

PLAYING POKÉMON GO FROM THE COUCH:

WHY DO PEOPLE CHEAT IN LOCATION-BASED
GAMES?



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AALBORG UNIVERSITET
STUDENTERRAPPORT

PLAYING POKÉMON GO FROM THE COUCH: WHY DO PEOPLE CHEAT IN LOCATION-BASED GAMES?

SUMMARY

Since the emergence of video games cheating has been prevalent and a major issue of discussion.

Much research focuses on how and why people cheat in video games, but the uprise of location-based games presents a new area to research.

We contribute to the body of knowledge through an investigation on what makes players cheat in location-based game using the specific case of the popular game, Pokémon GO. We explore cheating by applying a multi-method and focus our study mainly on Northern Jutland. We report a series of factors that drive players to cheat.

We report that players of Pokémon GO cheat in ways that are similar to cheating in video games, but we also find that players at times choose to eliminate the location-based aspect of the games by manipulating the phone's GPS signal. Furthermore, we report that players have different perceptions on cheating depending on whether they consider the game to be a multi or single player game

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Phone 99 40 72 28

To:

Simona "Mimi" Avolio
for supporting me

To:

Charlotte Dalsgaard
for keeping me sane

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Preface

This report presents our work on the 4th semester Master's Thesis in Human Computer Interaction at the Department of Computer Science of Aalborg University.

The report is partly a continuation of our previous work on Engagement in Location-Based Games that we did on the 3rd semester. We focus our attention on a single game, Pokémon GO.

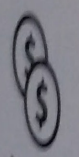
The report is made up of three parts.

First, we present an overall introduction. Secondly, we introduce our most recent paper, which is the main content of this study. Finally, relevant documentation is enclosed, consisting of a series of photographs, interview and focus group protocols and our prior paper on Engagement in Pokémon GO.

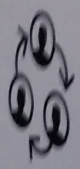
We would like to warmly thank Jani Paay, Associate Professor at Aalborg University, for helping and guiding us during our research path. She has always motivated us, pushing us to do our best, even during difficult times.



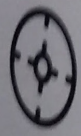
Creative ways to hatch eggs
There are many ways to hatch eggs without walking. Some of these include using a hacked game, using a bot, or using a hacked account.



Account Buying/Selling
Buying or selling accounts is against the terms of service.



Account Sharing
It is not allowed to give someone else access to your account. It is also not allowed to use someone else's account.



Spoofing
It is not allowed to use a fake location. This includes using a hacked game, using a bot, or using a hacked account.



Bot
Automated programs can be used to automate tasks. This includes using a hacked game, using a bot, or using a hacked account.

Introduction

The release of the mobile game Pokémon GO probably marks the first time that many people heard the term location-based games. After its release, Pokémon GO quickly evolved into a global phenomenon with tens of millions of players across the world. However, not all players choose to play in the intended way. When discussing cheating, most players are quick to state that they are against it, but there is generally not a clear agreement on what constitutes cheating within the player community.

Much research exists on cheating in video games, but very few studies to investigate cheating in location-based games exist.

With this study, we look into cheating in location-based games, specifically on which behaviors are being considered cheating and why players choose to cheat. Based on our investigation of Pokémon GO and existing literature on cheating in video games, we explore and discuss similarities and differences between cheating in location-based games and video games.

We adopt a multi-methodological approach, using digital ethnography, field interviews, semi-structured interviews and a focus group. Through digital ethnography, we collect 3256 comments which are filtered and analysed using affinity diagramming (Appendix A). We then conduct open interviews in the field (Appendix B), talking to players we learn more about their ways of playing and the reasons for playing in these ways. We shape the obtained data and knowledge obtained in our previous study (Appendix E) into an interview protocol to further explore cheating through semi-structured interviews (Appendix C). We conclude the study with a focus group structured on a protocol, in this session we explore cheating through a common discussion mixed with group activities (Appendix D). Through analyses of 415 comments, 16 field interviews, 8 semi-structured interviews and a focus group, we discovered important factors related to cheating in location-based games. This information is used to give suggestions on designing future location-based games.

