' constructed in locative media thus can be the basis for decision making, sharing knowledge from local communities with outsiders and becoming a tool for social connectivity.

Following a similar approach, Humphreys et al. [34] studied the parochialization of public space. The authors refer to three kinds of urban realm:, the public; the private and the parochial realm, defined originally by Lofland [42]. According to Lofland [42], urban places are shaped by the social relations occurring in them. Thus, the three kinds of urban realms are based on three different kinds of relationships and ties between people. Public realms are characterized by people who are relatively unknown to one another, such as city parks, malls, or plazas [27]. Private realms are those shaped by people with intimate and close relationships, such as individual apartments. Parochial realms are forged by groups of people that have parochial relationships embodied as *"a sense of familiarity or commonality"*. An example of a parochial realm would be a neighborhood, where those living in an area have a sense of familiarity or commonality with others in the area. As stated by Lofland [42], these parochial relationships can exist either person-to-person or person-to-place. A special person-to-place parochial relationship expanded upon in this paper is the relation to home territories. In particular, the home territory is one where people have a sense of connection, intimacy, and control. [7] [27]. These relationships can be formed with private as well as public spaces, as both private and public spaces can be understood as home territories.

Fazel et al. [21] argued that mobile social networks can serve as a platform where territorial relationships with places can be negotiated through physical and social interactions with others. Also, they offer more reach and authority in making territoriality legible than a single person could through everyday physical practice in a space. By identifying person-to-person and person-to-place parochial relationships formed through the usage of Foursquare, Fazel et al. [21] argue that Foursquare can facilitate parochialization. These relationships were supported by Foursquare's social network quality of users meeting new people and a generated sense of familiarity and belonging to people and places within the larger urban environment. Furthermore, they found that the use of Foursquare can result in increased interaction between strangers in the public realm based on browsing through Foursquare profiles of other users that have checked in to the same place or even trying to find them in the physical space. Particularly interesting for this paper are the findings in person-to-place parochialization. The authors found that participants used mayorships in Foursquare to make claims to places and defend their claimed places against competitors, if the competitors claim on the place seemed illegitimate. Fazel et al. [21] reasoned that the fact that users can make virtual claims on physical spaces by checking in and the way the interface of Foursquare communicates competition over territories, can invoke territoriality and defense of these places as "home territories". In our study, we have found similar notions of territoriality and claims to territories that have been perceived by other claimers to the territory as more or less legitimate.

The work of Fazel et al. [21] is grounded on Lofland's [42] definition of the urban space as public-private and parochial realms, while others have focused on the urban space with a perspective of play. In [12], the authors introduce an understanding of playful spaces based on Lefebvre's work on social spaces that are a product of social practices. Playful spaces are mostly urban spaces and are produced by the mobility and interactions of people who inhabit these spaces. Supporting the idea of the use of urban spaces as playful spaces, De Souza e Silva et al. [12] reintroduce the *flâneur*, a late 19th-century concept of a person who would wander and experience the urban space, consuming the city lead primarily by her or his vision. The *flâneur* would stroll through the city engaging in actions that are playful and spontaneous, exploring new facets of the urban space. The *flâneur,* in a locative media context can be interpreted as another form of participatory urbanism, which seeks to enhance the citizens' awareness and participation and gives them the power to appropriate space and make claims upon the streets. This politicization has always been evident in the relevant literature but current efforts call for providing tools that enable the citizen to challenge assumptions about space, celebrate their personal freedom and challenge power structures by empowering citizens and making them aware of such structures [2, 20].

Adapting the *flâneur* with respect to mobile communication and mobile internet access, Luke [41] introduces the *phoneur*. The *phoneur* strolls the urban space like the *flâneur* but experiences the city using a mobile phone with a connection to the mobile web. Luke sees the *phoneur* as a consumer who, through her or his use of a mobile phone and connection to the mobile web, is at the mercy of commercial information and entangled in a web of consumerism. Using this imagery, he criticizes the emerging normalization of information cities [12, 41]. However as argued by De Souza e Silva et al. [12], mobile games intervene in the map that trace the patterns of everyday life and thus can enable the *phoneur* to break free from her or his ties as a digital-citizen-as-consumer.

Following this argument Saker et al. [51] conducted a study of Foursquare, finding that Foursquare with its overlaying of space and place with digitally mediated play, altered how participants moved through their environment. Play in Foursquare motivated participants to explore places they haven't visited before, alter their pathways through the urban space and travel to places that were 'out of' their usual pathway. It was also reported that some participants had less interest in what the place they visited had to offer than in its relevance and meaning in the game context. Saker et al. [51] define the *playeur*. Supporting argument made by De Souza e Silva et al. [12], the *playeur* is the *'phoneur'* who not only employs his or her smartphone to alter how the urban terrain is traversed but also does so under the auspices of location-based-play. Contradicting a conventional understanding of play initiated by Huizinga [33] who stated that *"Play is distinct from 'ordinary' life both as to locality and duration"*, De Souza e Silva et al. [12], argue that the boundaries between play and ordinary life are blurred or challenged. Saker et al. [51] give qualitative support to this argument, by showing examples of play in Foursquare being not separate from participants "ordinary" life because the experience of space includes play and consequently play- and "ordinary" space are no longer separate.

Privacy and surveillance are also topics that are raised in the literature mentioned earlier and deserve attention. A user's location can provide valuable information about travel behavior, interests of users and the social value of locations. [13]. Due to the variety of personal information that can be derived from a person's location, security and privacy concerns cannot be discarded. The game provider (Google) captures data produced by the players, players monitor each other and players produce data about themselves. This tradeoff between "*privilege of play*" and "*surveillant labor*" can surely also be found in Pokémon Go [13], where privacy, data collection, and surveillance issues are important issues. It is the case that for all location-based games, *"[…] just like with other location-based apps, most users are unaware that they are sharing this kind of location information"* [13].

3 CITYCONQUEROR

To investigate how location-based games are integrated into a player's daily life, how they influence a player's mobility, their routes through the city, the perception of places and how human territoriality drives competitive gaming in public spaces we have designed and developed a location-based mobile multiplayer game for Android devices called CityConqueror.

We chose to design and implement a new location-based mobile game rather than using existing games such as Foursquare, Ingress or Pokémon Go [13] for a number of reasons. The first and most important reason is that our study was executed in Suzhou, Jiangsu in China where Foursquare, Ingress, Pokémon Go, Google Maps and others services are either not available at all or can only be used in a very limited way. Other alternatives to location-based games in China would be in the Chinese

language and result in a language barrier for many researchers and other participants of the study. CityConqueror supports multiple languages including Chinese and English. Another reason to implement a separate solution is the controllability of numerous variables that comes with the design and use of location-based games.

Games such as Pokémon Go that make use of monsters, imaginary worlds, and fantasy elements, have a storyline that might not be appealing, or acceptable to some players. By developing our own solution, we chose to base the game on an 'actual' map of the city. We chose not to include any plot, storyline or characters in the game, as we wanted to create a thin hybrid reality in order to blur the borders and interpretations of ordinary space and play for the players [15, 54]. Such an approach is based upon Flanagan's view [24] that locative media and pervasive games should refer to, and not appropriate spaces, in order to not divorce them from their meaning, history, and significance. Doing so can significantly impact upon gameplay by leading the players to unconsciously not reproduce the city within their perceived dominant structure and perceptions of space and place. Even though this design decision is clearly a double-edged sword (as one can, by appropriating spaces with new meaning, create engaging experiences – e.g. the portals in ingress[5] alter the meaning and interpretation of their physical surroundings for the players) in CityConqueor we wanted to enable the participants to play on an 'actual' landscape, initiating reflection on their relationship to space and place [30]. Our goal was to explore the impact of territoriality in LBG in the real world and not the virtual.