An example of the visualization of the coding references for the semi-structured interviews can be seen in Appendix C, where the size of each rectangle represents the amount of coding references within the category. An important finding unique to location-based games is that some players choose to eliminate the location-based aspect of the games due to various conditions such as weather or time constraints. Thereby, they play the game in a way that resembles a traditional video game. Furthermore, we report that the limited in-game interaction between players results in different perceptions among players on whether the game is a multiplayer or single player game. Players that consider the game as being a multiplayer game are more hesitant to cheat in ways that they consider to affect other players.

While giving an in-depth view on cheating in location-based games, this report is simply an initial exploration of a new exciting research area.

Research Paper

Playing Pokémon GO From The Couch: Why Do People Cheat In Location-Based Games?

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ABSTRACT

Since the emergence of video games, cheating has been prevalent and a major issue of discussion. Much research focuses on how and why people cheat in video games, but the uprise of location-based games presents a new area to research. We contribute to the body of knowledge through an investigation on what makes players cheat in location-based game using the specific case of the popular game, Pokémon GO. We explore cheating in Pokémon GO by applying a mixed-method research design to allow for a wide and deep understanding of this phenomenon. We report a series of factors that drive players to cheat. We report that players of Pokémon GO cheat in ways that are similar to cheating in video games, but we also find that players at times, and for various reasons, choose to eliminate the location-based aspect of the games by manipulating the phone's GPS signal. Furthermore, we report that players have different perceptions on cheating depending on whether they consider the game to be a multi or single player game.

Author Keywords

Cheating, Pokémon GO, location-based,

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI):
Miscellaneous.

INTRODUCTION

Cheating in video games is a phenomenon as old as video games, and the phenomenon is as fast-growing as video games themselves and is constantly being evolved and adapted to new gaming platforms [5]. Data on the gaming industry indicates that there are around 2.2 billion gamers across the globe, which are expected to generate almost \$108.9 billion in game revenue in 2017 [22]. While information of this nature is relatively easy to find, it is difficult to quantify cheaters and cheating techniques since most of these behaviors are rapidly changing and cheaters tend not to talk openly about it.

The subject of cheating is rich with controversies regarding what should be considered cheating in video games and what kind of impact this has on the game community. Video games, like other games, have rules that are binding; if the rules are broken it could be considered as the entire gaming system falling apart, meaning that “the game is over” [12]

Cheating behaviors are often perceived as a threat to the players and the game industry [23;1]. Since these behaviors are often related to personal experience and the motivations behind them are very fragmented and context related, it can be difficult to sort and categorize them [5; 8].

Cheating is widespread in all kinds of games. It can be found in offline single player games, massive multiplayer online games, social network games and mobile games.

Research on cheating is particularly focused on the field of online games [35; 31; 2; 6] which may be because these games are very popular and played by a huge number of people.

An area with limited research is the one related to pervasive games, possibly because these kinds of games are relatively new.

Pervasive games expand the spatial, temporal and social dimensions [29]. Augmented Reality (AR) games are a sub-genre of pervasive games, which expand the spatial dimension by overlaying it with a digital world, creating an Augmented Reality [34]. Another sub-genre of pervasive games are location-based games, where both the spatial, temporal and social dimensions are expanded, often mediated by mobile phones [29]. A few games draw from both sub genres, resulting in location-based Augmented Reality games. The phone becomes an essential part of the game because movement in the game is dependent on movement in the physical world, it is the player's phone (GPS, internet connection and camera) that connect the physical world to the game world. These kinds of games let players experience and interact with the physical world in a completely new and engaging ways and bring the excitement of games to the real world [29]

Google Ingress and Pokémon GO are the two most significant examples of successful commercial attempts at creating profitable location-based Augmented Reality games. Within 4 days of its release in July 2016, Pokémon GO had been downloaded more than 40 million times [25] and had an estimated 9.55 million active users daily in the US alone. [32]. Almost a year later, in April 2017, it still has around 65 million active users on a monthly basis and 5 million users daily [28].

In this paper, we aim to research why people are cheating in location-based games, using the specific case of Pokémon

GO. We aim to contribute to the understanding of cheating behaviors in these particular games, comparing and discussing our findings with respect to existing research.

BACKGROUND

Pokémon GO is a location-based game developed and distributed by Niantic. The game engages players to hunt virtual monsters in a real environment, using a smartphone and its GPS [13]. Pokémons are caught by throwing Pokéballs at them, which can be obtained from interactive spots named Pokéstops that are based on physical landmarks, linked to GPS coordinates. Each Pokémon has an Individual Value (IV) which is a numerical representation of its attack, defense and stamina. Pokémons can be used to compete in special physical points named Pokégyms used as arenas and controlled by a team. There are only three global teams. Players are initially not assigned to any team, but after reaching level 5, each player chooses which team he/she wants to be affiliated with.

In the initial phase of our research we discovered a series of common ways to cheat as perceived by players. Here we briefly explain the 10 ways of cheating that we identified in our study, to make the concepts more understandable:

Botting: Using automated programs to carry out game tasks.

Buying and selling accounts: Purchasing accounts that others have levelled up, often through botting, or selling accounts that oneself has levelled up.

Exploits: taking advantage of the weaknesses of the game and related technologies, such as an inaccurate GPS.

Hatching hacks: manipulating the distance measurer to hatch Pokémon eggs, e.g. by strapping the phone to a dog or a ceiling fan.

Measuring IV: Using apps or websites to obtain information on individual Pokémon's stats that are not directly visible in the game.

Using maps and scanners: Consulting maps that display Pokémon's positions or using functions that alert the user when a specific Pokémon appears.

GPS spoofing: Manipulating the phone's GPS position through an external app or the phone's Developer Mode.

Multiple accounts: Using several accounts, often to gain an advantage in Pokégyms.

Sharing accounts: Sharing Login information to gain an advantage from playing for others or having others play for oneself.

Transport: Using unintended transportation devices to move faster or to other places than walking allows.

RELATED WORKS

The field of cheating in single player as well as multiplayer video games is well researched in many different aspects, but when it comes to location-based games it seems that not much research has been done. In the following section, we present some of the relevant literature on cheating in video games and a small selection on location-based games and services.

Location-Based Games

Geocaching is one of the oldest location-based games. It is still played by thousands of people all over the world and the community is very active [10]. The goal of Geocaching is to find items and caches that are hidden by other people throughout the world [24]. The GPS coordinates of each item are reported on the game website. When a beacon or cache is found, the player usually posts a proof of finding (i.e. pictures) on the Geocaching website and puts the cache back in its place.

Foursquare is a location-based application for mobile devices. When users are visiting a place, which could be a building, landmark, store or a commercial activity, they can "check in" through the app to let other users know about it. Doing so, the user earns collectable badges for going certain places. Foursquare is not considered a game but a gamified location-based service [27] since it has game-like features like collecting items (badges) and competing with other people in the Foursquare community.

Ingress is a location-based game developed by Google and Niantic that was introduced to the market in 2012. It uses physical landmarks and their related GPS coordinates as main elements of the game, as well as a complex social network that allows players to communicate inside the game. Players are divided into two global teams and compete against each other to conquer and defend as many landmarks as possible [7].

Cheating in Video Games

Studies on cheating usually revolve around describing and classifying cheating behaviors, investigating motives for cheating or exploring countermeasures to combat cheating behavior.

Studies such as the ones from Yan & Randell [33] and Duh & Chen [9] classify the different types of cheating in online games, creating a taxonomy useful in understanding and preventing future issues.

An interesting overview on cheating behaviors in video games is presented by Consalvo [4] in a study that introduces a set of cheating behaviors, as well as players' perceptions of cheating and motivation to cheat. She defines cheating as "*taking advantage of a person, a situation, or both.*". Consalvo concludes that there are several reasons to cheat, often related to the specific game and always to the individual player's approach to game. Cheating is a "*way for individuals to keep playing through boredom, difficulty [...] or just bad games*".

One common cause of cheating is becoming able to progress in games when being stuck. Too high a difficulty results in a stressful experience, and players are pushed towards cheating to overcome the problem. Another common reason is the desire to control every single part of the game, "Playing God" as Consalvo [4] defines it.

In other instances, players cheat for the pleasure in exploring the different aspects of the games including the hidden ones, collecting all game items, and bending the rules of the game at their will. "*Cheating, in this instance,*

is not the instrumental action that it is when a player is stuck—it's more ludic in form" [5.]

Doherty et al.'s research [8] is an attempt to further investigate the reason behind cheating, building on previous studies on the subject. They compare their results with Consalvo's cheating categories, and argue that, while cheating behaviors can be sorted and classified, players' motivations may be different because it often relates to the player's personal experience and emotions.

Chen and Wu [3] add to the motives that people are more likely to cheat in video games because they believe that they are unlikely to be caught due to the anonymity of players in many games and because they assume that cheating is a normal behavior in the player community.