It is important to note that the game developed for our study is not a commercial game. It is a simple technological probe [35]. The simplicity of the game allows us to be able to study specific design features. The focus of the design and development lies in the functionality and meaning of location-based components rather than optimization, visual effects, animations, or scoring/reward systems. Nevertheless, all interfaces were designed and structured in a way to prevent bias through limited usability. Simple animations, icons and color effects were used to give the game a pleasant, playful character to enhance the user experience and prevent possible bias caused by a neutral, cold and un-appealing interface.

CityConqueror was inspired by the board game Risk[6], in which a player conquers countries on a world map, deploys units to defend her or his countries and attacks countries owned by other players. In CityConqueror, a player can conquer territories based on her or his physical location, deploy units to defend her or his territories and attack other players'territories.

[5] https://www.ingress.com/

[6] http://www.hasbro.com/en-us/product/risk-game:2C7C6F52-5056-9047-F5DD-EB8AC273BA4C, accessed 12/21/2016

Fig. 1. A player begins by conquering a territory based on her or his current physical location.

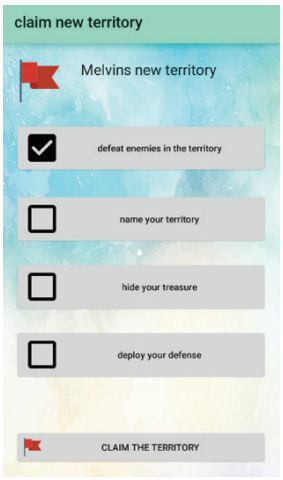

Fig. 2. To conquer a territory, the player has to give it a name, hide a treasure and deploy units to defend it.

When conquering a territory, the player can give it a name that is visible to other players, deploy units to defend the territory and hide treasures (Fig. 1, Fig. 2). Territories are conquered and plotted on a map of the real urban terrain familiar to a player where her or his location is clearly marked. This map is covered by the *Fog of War* strategy similar to popular strategy games with some caveats. The Fog of War in CityConqueror is a (gray) transparent layer that allows players to see the underlying map and not the enemy territories. Players in CityConqueror can uncover the Fog of War by physically exploring the urban space. When a player has physically visited a space, and thereby uncovered the Fog of War (overlaying it), s/he gains the privilege of seeing and spying on enemy territories in this area (even after leaving it). However, in order to drive the exploration of the map and thereby the player's surroundings, the player can see 'glows' in unexplored spaces, indicating the location of enemy territories covered by the Fog of War (Fig. 3). The Fog of War gives players an incentive to uncover the game's world. A compulsion to reveal obscured parts of a map designed in this manner gives a sense of exploring the unknown [59].

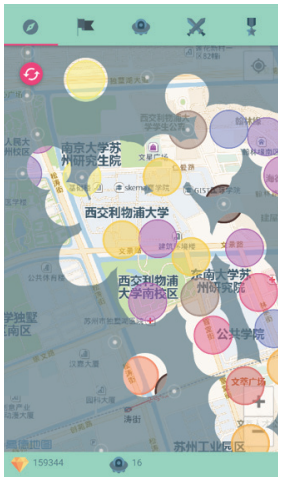

Fig. 3. Territories are plotted on the map.

Territories owned by a player generate resources over time (Fig. 4, Upper left corner). These resources can be collected and used to buy new and stronger units to defend the player's territories or attack territories owned by other players. There are three different types of units. Two units of the same type can be combined to create a stronger unit. Each unit type has a bonus against one of the other types when it comes to a fight (Fig. 4, Upper right corner).

Fig. 4. Upper left corner - A territory generates resources. Upper right corner – There are units of three different types. Units of the same type can be merged. Lower left corner - To conquer a territory the player must first defeat all enemy territories in the range of the territory (the pink ring in this figure). Lower middle - A player can spy on enemy territories even when they are outside of her or his attack range. Lower right corner - When spying on a territory, the player can see who conquered the territory, the name of the territory, the units defending the territory and the possible treasures that could be found after a successful attack.

To conquer a new territory in his location, a player must first clear the area by defeating all enemy territories in her or his range (Fig. 4, lower left corner). A player can spy on enemy territories anywhere on the uncovered map which enables her or him to see which player conquered the territory, the units defending the territory and the potential treasure to find after a successful attack. This allows her or him to decide if – and with which units to attack (Fig. 4, lower middle). To attack an enemy territory, the player must be physically located in the range of the territory.

A fight is executed following a 'turn-based' system as it is popular in pen and paper role-play games such as Dungeons and Dragons[7]. In turn-based systems flow is partitioned into parts called turns. A player of a turn-based game is allowed a period of analysis before committing to a game action, ensuring a separation between the game flow and the thinking process, which in turn presumably leads to better choices. Once every player has taken his or her turn, the round of play is over. In CityConqueror the defender opens the fight and her or his deployed units are the first team on offense, making the attacker's deployed units the first team on defense. With each round of the fight, the units of the offense team automatically attack the units of the defense team. After a round, the offense team becomes the defense and the defense team becomes the offense team and the next round is started. Every round each of the offense team's units tries to hit one of the defense team's units. Each hit has a chance to miss without a damage calculation (see next page for how damage, misses and critical hits are calculated). If a hit is successful (i.e. not a miss), the attacked unit takes damage. In CityConqueror we have 3 types of unit – red, orange and green. Each unit is 'strong' against a particular choice, but 'weak' against another, emulating the cycles in real world warfare (Fig. 5.). In our case the red unit can overpower the green unit, the green unit can overpower the orange unit, and the orange unit can overpower the red unit.

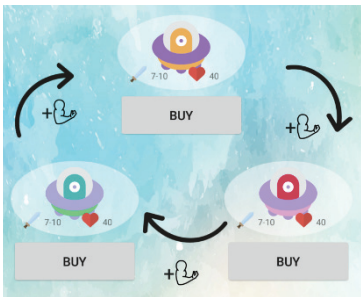

Fig. 5. – The different types of units.

By granting an attack bonus based on the types of opposing units, we implemented a simple Rock-Paper-Scissor system. The Rock-Paper-Scissor mechanic is based on the zero-sum popular hand game. It is a common mechanic in games where groups of possible weapons or unit types interact in a rock–paper–scissors style, where each selection is strong against a particular choice but weak against another. Such a game mechanic, often referred to as asymmetric balancing, can make a game somewhat self-balancing, and prevent gameplay from being overwhelmed by a single dominant strategy [19]. Unlike truly random selection methods, however, rock–paper–scissors can be played with a degree of skill by recognizing and exploiting non-random behavior in opponents [22].

In CityConqueror the fight is over when there are no surviving units on one of the teams. The winner of the fight is the player that still has surviving units after the end of the fight (Fig. 6).

[7] http://dnd.wizards.com/ accessed 12/21/2016

Fig. 6. The result of a fight in CityConqueror.

Fig. 7. After winning a fight the player can try to find the treasure by getting to the indicated position within the time limit.