Kimppa and Bissett [14] underline the importance of not ignoring the issue of cheating in online games because the games are of value to the players, making it an issue of moral significance. They also address the difficulties in assessing what is considered cheating, as many behaviors that players consider cheating is not directly against the rules of the game. It is easy to condemn behavior that has a negative impact on other players, but other situations are more problematic to assess.

Furthermore, Kimppa and Bissett [14] present a series of countermeasures to combat different kinds of cheating.

Research on cheating in location-based games is extremely limited. There are just few studies that approach the phenomenon, mainly from a technical point of view, to understand how to fight and possibly eliminate cheating in location-based services and games.

Projects like TrustPos [30] aim to find solutions to prevent cheating in location-based games. They suggest doing so by using the internal network itself to continuously check if the GPS location is trustworthy or faked.

He et al. [11] also propose a technical solution to improve anti-cheating measures, using Foursquare as case study to analyze how cheaters bypass the actual protection system and how to prevent this from happening.

Li et al. [19] encountered cheating during their study on augmented reality games, pointing out that cheating behaviors, such as using a GPS-faking application, are common in the Ingress player community. However, they are not easy to study. Players often cheat but discussing cheating happens "*under the veil*". To avoid disruptive behaviors in games such as cheating and to keep the game experience pleasant, the researchers suggest that designers listen to the player community, adjust the gameplay difficulty and allow players to communicate within the game.

DATA COLLECTION

For this study, we applied a multi-methodological approach. Our chosen methods are digital ethnography, open field interviews, semi-structured interviews and a focus group. We decided on a mixed-method research design to allow for a wide and deep understanding of the phenomenon of cheating that would have been impossible if

using only any single method. We applied the methods in stages so that the obtained data helped structure the following collection of new data.

Digital Ethnography

The study was initiated with a 3-week digital ethnography. This method differs from ethnography by the researchers emerging themselves in a digital world and an online community rather than a physical [21]. We collected digital data, in the form of online posts. The method was chosen because we wanted to quickly form a wide understanding of a complex phenomenon in a short amount of time, including how people cheat and what they talk about online related to cheating. Inspired by the work of Raptis, et al [26] we adopt a two-step process of collecting and iteratively refining data.

We used various keywords like "cheating" and "location-based games" taken directly from our research question. Others, like "Pokémon GO", "advantage", "modding" and "hacking" were found in the semantic field of the research question. Doing so, we also collected comments on e.g. cheating in Google Ingress. We used common search engines and platforms such as Google, Bing, Facebook and Reddit. The collection spanned from March 1, 2017 to March 17, 2017, involving approximately 40 hours of online searching.

In total, we collected 3256 comments that were downloaded as PDF files, which were filtered iteratively by removing non-relevant comments such as complaints about Niantic or their policies and degrading comments about cheaters. E.g.

"You know what, Niantic? I'm done. Fuck you"
(digital ethnography)

"we should enact the death penalty for those who cheat using GPS tech. It's just... sick... and wrong... and they deserve to DIE. Or at least have their Pokemon taken away." (digital ethnography)

After the final iteration, we had a collection of 415 comments. This method supported an understanding of common ways of cheating and motivations that allowed us to assess how to talk about the topic and how to approach people for field interviews.

Field Interview

We used the method of field interviews as a tool to explore cheating in situ. Here, we actively sought out and interacted with players in the environment that they usually play in, allowing us to understand activities within the context of use [15]. The knowledge obtained through digital ethnography was used to structure a set of areas to investigate, such as ways of cheating and general thoughts about cheating. The pre-existent understanding proved immensely important in our ability to approach players and understand the answers, which allowed the conversations to be more fluent and natural.

We performed an initial series of open field interviews in Kildeparken, an urban park in Aalborg, which is one of the preferred areas by local Pokémon GO players (Figure 1).



Figure 1. A player cheating in Kildeparken by playing on three separate accounts simultaneously.

The interviews were conducted during a span of three days, and we conducted a total number of 16 interviews with 19 participants. The target was heterogeneous and included 11 single players, 3 pairs and 2 children. The average age was around 30 years, ranging from around 10 to 50.

Due to using "fake GPS" and "bots" some players play from home, so we decided to run a second series of interviews, recruiting players online for short open interviews at their private homes, so that the context of the interview suited their normal playing habits.

Taking place in the field, the settings were noisy and with many distractions, but the method proved to facilitate a solid, wide understanding of cheating in Pokémon Go. To further explore areas discovered through the field interviews, we designed a series of semi-structured interviews.

Semi-Structured Interviews

We decided on doing semi-structured interviews to expand on specific behaviors, feelings and thoughts discovered through prior methods. We structured the interviews on an interview protocol, as described by Kvale and Brinkmann [17] to ensure that all relevant topics are touched upon, while also exploring new emerging topics. To understand motivations for cheating we designed questions such as "Which rules do you think work well, and which ones don't?" and "Why did you choose to play like this?". Most of these were based on the preceding data, but some were also on our prior research on engagement in location-based AR games [13].

The protocol we created was divided into sections named introduction, ways of playing/strategies and view on cheating/rules. For each section, we included a short introduction that explained the topic, this was aimed at making the participant feel comfortable, so that he/she would not feel obliged to give certain answers.

We made sure to encourage participants to reflect on their own experiences and use of the game and related

techniques. Combining this with a more relaxed setting than the field interviews, and more time to talk about various aspects, these interviews allowed us to explore reasons for cheating that were undiscovered after applying the prior methods. Figure 2 shows a screenshot of an external map that we took during a field interview.

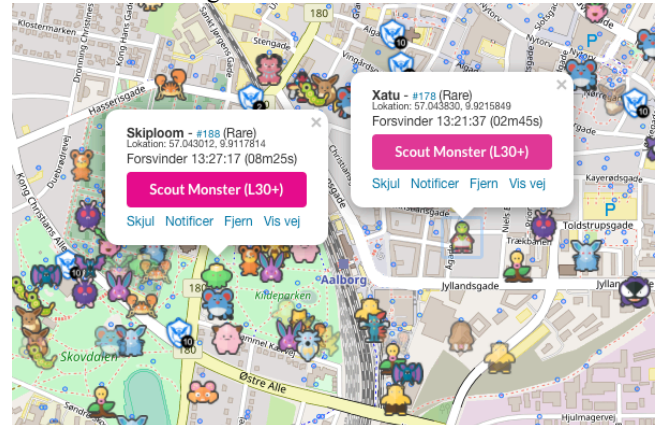


Figure 2. Use of an external map

We conducted a total of 8 interviews involving 9 participants, 5 males and 4 females, aged 11-35, average age 24. 3 interviews were conducted at Aalborg University, 1 in a private home and 4 online.

These interviews resulted in rich data on topics such as fairness and playing from home, which helped us narrow the focus and clarify what could be further explored through a focus group.

Focus group

We facilitated a group discussion between players, in the form of a focus group based on an approach inspired by the guidelines from Krueger & Casey [16]. Using this method, we aimed to trigger participants to open up and reveal information that may not have been shared with us by any interviewee.

All participants were recruited in Kildeparken, during our field interview sessions. The participants were a young couple, a woman and her two grandchildren, and a single woman. The participants were aged 22, 23, 60, 7, 10 and 54 respectively.

The focus group was structured on 2 ice breaker activities and 8 questions. For the activities, the participants were divided into two groups, for the rest of the session the participants discussed as one single group. The session was audio recorded and photographed, and it lasted around 90 minutes.

Before each ice breaker activity, the participants were divided in two different groups. Splitting them in groups allowed us to observe and collect data of different groups' dynamics.

For the first activity, one group consisted of the young male and the two kids, the other of three women. The activity consisted of us presenting a single-sentence topic, followed by a 90 second group discussion, and 30 seconds where participants would individually write down one word that

reflected his/her thoughts on the topic. We used the topics "Playing Pokémon GO" and "Cheating". The goal of this activity was to make the participants accustomed and comfortable each other, and to introduce the topic.

The second activity consisted of giving each group a set of cards representing different common kinds of cheating, asking them to sort the cards, according to what they considered cheating or not (Figure 3). For the second activity one group was composed of the couple and the single woman, the other of the grandmother and her two grandchildren.

We then asked them to explain how and why they decided on sorting the cards in the way that they did. Following, they had to sort the identified cards from least to most severe kind of cheating according to their own perception. The aim was to immerse the participants into the topic of the focus groups, and to gain an understanding of their perception of cheating. The activity triggered an intense dialogue which all participants took part in.