If a player attacks an enemy territory and wins the fight, s/he has the chance to find the treasure hidden in the enemy territory. Searching for a treasure is a mini-game within the game, where the player is given a compass pointing her or him in the direction of the treasure, the distance in meters to the treasure from her or his current location and three minutes' time to find the treasure (Fig. 7). To find the treasure, the player has to traverse the urban space following the compass. The treasure is found when the player (and her or his mobile device) has moved into the GPS location where the treasure was hidden by the user who initially created the territory. If the treasure is found within the given time, the attacker can steal an amount of resources or a unit from the player who owned the attacked claim. It is to be emphasized that for finding the treasure the player does not have a map or a specific path to follow to the treasure but only the direction and distance to the treasure. If there are obstacles as for example bridges, canals, streets, or hedges in the way, the player has to find her or his way around them and orientate her/himself based on her or his surroundings and the pointed direction. This gives the *'treasure hunt'* a strong exploratory note. A player who has been attacked receives a notification, and is shown the result of the attack in an 'attack log'. S/he can also replay the fight to see how her or his units were defeated (or have defeated the attacking units) and rethink her or his strategy for the future (Fig. 8). A player can complete achievements that reward actions that are related to exploring her or his surroundings and success in the game such as conquering a certain number of territories, conquering territories with a large distance between them, defending territories or attacking others. (Fig. 9)

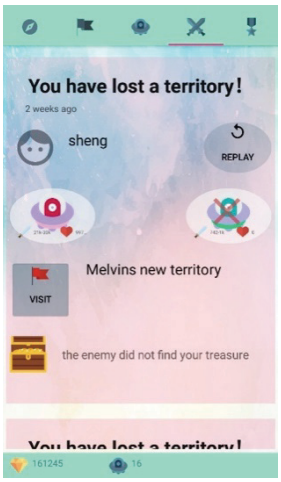

Fig. 8. The player can see and replay enemy attacks.

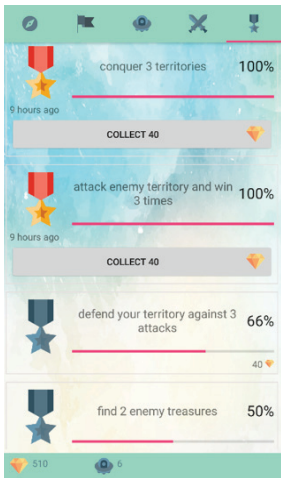

Fig. 9. The player can complete achievements.

As will be described in the following section, CityConqueror was tested in a '*free-for-all*' setting, giving the players a chance to get familiarized with the new technology before a study was conducted in a '*team-match*' setting. In the *free-for-all* setting, every player has all other players as enemies and there is no predefined measure of performance of individual players. In this setting, the game has no winning situation or condition. In the *team match* setting, a player is a part of one of two teams ('red team' or 'blue team') and an individual and team score are published to all players daily. The score is calculated as follows:

$$\text{Individual score} = (\text{total collected resources} + \text{rewards from unlocked achievements} - \text{resources stolen by others} + \text{resources stolen from others})$$

The team score is the sum of individual scores of all players on a team. We explicitly chose to keep friendly fire, the attack on territories owned by team members unrestricted to allow all forms of interactions and dynamics between players within and across teams. In both the *free-for-all* and *team-match* setting, the goal of the game is for a player to claim as many territories as possible to generate income and consequently to be able to defend his/her territories against attacks from others and attack others to conquer their territories. Thus, the game experience of one player is highly dependent on the actions and interactions of other players, which gives the game a strong, social character. The above described features and especially the location-based claim of territories, the different levels of interactions based on proximity and location by allowing attacks only on territories in the physical range of the player, the *Fog of War*, *treasure hunt* and achievements as exploration driver and the strong dependence of a player's experience on the actions and interactions between other players and places, we have designed a location-based mobile multiplayer game with a strong social character.

4 METHODOLOGY

Throughout the development of this game, we executed extensive tests in a controlled laboratory environment. In this laboratory environment, the location of a test device was defined by the WIFI it was connected to and the game data was stored on a local server. Each component of the game was tested individually and with respect to other components. After the completion of development and testing in the laboratory and after all components were put together to build the complete game, all basic functions and a large number of gameplay scenarios were tested in the wild and using a remote server. Depending on the field test results, problems were solved and fixes made if necessary. Since the game was developed as a technological probe and not as a commercial game, we did not take into consideration usage scenarios that are not in the scope of the main functionality of the game. For example, we did not test or optimize the game for high data loads, high movement speeds of players or complications with GPS tracking caused by buildings or other disturbances.

After developing and testing the game in the laboratory and in the wild with only one player, playing as multiple users using different devices, we gave the game to a group of 30 participants for testing and familiarization before conducting a study. All participants were male students of Xi'an Jiaotong-Liverpool University (XJTLU), an English-based university located in the mid-size Chinese city of Suzhou, and were aged between 19 and 26 who spent the greater part of their daily life in close proximity to the campus.

In the user familiarization and testing phase, participants had one week to familiarize themselves with the game in a 'free for all' scenario where every player is every other player's enemy. The players were left to play the game freely without further guidance or feedback on their performance in the game. To extend testing, performance and the stability of the game in a multi-user scenario and over different devices, we took error reporting and general feedback from participants into consideration and released new and optimized versions throughout this phase. Optimizations included simple bug and usability fixes and a major performance increase but they did not include changes to the interface or change the location-based features or the basic concept or experience of the game so that the user experience throughout the different versions of the game remained comparable.

We sampled the most active players from the participants of the test phase, and they became the participants in the subsequent study. The 12 participants sampled as the most active players in the game were male students aged between 19 and 24. All players started a new game so that their in-game progress was not carried over from the test phase. They were randomly assigned to one of two competing teams ('blue team' and 'red team'). Each team had six players. For the duration of one week, the teams competed in a 'team battle' scenario (as described before in section CityConqueror). As a means of communication within the teams, we created three separate chat groups in WeChat (a mobile instant messaging service popular in China similar to WhatsApp). One was a global chat group containing all participants of the study and two were team chat groups, each representing one of the two different teams and containing all members of the respective team. The researchers were part of all of the chat groups and thereby capable of monitoring communications and sharing information only if necessary. On a daily basis, a score update was published to the global chat group, giving all players feedback on their individual and cumulative team performance and progress. For both the test phase and the study, each player received the same explanation of the key features of the game and the scenario via the global group chat. In total, 454 territories were claimed and on average a single user claimed a total of 38 territories. 130 territories were attacked, 1231 units bought, 695 units created by fusion (the combination of two units of the same type) and 27 treasures were found (Fig. 10).

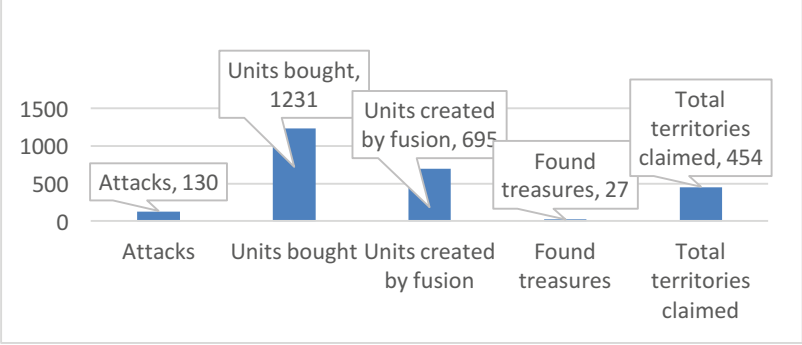

Fig. 10. Usage statistics of CityConqueror.

After the testing and team battle phases of the game, each participant was interviewed to assess his experience with the game. Following a semi-structured approach, we interviewed each participant for about 30 to 45 minutes. Instead of preparing fixed questions, we prepared topics for discussion to engender a dialogue between the interviewer and the participants. The same topics were followed through the course of each interview—these included the importance of a real map and a location-based approach to the entertainment value of the game, the importance of territories, strategies to claim territories, places that had or had gained importance to the player, exploration of new places, mobility, monitoring and anticipation of the behavior of other users, communication between players, rivalry between players, privacy concerns, and the integration of the gameplay into the daily life of the player. It should be noted that some participants focused more on certain topics and less in others. For example, "M" spent more time discussing the importance of territories in relation to gameplay, strategies to claim territories, and rivalry between players and less on mobility and exploration.

The audio-recorded interviews were transcribed verbatim and subjected to an approach involving data reduction and inductive thematic content analysis. This approach enabled us to review the data collected and assign meaning to them through the apparent repeat of ideas, concepts and elements. The results of this approach were analyzed using an inductive thematic content analysis approach. The purpose of this was:

1. To condense extensive and varied raw text data into a brief, summary format;
2. To establish clear links between the research objectives and the grounded theory type approach findings; and
3. To develop a model of the underlying structure of experiences or processes which are evident in the raw data.

This approach enabled us to identify emerging trends and theories from unstructured data [29]. By identifying the important topics discussed in the interviews, grouping statements based on the identified topics and subsequently mapping quotes from participants to statements, we reduced and structured the data to meaningful findings.

Overall, our research adopts an experience-centered design approach: our study focused on and highlighted the lived, felt experience of the individuals taking part in the game, as opposed to taking a purely theoretical position. As such our methodological approach included taking location-based technologies out of our laboratory and deploying them among users in "the wild" in order to fully understand and appreciate their use and reasoning about the system in a 'natural' setting [11, 8].

5 RESULTS

During our analysis of the data, we identified several interesting findings in the topics spanning from the feel of playing in the real world, over changes in perception of space and mobility to strategies in the game, territorial behavior, and surveillance of other players. To evaluate the game design and to understand how players experience a game that takes place in the "real" urban space we used a real city map. We did this to construct a minimal virtual reality layer onto the player's "real" reality, thereby keeping the hybrid reality made of the real world and the virtual game world as close to the real world as possible. We were pleased to find that our expectations in this matter were met. 9 out of 12 players noted that the employment of the real map and the player's location gave them the feeling of playing in the real world rather than in a fantasy or an otherwise restricted game environment. Participants commented that:

"It feels like I am really conquering a specific building like the library or my dormitory." (D)

"It made me feel that the territories I take are real. I had the feeling that place belongs to me" (M)

"I had the sense that this territory is the real place that I have ion the real world, not just the virtual world." (E)

These quotes show that the impression of reality was stated particularly with regards to conquering territories in the game when the players felt like taking possession of the actual place. Further, two players also mentioned that the use of a fantasy world in the game would have mitigated this experience (below is one comment).

"Having a connection to the place is better than conquering something you have never seen before." (J)

With respect to the social aspect of the game, one player shared that the location-based game staged on a real map of the city gave him the feeling of playing with everyone that surrounded him in the real world rather than the limited number of players that were part of the game world.

"You play this in a real world. You feel like you are playing with all the people around you." (L)

The research by Saker et al. [25], drawing from de Souza e Silva et al. [5], *"provides qualitative support to the proposal that the boundaries between ordinary space and play are blurred"*. Our findings indicate that players *"feel like"* claiming real places rather than virtual territories. This 'hybrid reality' where the virtual and real world overlap is so thin that the player retains the impression of playing in the real world and the real urban space around him. As shown by Saker et al. [54]'s

study on Foursquare, we can also see that in CityConqueror the ordinary space and play are not distinct as players connect these worlds when playing. This, also, contradicts Huizinga [33] and Salen and Zimmerman's [52] conventional understanding of the "magic circle", and is in line with several scholars who agree that LBG challenge these concepts, since in LBG the space is not finite, as these games expand its boundaries spatially, temporally, and socially [54, 15, 32, 44, 58].

5.1 Planned changes in mobility: planning to play

Seven participants played the game on their daily commute from their dormitory to the university and/or from the university back to the dormitory. 10 out of 12 participants checked the game before getting on their way to move through the urban space to a target and planned which territories to attack or conquer on their way.

"I checked my phone before I left to check which territories to attack and then on my way home I stopped, took my phone out and attacked the territory." (J)

This example shows how a participant planned to interrupt their path through the city to play. In other cases, players planned to change their path through the city, took a detour or even chose which place to go to with respect to the game.

"I planned to go home on my bike so I took a short detour around the campus to check the territories." (G)

"I did not know where to go to lunch so I took out my phone and checked where there were territories to attack and decided to go to Wenxing for lunch to attack some territories there." (L)

"I was thinking if I should order some food to my dormitory but then I thought why not go out for lunch and play on the way. So I actually went out for lunch." (T)

"One time I went to the dormitories in Wenxing. I checked the territories on my phone and then I went there just to attack." (M)

"M and I were on the bus into the City and when we saw L's territories on the way, we planned to get off the bus on the way back to attack him." (G)

These scenarios show that a location-based mobile game can influence a player's plan to move through the city—even when s/he had a pre-planned destination. This behavior can range from planning a stop on a given path to altering the path and taking a detour to decision making and even to giving a reason to leave the house at all. Thus, adding location-based games to a player's navigation through the city can have a high impact on a player's planned traversal of the public space. Similar scenarios were observed in the spontaneous change of a player's path through the city while playing the game "on the go". For example, seven players changed their movement spontaneously based on the game. A common scenario was that players would observe the game on the go (e.g. on the way home). Then after observing his surrounding territories and spaces, the player would stop and changed his path spontaneously to interact with the game. These interactions ranged from attacking and/or conquering territories over finding treasures to exploring "glows" in the *Fog of War* nearby.

"There was a time I walked to a place I didn't have to. I had a class in the opposite direction but I still went there just to get a treasure." (J)

"On the way back and on the way to school I would walk with the game so I saw a glow in the fog by the Foundation Building and went there to check if I can attack the territory but when I was there it belonged to my teammate." (M)

It is notable that the distance a player would depart from his original path to follow a place in the game is relative to the time it takes to reach it. Players who were using a bike or a car, expressed a higher readiness to vary their path than players who were on foot because a detour using a car or bike can be made quickly while walking would involve a longer amount of time. Next to planning paths and changing paths spontaneously based on CityConqueror, some players considered, and some even did go out to traverse the urban space with no other reason than only to play the game.

"After having lunch, I checked the game and went out to attack a territory, then I found more and more and ended up walking around playing the game for about 40 minutes, attacking one territory after another." (L)

It is to be pointed out that while two participants said they went out just to play the game, the majority of the participants said they would not go out just to play the game. Two of them indicated that they found excuses to go outside with the actual intent to play the game.

"Going out just to play the game feels stupid. Maybe I want to go out because of the game but I will find a reason or something like taking out the trash and then play the game." (D)

"I thought hey why not ride a bike I could do some exercise but during which I can take territories where the public transportation won't go so that people who don't have a car or a bike won't go there to find my territories." (J)

The fact that the majority of players would not go out just to play the game can be related to the public acceptance of playing games. The examples above describe scenarios where players altered their mobility, travel, and path through the city based on various aspects of CityConqueror. However, not all players were ready to change their behavior for the benefit of the game, but rather played the game in spaces that they would pass or visit in the regular course of their day.

5.2 Motivation to play: Perceptions of space

In addition to this, five players reported circumstances where their awareness of the surrounding space, made them consider the place with regards to CityConqueror and reminded them to play.