Figure 3. A group discussing cheating techniques during the focus group

After the group activities, the two groups were dissolved and the focus group session continued as mutual discussion with questions such as “*What are the pros and cons of using enhancing tools to play Pokémon GO?*” and “*Can you give any examples of cases where it would be acceptable to bend the rules?*” designed to stimulate participation, self-reflection and to investigate reasons and thoughts behind cheating.

One of the benefits we had from using the focus group was that the participants became relaxed and willing to express their thoughts, more so than the people we interviewed before. It seems that the group activities and questions stimulated them to talking about cheating, in a way we did not experience using other methods.

Moreover, the focus group allowed us to form a precious understanding on “Acceptable cheating”, a reasoning for cheating because of not damaging other players’ game experience.

DATA ANALYSIS

Due to the limited research on cheating in location-based games, we could not base our coding on an existing theory or framework, so we used emergent coding to refine the list of coding categories based on each dataset. We intertwined the processes of data gathering and data analysis, so that we could continuously adapt our research to the data we discovered.

We used a step by step process starting from the digital ethnography dataset, moving through the following datasets we developed an iterative code list. When a final code list was created from the focus group dataset that list was then applied to all datasets, making the coding an iterative process.

For inter-rater reliability, to ensure an acceptable quality and to properly identify suitable coding categories, we followed a strict procedure. We coded all of the data individually and later compared our coding, making sure to agree on all coding categories and each individual code item. Each disagreement or differently coded part was discussed until agreed upon and then corrected. At the end of this process, we had coded 1493 references.

Analyzing Digital Ethnography

We had allowed for two weeks of collecting comments, at the end of the two weeks many of the comments became repetitive and we began the process of analyzing the data.

We use the technique of Affinity diagramming [20] to sort the data. The 415 comments were all gathered in a single document consisting of 112 A4 pages, which were printed, cut up into individual comments and then organized into piles named according to the content. After the initial sorting of comments, we reread and discussed each individual comment to make sure that the piles consisted of coherent data. Visualizing the data in groups, we realized that a few comments could be interpreted in different way, which lead to another iteration sorting the comments. We applied the same technique to the field interview dataset.

These code items combined form Code List 1.0. We then imported all the comments into the tool NVivo and used the coding list to code all comments. The resulting code item list was similar to the affinity diagram, but several comments were coded into several themes because they contained information that related to more than just one theme.

Analyzing Field Interviews

The process of analyzing field interviews was similar to the one of digital ethnography. The difference was that after doing an affinity diagram for field interviews, the resulting code items were combined with the existing code items of Code List 1, which together formed a new iteration of the code list (Code List 1.1). We used Code List 1.1 to analyze the field interview dataset.

Analyzing Semi-Structured Interviews

This step was different from the previous ones. We decided to not use an affinity diagram to identify new possible

categories because this data was more homogeneous than the previous data, as a result of the sessions being carefully crafted and planned.

Instead, we used emergent coding to find research-denoted concepts by continuously working through the data and discovering recursive patterns [18].

We independently worked through a selected part of the dataset and developed a list of coding categories based on our individual interpretation. Then we compared our lists and discussed the differences until we reached an initial coding list that both agreed on.

The code items that emerged from this activity were combined with the Code List 1.1, resulting in an updated code list, Code List 1.2. This third code list iteration enriched the list with several new items. The dataset was then coded using this list.

Analyzing Focus Group

The process of analyzing and coding the focus group dataset was the same as used for the semi-structured interviews.

After discussing and deciding on a set of code items through the emergent coding, we combine the result with the Code List 1.2 to generate the final list, named Code List 2.0, which was then used to code the dataset.

Re-coding the datasets

We applied Code List 2.0 to all datasets starting from digital ethnography to focus group to ensure data consistency. We chose to follow this iterative procedure to make sure that the most relevant code items and data were discovered, and we believe that continuously refining the items iteratively helped us to successfully identify the most relevant emerging concepts from the data, rather than simply attempting to fit each piece of data into an existing code item.

FINDINGS

From the data analysis described above, 9 overarching themes emerged which we will present and discuss in detail in the following section.

Playing location-based games without moving

At the very core of location-based games is the location aspect. Many enjoy playing Pokémon GO because it forces them to go outside and exercise and socialize. However, there are situations where a group of players choose to eliminate the location-based aspect of the game by using a GPS-faking application that lets them manipulate GPS positions and thereby play without moving.