"When I walked by a building like the library or the foundation building, I was sure that this place must have been conquered by someone so I would take out my phone and check." (D)

"I was on my way home in my car. The street was not a main street and had no bus line. I thought that no one would find my territory here, so I stopped the car on the side of the street and created a territory there." (L)

"Whenever I would walk through one of my territories, I was reminded to play the game thinking: 'it's conquer time!" (J)

These quotes show how people perceived their immediate physical surroundings with regards to aspects of the hybrid game reality. In a similar way, participants also judged places they planned to visit in the future based on the game.

"I was going to go home to Shanghai for the weekend, so I planned to play there and take as many territories as possible." (D)

This last example shows that while players did not only experience and perceive spaces in their physical surroundings differently through CityConqueror, they considered distant spaces and places with respect to this game.

These findings regarding mobility and changes in paths of players suggest that location-based play can motivate a new form of perception and engagement with spaces. This new form of perception and engagement with spaces can, in turn, motivate location-based play. This supports the results of Fazel et al. [21], who stated that the image of space created in location-based media *"contributes in developing an expectation towards places, and giving recognition to places through defining values and consequently growing a sense for that place"* and can provide a basis for decision making in the traversal of the urban space. Furthermore, the behavior shown by CityConqueror players, the changes of paths through the urban space and the exploration and perception of place/space through the lens of location-based play give support the model of the *playeur* proposed by Saker et al. [51], and with it the playful space introduced by De Souza e Silva et al. [15].

CityConqueror is not only location-based, it is also a multiplayer game. In addition to observing places and spaces, as shown above, players also started anticipating and monitoring the behavior of other players and started developing gameplay strategies that took the characteristics of places and players into account. Such strategies were mainly developed and applied to claim territories. Territories generate income in the game, with which players can buy more and stronger units. Thus, it is important to players to have many territories to build a stable source of income that is the basis of their success in the game.

A common strategy followed by 10 players was to claim as many territories as possible in remote areas through which it is not expected that other players would pass and therefore the risk of being attacked is low. Places were qualified by multiple properties that described the likelihood of other players visiting them. These factors included the distance to the university and student dormitories, where other players were anticipated to be located for the most part, the popularity of places, the availability of public transportation (which determined the accessibility of places to players that relied on it) and even the existence of streetlights. If a place had no bus stop or street lights it was anticipated that other players were not likely to visit the place, making it safe to conquer without having to protect it.

"This street has lights and a bus so I have to go somewhere else to conquer a territory. You have to use the advantages in real life to win the game." (J)

One player also reported he considered the terrain of a place before conquering a territory, to only conquer territories in places where a treasure could be well hidden. He preferred to conquer territories in places where he could hide the treasure in a canal, inside a building or behind a wall or fence so that attackers would not easily find it. Another strategy used by four players was not to claim any territories at all in areas that were frequented by other players. The idea was that the risk of being attacked and losing a treasure in these areas is too high since the nature of the place and the anticipation of the other players' behavior suggested that potential attackers would visit the area frequently. As a combination of these strategies, two players only claimed territories when they left their usual surroundings that they shared with other players (e.g. the university or dormitories). By doing so they would leverage the advantage that being in remote locations gave them and avoid conflict on common ground with other players.

5.3 Dominance, demonstration of power and territoriality

In contrast to this strategy, three players described the importance of conquering territories in areas known to be frequented by other players to show strength, power and dominance where most people can witness it.

"I think that everyone will go through those places every day and if I claim the territory they can see it every time. If they have the ability to attack, they can take the territory but they didn't because my defense was really strong. That gave me a sense of satisfaction." (D)

This quote shows how dominance was expressed by deploying strong units in territories that would be visited by many other players and challenging others to a trial of strength, drawing satisfaction from being the undefeated ruler of a territory in a highly-frequented place. While this presentation of power was one strategy to deploy units, there were many other strategies anticipating the behavior of others. To decide what units to deploy in conquered territories, all players judged the risk of being attacked, based on the anticipated frequency of others players visiting these places. Remote territories where the risk of being attacked was estimated to be low would be defended with weak units; while territories with a high risk of being attacked would be defended with strong units. This strategy was applied by all users over all territories and only breached for one purpose, the defense and demonstration of power in the player's 'home territory'. It is to be pointed out that the idea of a '*home territory*' is not a fixed concept in CityConqueror. There is no difference between territories in the game and particularly there is no particular role for a territory as 'home territory' or 'home base'. Even so, all players used these expressions to describe the territories they conquered in the places where they live. Thus, the idea of a 'home territory' was implemented solely by the players. This makes it all the more interesting to find that all participants expressed the importance of conquering their 'home territory' and keeping control of it, even if this would not necessarily give them an advantage in the game. All players reported that they had conquered the territory in the place where they lived (dormitory or apartment) or had tried to defeat other players in the same dormitory to claim the territory for themselves.

"I did not want the place where I live to have other territories on the map that belonged to others." (D)

"It's like "this is my home. Don't come here." (L)

"I mean if it's not my home I don't care. If it's my home, then, of course, I have to take it." (R)

"Somebody else has a strong territory in my home. Every couple of days I check if I am strong enough to attack him." (T)

Eight players deployed their strongest units in their *home territory*, even if no other player ever attacked this territory and the risk of being attacked in this space was low. This shows highly protective behavior concerning the home territory that exceeds the common rational strategy of protecting territories endangered by others.

"Yes, I deployed the strongest units in my home territory. This is my home and I need to guard my home." (A)

"It's an honor thing to show how much strength you have in your home territory." (J)

"It is humiliating being defeated at home. It's like losing a football game on the home field." (J)

One player even attacked a teammate who had conquered a territory in his dormitory.

"He had a territory at my home and he was on my team but I attacked him anyway. This is mine! This is my home!" (M)

Most other players, however, announced that when somebody else had conquered their home territory, they would tolerate it as long as it was a teammate. In one particularly interesting case, a player claimed a territory in a place that he never visited before and treated it as his 'home territory'.

"In the test phase I wanted to claim a territory in my dormitory but because I was inside a building the GPS location jumped to Dushu Hu Street so I claimed the territory there. It is mine and I always put my strongest units there. In the team phase I planned to visit the place to conquer it but before then the GPS location jumped there once more and I could take it as my home territory again. I have never been there but still, I wanted to protect it. I think it was because it was mine from the beginning that I didn't want anybody else to have it." (T)

The findings that players would conquer and protect the places that they lived in or even public places and treat them as their *home territory or home base,* are clearly comparable to the findings of Fazel et al. [21], that the ability or users *"[…] to make virtual claims on physical spaces by checking in […]"* and the interface of Foursquare "*can invoke territoriality and defense of these places as 'home territories"*". The last example of a player treating a public place as his home territory promotes Lofland's [42] statement that the relation to *home territories* is a person-to-place parochial relationship where "*people have a sense of connection, intimacy, and control",* that can be formed with private or public spaces equally. Fazel et al. [21] argue that mobile social networks can serve as a platform where territorial relationships with places can be negotiated through interactions with others and *"offer more reach and authority in making territoriality legible than a single person could through every day physical practice in a space"*. Similarly, this echoes the research on Actor-Network Theory and human territoriality as four different forms of territorial production were observed during our study: territorial strategies, tactics, association, and appropriation [36]. Territorial strategies and tactics are intentional attempts to claim a territory. Territorial tactics are personal; they are directed explicitly toward the ordering of a certain area. On the other hand, territorial strategies are impersonal, planned and mediated control. Territorial association and appropriation represent territorial productions that are not planned but are consequences of regular practices. Territorial appropriation is typically based on a repetitive and consistent use of an area by certain individuals and/or groups, while territorial association characterizes a place with a certain usage and specific conventions and regularities that underpin this usage. Given our findings, we propose that this also applies to location-based mobile multiplayer games. Apart from the one exception, the *home territories* discussed above were all territories that the players felt connected to before playing the game. Interestingly, five players shared stories about places that they had no relation to before, but connected memories and importance to after playing the game in these places.

"There is one place somewhere on the street that I never really cared about. One time I tried to find a treasure in that place and almost walked in front of the bus. Now I will remember this place." (D)

"If I put a lot of effort into taking over a territory, then the place means allot to me." (J)

These quotes show that experiences in the hybrid game reality can connect to the real world and manifest in a sense of familiarity or connection to the place and thus a parochial relationship between player and place as stated by Fazel et al. [21] with respect to Lofland [42].

Another category of places special to players are the places where players took the time to give their territories names for all to see.

"I conquered a territory in the toilet of the Suzhou train station and called it 'my toilet' as a joke." (D)

"One time I was on the bus to the city and I knew that L lived nearby and sometimes followed and attacked the territories that I conquer on the bus route. So I conquered one territory after another, on the bus and gave each territory one word as a name to spell: 'COME AND GET ME SUCKER!' (M)

In both of these anecdotes, the players left messages for following players to see. In the first scenario, the player gave a name to make a joke in the context of the place. In the second scenario, the player used elements of storytelling by hiding a message over multiple subsequent territories for an enemy who follows his path through the city, territory by territory, to find. The joke in the special context and the message in the form of a storyline that engages players to follow the path of the author through the urban space are highly interesting concepts that require further investigation in the field of locative media and particularly in location-based mobile social networks. One player used the naming function to publicly claim the possession of the place verbally.

"I gave places like the Zemo café the name: Jason's Zemo, but I did that only for places where other people would notice it" (J)

Claiming the possession of a place in naming territories and especially doing so only in places where other players are sure to read the message, is clearly another expression of territoriality and dominance. One player named his territories with his name and increasing numbers to tell others how many territories he had conquered (e.g. the fourth territory conquered would be named including the number 4 to show others that see the name that he has conquered three territories before this one). This was to show his power and advantage in the game which again is a clear demonstration of dominance.

"I named my territories with my name and the number to show others how many territories I have so far" (E)

Both examples lead to the suggestion that the communication via territory names can be interpreted as an instrument to negotiate legitimacy of claims to places and facilitate territoriality in CityConqueror as discussed by Fazel et al. [21]. Another player who named his territories did this with a completely different purpose in mind. He named his territories with increasing numbers to help himself remember the succession in which he visited and conquered these places as a form of personal (locational) diary. This behavior of documenting visited places and drawing a personal storyline through the urban space was also recognized in location-based media as witnessed by Lindqvist et al. [40] as a usage pattern in Foursquare and deserves further research in the context of location-based social media.

5.4 Surveillance

In CityConqueror, players would publish their location by conquering or attacking territories. The published location information can, to some extent, be used by players to monitor movements of other players' daily routines and most visited places. Because CityConqueror is a location-based mobile multiplayer game and an important part of every multiplayer game is the understanding and anticipation of the behavior of other players, a player-to-player surveillance was a common element of the game. In fact, even after the short period of two weeks that the subsequent testing and familiarization phase and the trial lasted, players have gained surprisingly detailed insights into the life of others based on their location traces left by playing the game.

"I knew that some of the other players lived in one of the three dormitories but after playing the game I knew exactly where they lived because I could see their home territory" (D)

Because of the fact that every player made an effort to claim his home territory in the game, it was fairly easy for other players to find out where they lived. Based on territories claimed by specific players, some players were able to identify where others were traveling and what form of transportation they were using.

"I saw the first territories in the area that I had explored on the map and a chain of glows glowing the bus route in the Fog of War, so I knew he took the bus 178. I also knew that he was coming from town and not going into town because his territories were centered on the side of the street where the bus comes back from town." (L)

Evidently sharing location information by playing CityConqueror or other location-based mobile games allows players (and providers) to practice surveillance by seeing and monitoring the location behavior of others and putting this information into context to retrieve all sorts of detailed information about players. The privacy concerns that arise with sharing location data is not within the scope of this paper and will not be discussed in great detail. Still, it is interesting to see that not one of the participants stated that they were worried about their privacy. When asked if they could think of places that they would consciously not claim as a territory to avoid sharing that they have visited these places, all participants said that they did not have any concerns of that nature. The explanation given was that since the study was focused in a university environment, everybody knew the limited number of dormitories where others can live and everybody knew the general area and places in which others move regularly. When conquering territories, they did not employ any controlling mechanisms that are described by Schwartz et al. [54] as the spatial self to communicate a certain location profile to the other players as has been pointed out by Lindqvist et al. [40] in the use of Foursquare.

In our exploratory study of how location-based mobile games influence players' perception and mobility in the urban terrain we have pointed out numerous interesting findings. All results, however, must be discussed and challenged critically and with different perspectives and viewpoints in mind.

6. DISCUSSION AND CONCLUSIONS

Even though research in location-based social networks and location-based games is commonly carried out using existing systems such as Foursquare [21, 40, 34], we have decided to design and develop the location-based mobile multiplayer game CityConqueror. Factors in favor of using established systems such as Foursquare for research purposes are the large number of users and the high engagement and activity of people using the service. With more than 50 million active users each month, and 9 million check-ins a day, Foursquare is a well-established system that spans the world. However Foursquare is a fixed system with a limited set of defined features. We chose to develop our own location-based mobile multiplayer game to have control over game design elements that can amplify user behavior such as exploration and territoriality within the urban space. The *Fog of War* and *glows, for example,* were explicitly designed to drive exploration of the city. Because we are in charge of the game design and the features implemented in CityConqueror, we can highlight design implications for future development of location-based mobile multiplayer games.

Unlike a well-established commercial system like Foursquare, CityConqueror was developed as a technological probe with a focus on functional location-based game features and not on game balancing, stability or performance. By allowing a full week of multi-user testing in the wild where player feedback was observed to improve the game, we have produced a functional technological probe that is engaging and performs stabley enough to back up our research.

Figure 10 gives a brief overview of the usage of CityConqueror. 454 territories have been claimed and on average a single user claimed a total of 38 territories. 130 territories have been attacked, 1231 units bought, 695 units created by fusion (the combination of two units of the same type) and 27 treasures found. With the short trial duration of only one week, we state that CityConqueror was indeed played actively and with high engagement within the community of players, which gives our findings and results a solid foundation. Because our trial was situated in a university environment in a mid-size city with a vibrant economy and student population, where all participants were students that moved primarily around the XJTLU campus and the nearby dormitories, one could suggest that the area over which CityConqueror was played was not large enough to assess exploration and awareness of spaces and places. Even though the study was centered on the campus, it was not technically limited to it and CityConqueror was played all over the city, and even in nearby cities such as Shanghai (Fig. 11, and Fig. 12).

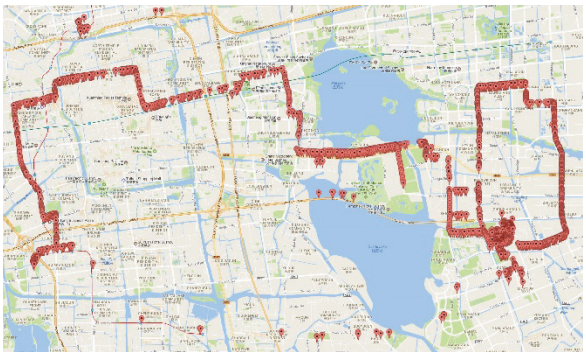

Fig. 11. Where CityConqueror was played in Suzhou.