Players situated in areas with a not so dense spread of Pokéstops and Pokégyms often feel that they are not able to experience the game on equal terms to the players in large cities. One player expresses:

“The truth is that not all players are treated equally, some of us have 2-3 pokestop on top of their own house, while others have to travel 1 hour just to reach one

of them, and some of us don't even have pokemon spawns near their place” (digital ethnography)

In the digital ethnography dataset alone, 82 comments concerned this aspect of Pokéstop locations, and it was further added to through the following methods.

Proximity to Pokéstops is not the only aspect that makes players resolve to manipulating the location through GPS cheating. We observed several instances of players expressing that they either do so because of physical impairments, bad weather conditions or simply because of not having enough time to play in the intended manner. One player sums up how many separate factors can encourage cheating:

“I would love to play and go out and socialize, but time, children/a baby, the server, work, college and of course the fact that pokestops and gyms are no where near me, can cause GPS spoofing to be very tempting” (digital ethnography)

Making the game more fair

A general agreement on the fairness issue exists, but there is less agreement on whether this justifies cheating. One's physical location is not the only factor that has an influence on how the game is experienced.

“It's an inherently unfair experience. By its very design it was built to encourage this sort of behavior. The responsibility is on Niantic, not the player base” (digital ethnography)

With 3 teams available for the player to join, one would initially expect an approximately equal distribution of players on each team, but reality is somewhat different. Many players that were allocated to the team with least players, and to a less extent also players that joined the team with second least players, feel that the distribution results in an unfair experience for players on the less populated teams, making it harder for these players to maintain a position in Pokégyms. This motivates some to manipulate their phone's GPS signal so that they can claim gyms without having to physically go there to reclaim it every day.

Other players perceive an unfairness in the strength of specific Pokémon. Placing strong Pokémon in a gym makes it hard for others to win the battle, as a result many resort to using maps or scanners to find these Pokémon so that they increase their chances when competing in the Pokégyms.

Renewing the game

We encountered many players that complained about a lack of excitement due to the repetitiveness of the game. Some players decided to attempt to increase the excitement themselves, which we identified several ways of doing.

One way is to switch up the game environment through GPS spoofing. Doing so, players experience new places and

biomes virtually. Wanting to be surrounded with new Pokémon is the most common reason for GPS spoofing, as one interviewee explains:

“It’s nice because we went to Tokyo and it was some other pokemons than we have in our area. Well some of them were. It was exciting to play in a new place.” (semi-structured interview, Participant 8)

One interviewee even commented on the excitement of experiencing new environments and art through the pictures attached to each Pokéstop.

The main reason players try to renew the game is to recreate the feeling of excitement that they felt when first playing the game, they want to have *“more fun”*. When almost all Pokémon have been discovered and caught people turn to GPS spoofing or using maps to find the last Pokémon that they need, instead of wandering around and waiting for it to randomly spawn. These players seek the arousal of registering a new Pokémon to the Pokédex and the feeling of accomplishment when a new Pokémon is finally caught or evolved.

Eliminating boring aspects

In relation to increasing excitement, some players choose to reduce or eliminate those aspects of the game that they do not enjoy. Collecting items that are necessary to catch and evolve Pokémon is one example of an activity that many players do not enjoy. Niantic offers players to purchase Pokéballs to avoid collecting them manually, but some players find another way. A player explains how using bots combats this:

“It was mostly about making it easier, of course you can pay for pokeballs and stuff like that, but you can also just pay a few dollars to get everything using the bots, so that’s what I decided to do. I guess it’s about making it more exciting, because you don’t have to waste time gathering items and catching worthless pokemons. It’s automating everything so you simply get what you want” (semi-structured interview, Participant 1)

Another player explains how automating the process resulted directly in increased excitement:

“The bot was a game within a game. [...] it was intoxicating. A lottery system where winning was not a matter of ‘if’, but ‘how much’. Leave it running and come back later to see what prizes had been collected” (digital ethnography)

Crafting their own adventure

Many complain about the repetitiveness of the game, but a small group of players are using a map and a bit of imagination to experience the game in a new way. Using maps that display the Pokémon’s positions and the amount of time left before a Pokémon disappears, these players

develop an imaginative story in which they are Pokémon trainers on a mission. The term “mission” was mentioned in several cases, a couple of players expand on developing a story around the map cheat:

“It is like hunting: you study your prey, its habits and try to locate where it spends most of the time” (open interview, Participant 12)

“The thrill of chasing down Pokemon found on poke vision or poke radar was far more fulfilling than not knowing where anything is or what direction to head at all” (digital ethnography)

The players that go on this imaginative journey seem to agree that the excitement from the chase exceeds the excitement of playing in any other way.