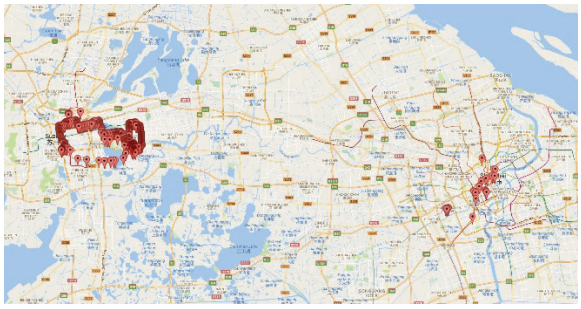

Fig. 12. CityConqueror was played in Suzhou, and in nearby cities.

With the absence of a fantasy element in the game and its mechanics, CityConqueror is constructed on top of the players (real) reality as a layer that is so thin, that player participants have the feeling of playing in the "real world" rather than a virtual game word. Our findings indicate that players feel as though they are claiming real places rather than virtual territories. This is 'hybrid reality' where the virtual and real world overlap so that the player retains the impression of playing in the real world and the real urban space around him [54, 15, 50]. This is in line with the notion that players have a "hunger for reality" and are not interested in fake experiences. [55]. This tension between fiction and reality is concerned with the blurring of boundaries between fiction and facts. CityConqueror in that respect blends what is real and what is fictional, blurring the game space and everyday life and as such provides "an environment perceived as authentic which allows the participants to physically act in a near-perfect representation of the game world" and "the players' 'emotionally and physically' immersive role-play" [60].

Additionally, we found that location-based games can influence a player's traversal of the urban space. They can motivate players to change their path through the city by spontaneously reacting to game content. They can also influence the planning of a path through the city and provide a basis for decision-making, in terms of where to go or which path to follow to a given target. In some cases, CityConqueror gave the player a reason to traverse and explore the urban space in the first place. Still, most players noted that they would not go out just to play the game. This could be due to unfamiliarity with the new technology or the social acceptance of the public usage of mobile games and mobile location-based games in particular or simply that playing the game is not worth the effort of going out. Players gave the reason that "*it is silly*" to go out just to play the game and two players shared that they would make up excuses and reasons to go out, while the actual intent was to play the game. This and the familiarization phase as part of our methodology leads to the suggestion that the inhibition about going out to play does not have its cause in unfamiliarity with the technology, but rather in a form of concern about self-representation and social acceptance [54]. Players do not want to present themselves to others as a person who walks through the city for no other reason than to play the game. Further findings suggest that location-based play can induce a new form of perception and engagement with spaces. This new form of perception and engagement with spaces can, in turn, motivate location-based play. These findings support the model of the *playeur* defined by Saker et al. [51] and the work of Fazel et al. [21] on the 'image of place' and how locative media can influence it. Further, our results illustrate that players made

connections between elements relevant in CityConqueror and created meaning and experience by participating and creating their own boundaries. This relates closely to the concept of framing, which relates to how a situation is framed as play and is communicated as such. In CityConqueror the boundaries of when and where play happens or does not are blurry and left to the players to decide. As such it can be argued that in CityConqueror framing relates to the mobility of the players, how they traverse the urban landscape, where and when they will go to conquer territories, and the extent they will go to do so. However, it should be mentioned that ambiguity and uncertainty about what constitutes parts of the game and what does not is very clear in CityConqueror and ambiguity and uncertainty occur when players negotiate the boundary of play within the blurred framing of CityConqueror [3, 28].

In addition, we have identified expressions of human territoriality and dominance in CityConqueror. All participants conquered or at some point tried to conquer and protect space where they lived as their '*home territory'* even though 'home territory' is not a concept implied or in any way benefited by CityConqueror where all territories have the same function (from a strict game mechanics standpoint). One could argue that conquering a territory in the space where a player lived was simply out of the comfort of playing the game at home and does not give evidence of territory behavior. Yet, all participants used the expressions "home territory" or "home base" to describe these territories and most of them deployed strong units even if the *home territory* was never attacked. This wording and protective behavior indicates territoriality, and suggests that territorial claims are not only communicated via location-based social networks [21, 49], but also via location-based mobile multiplayer games. This communication, while limited in the population the players reach (i.e., the other players in the LBG as opposed to those in the physical space), in some ways, offers more reach and authority in making territoriality legible than a single person could through everyday physical practice in a space. By making virtual claims over a particular geographic area one does not have to actually exert control over others, but by virtually taking over one's connection to a place, one can normalize the activities, resources, etc., which represent the potentialities for power within that area. To a limited extent, dominance and territoriality were also expressed in naming territories. One player used territory names to claim possession of a space. This finding is biased by the fact that the default name of the territory is "player's new territory" where the possession of the territory is already indicated. The player merely replaced 'new territory' with the name of the place and thus did not actually claim the possession of the space or place. However, the fact that the player used the name of the real-world place to name the real world place his, rather than the territory (in the virtual game world) and the fact he did so only in areas where he knew others would see the name, backs territoriality and dominance as a motive.

These results (both on mobility and territoriality) echo for the most part the wealth of literature on mobility, human behavior, territoriality and dominance from the fields of humanities and social sciences. For example, the change of path spontaneously in regard to game content that we observed during our study may relate to the 'localism' and the role of 'place attachments' - places of central importance in the lives of urban residents over which they exercise (or desire to exercise) exclusive control and to which they feel strong attachment [57]

Similarly, the creation of 'home territories' by players in places they felt connected with (e.g. near their home) relates to the concept of 'dwelling', which serves primarily four purposes:

1) Satisfaction of basic needs including 'psychic security' [25],
2) Control over the living environment [25],
3) Fixed point of reference in the individual's knowledge of urban space [17],
4) As a physical framework for the spatial and temporal organization of activities [53].

When these are viewed through the lens of the results of our study, they may relate to the interplay of the need for gathering of resources (a basic requirement to play CityConqueror), the communication of dominance and reification of power (through moving in the urban space and exploring and conquering new territories), and the person-to-place private parochial relationships that are potentially created through LBG [21, 42].

Moreover, the naming of territories observed during our study relates to what Bachelard [1] in his 'poetics of space' calls 'territorially related satisfaction for self-expression' – a concept that relates possession of territory with personal identity. This is especially clear when one consider the actual wording of the naming of territories (e.g. I have conquered X places) as players used it as a medium to communicate relationships to other players and the wording of the names of territories acts as a medium by which symbolic messages were communicated. For example, one participant named a high-risk territory with strong units as 'come and get me sucker' to illustrate dominance to the other players.

Research that applies the territorial analogy to the study of the neighborhood is of also of interest and relevant to our findings. Especially the ecological approach which establishes the impression of the city as a mosaic of distinct subareas in which the urban population is segregated over natural areas into natural groups [61]. Relevant concepts from this corpus of research are the interplay of 'territorial attachments' and 'activity segregation'. These are mainly discussed in the literature in the context of neighborhood territorial conflict. For example, Boal [6] studied the sharp cleavage between two adjacent and mutually hostile districts of Belfast – the Protestant ward of Shankill and the Catholic ward of Clonard, while Ley [39] examined the significance of territoriality in neighboring gangs in the Monroe district of Philadelphia. In each study, residential segregation was matched by activity segregation to the extent that the main criterion in many movement decisions appeared to be the desire to avoid hostile territory. This is very similar to what we observed in our study. Players were putting their best units in high-risk territories neighboring other players' territories and were trying to conquer territories to generate resources in low-risk areas away from conflict. This relates broadly to the highly-debated concept of 'defensible space'. This concept is derived from the work of the American architect Oscar Newman [46, 47, 48]. Using statistics mainly from New York, he argued that abnormally high crime rates were associated with building design, as the layout and design of buildings denied residents the opportunity to exercise territorial control over the area around their dwellings. Substantial criticism has been directed against Newman for his approach and the limitations of his work (e.g. neglect of variables). That being said, his conceptualization of 'defensible space' is of interest to LBG as the layout of the city affects the accessibility of areas and this in combination with the mobility of the players affects gameplay. This was quite evident in our study as remote (difficult to access) territories where the risk of being attacked was estimated to be low would be defended with weak units, while high-risk territories would have stronger units. This relates directly to the aforementioned concept of 'activity segregation' as the remote, difficult to access territories were used to generate resources, while the highly accessible and thus high-risk territories were used for projection of power and attacks. It should be noted that our study indicated that this strategy was employed by all players and it was more evident to those with higher mobility.

A concept relevant to mobility and accessibility of places and LBG is that of physical exertion. Even though in our study players covered big distances conquering territories (see Fig. 11, and Fig. 12), we did not encounter issues arising from physical effort and exertion [45]. This can be due to our sample being small and comprised only of healthy teen males. However, as Marshall et al. [43] have discussed, physical effort can affect the experience of LBG significantly. As such, it can be safely assumed that a) exertion may be an issue when players with other characteristics (e.g. different age groups) or limited mobility play CityConqueror, and b) as the interplay of exertion and experience are closely knit there may be effects of exertion over the expressions of human territoriality in LBG. Further research is required to explore the interplay of exertion and territoriality in location based games.

When one interprets our results relating to territoriality in LBG, one must consider that in our study we had only males and that territoriality is a gendered and rather nebulous concept in contemporary society. For example, previous research by Charness et al. [9] has illustrated that mixed gender groups when playing games that affect the expression of territoriality exhibited no significant differences in behavior, cooperation, and expression of territoriality. However, the picture changes dramatically when they changed the experimental setting and grouped the participants in male only and female only groups. In this new arrangement, males tended to have higher cooperation rates and be more territorially aggressive outside of the home territory while the females more cooperative and aggressive near the home territory [9, 37].

It should be noted that the sheer richness of these interactions regarding LBG, gender territoriality, mobility and so on should be treated as exploratory insights that form a starting point for our understanding of territoriality in LBG, not as invariable generalizations.

A surprising result was that no participant raised privacy concerns. No participant said that there were places where he would not conquer territories to avoid sharing the fact that he visited the place with other players. No participant was concerned that others could monitor his movements and even find out where he lived and which bus he took. These impressions contradict the concept of self-representation [54] and the general arizing privacy concerns in locative media [13]. Our study was carried out in a university community and centered on the campus of XJTLU. All participants were male students at the same university and some of them knew each other. Most of them lived in the surrounding dormitories and spent the largest part of their day around the campus and surrounding dormitories. Consequently, our study is heavily biased with respect to privacy concerns and self-representation. Most participants said that privacy was not a concern for them because they knew that all the players were students and that most of them lived in the same places and visited the same places anyway. Because of this, the absence of privacy concerns cannot be classified as a finding and we do not contradict or neglect the concept of self-

representation through spaces and general privacy concern in locative media but suggest further research on the matter [56] [13] [54].

By designing and developing a location-based mobile multiplayer game and with respect to the findings of our study we offer the following three design implications for location-based mobile multiplayer games:

1. The game design should construct a layer of virtual reality on top of the players' (real) reality that is lightweight and thin, giving the game a 'real feel' and forming the illusion of playing in the real world to support the integration of the game into the players' daily lives. The 'Thin layer' and 'illusion of playing in the real world' - in this context imply the use of game mechanics that blur the borders and interpretations of ordinary space and play for the players while at the same time do not alter the meaning, history, and significance of the real-world places. The absence of a 'plot' meant that the users were able to imagine their own story to support gameplay and in so doing relate elements of the game to both the real and virtual worlds that the game spanned. This enabled the players to prioritize elements of the game and to map those elements onto the real world in order to express territorial behavior in a way that related to their understanding of place, as opposed to one suggested by an imposed narrative.

2. The gameplay design and mechanics should consider the fact that the game can change a player's perception of the urban space. This is a strong effect and often provides a basis for decision making in the traversal of the urban space as it leads the players to develop an expectation of places, and gives recognition to these places through defining values, which consequently lead the player to develop a sense for certain places. As such, it becomes apparent that it has the potential to significantly affect the traversal of the urban landscape through redefinitions of interpretations of places in the city. Examples of mechanisms that can impact upon the movement of players through the city, based upon factors that affect the players perceptions of space and place include: the type of landscape where the player is based (e.g. a 'natural' urban landscape free of virtual elements versus a virtual re-imagining of the city), and the way that meaning, history, and the significance of space and place are appropriated (e.g. highlighting certain areas as high value if conquered versus having all areas worth the same).

3. The game design should address human behavior such as territoriality to create an engaging experience and to support the integration of the game into existing habits and behavioral patterns of the player in the urban space. Design implications relate to the aforementioned concepts of dwelling, reification of power, 'defensible space', self-expression, and the interplay of 'territorial attachments' and 'activity segregation'. Mechanics should take these into account and interpret them based on the sought experience and gameplay.

Suggested changes for the version 2.0 of CityConqueror leveraging upon these include the following:

i. The ability of players to create home territories (dwelling)
ii. Different type of territories (e.g. territories focused on mining currency, defense territories etc.) (activity segregation)
iii. Carts that visibly move the resources from the different territories to the home territory on the map. These can be defended and can be viewed as "territories on wheels" (territorial attachments, reification of power, defensible space).
iv. Ability to attack other players while they deploy a new territory by setting "traps" on the map
v. Ability to decorate individual territories and mark the urban landscape where more than 3 territories are owned within 500m of each other (reification of power, self-expression)
vi. Visible grouping of nearby territories together to form bigger territories (territorial attachments, defensible space).
vii. Mark certain areas high value if owned (territorial attachments, defensible space).

The ways in which players used CityConqueror and how it influenced the player's experience of the urban space raised several interesting topics that deserve further investigation. Some players used the naming of territories to communicate with others by making a contextual joke, by splitting up messages over claims for others to follow their path or simply as a form of personal documentation of which places they have visited and in what order. While CityConqueror has only limited capacity for such communication, personal documentation and storytelling with respect to place and space are highly interesting and relevant topics that deserve further research in the context of location-based social networks. Communication

and collaboration with strangers, both online in the game and offline in the real world is an interesting topic that could be studied by implementing elements in the game that allow players to communicate with other players. Additionally, team play in small player groups that are traditionally referred to as guilds, squads, or factions, could be implemented to explore how players of location-based mobile multiplayer games coordinate their movements through and exploration of the urban space as a group. Further, the interplay of mobility and physical exertion requires more attention as does understanding the interplay of gender and the expression of territoriality. To investigate the ever-present privacy issues in location-based games and its role in CityConqueror future work could conduct a large-scale experiment with a larger and more diverse population of participants with different backgrounds. We have found that the perception of space with respect to a game and human territoriality can drive engagement and motivation to play in location-based mobile multiplayer games. It would be interesting to see what other human behavioral patterns and habits can be leveraged in location-based games to make people play more. Identifying these patterns and defining design implications for location-based games, we could assemble a toolset or framework to guide the design of location-based mobile games to create engaging experiences that make people play in the urban space.

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