Completing difficult game tasks

The desire to “complete” the game by filling out the Pokédex is another reason why some players resort to cheating. Though the game has no definitive end, many see collecting one of each Pokémon as the purpose of the game. A player explained to us why he is using maps:

“It’s nice because I can see what pokémon I can get. I already have most of them so I just need some specific ones” (open interview, Participant 1)

Players do this to gain a sense of purpose, something that they aim to accomplish, so that they experience a positive feeling every time they get closer to completing the task. Others make it their personal goal to collect as many rare Pokémon as possible or Pokémon with special characteristics such as 100% or 0% IV. To catch the Pokémon that are regionally locked, players manipulate their GPS. When trying to catch Pokémon of a specific IV, most players locate these through the map. The arousal of catching a rare Pokémon is still there, even though it was caught by cheating. The pleasure of catching one of these seems to be related to its rarity, one player explains chasing these:

“It’s just because they’re hard to get. Not everyone has them and they’re special” (semi-structured interview, Participant 8)

Keeping up with cheaters

An unfortunate side of cheating in Pokémon GO is that others are affected by this behavior. Related to the perception of fairness, many players, who previously did not cheat, felt at a disadvantage to the cheaters, especially to GPS spoofers.

“It’s obvious that it does provide an advantage, because if you were playing as intended then you’d never be able to reach that amount (of Pokémon), and because

you do that you're now able to get a Tyranitar and place it at the highest level of the gym that you conquer. So, cheating by tracking or spoofing has a huge impact on how the game evolves." (semi-structured interview, Participant 5)

A few players expressed directly that they cheat because others do so as well and that it is necessary to cheat to keep up. This mainly relates to fighting in the Pokégyms, and a few players even go to an extra length of cheating simply for the pleasure of getting revenge on cheaters:

"it's soul crushing when you make the effort to play the game properly and some asshole can take it from the comfort of their home. So I looked into a way to spoof (w/ my iPhone) to get back at this person. [...] it was pretty satisfying to actually make a dent in this player's mind. That's why I did it because it felt great to get back at this person" (digital ethnography)

Exploring game limits

We identified a few instances where players took pleasure in exploring hidden aspects of the game or discovering its limits. The curiosity of seeing what is possible and the pleasure of finding these possibilities drive this group of players to dig into the Application Programming Interface (API) and to explore its boundaries and expose its limits. Some of these explorers see it as a challenge to expose this information while others are motivated by mere curiosity. Simply figuring out how to successfully carry out a method of cheating is pleasing to some players, and some even enjoy sharing their discoveries or maps with others:

"I'm not going to lie. It was fun to see how easy it was to cheat and how quickly my collection was growing. If I really wanted to catch 'em all, was it so bad to just send out a bot to do it for me?" (digital ethnography)

"I see it more as a hobby, it's fun to learn from it [...] It's nice to know that I'm making people happy, that makes me happy as well." (semi-structured interview, Participant 7)

Bending the rules

An interesting discovery relates to the rationality that lies behind cheating.

Players that consider Pokémon GO a single player game are seemingly not hesitant to cheat, because they do not feel obliged to follow the game rules or feel that cheating should be allowed:

"I'm playing by myself, by my own rules" (semi-structured interview, Participant 1)

"my game, my rules. Man, It's like home invasion. You cannot decide how I'm playing." (semi-structured interview, Participant 6)

Especially the players that consider it a single player game see no moral dilemma because they perceive it as only affecting their own gaming experience.

In contrast, players that consider Pokémon GO a multiplayer game are seemingly hesitant to cheat because they see a moral dilemma when it comes to cheating. However, it is commonly agreed that there are situations in which it is acceptable to bend the rules and other situations where it is not. There also seems to be consensus on a scale of how serious each "offence" is, mainly that using maps and IV measurers are well-accepted while bots are frowned upon. In the focus group session, the two groups visualized such scales and agreed that botting was the worst offence:

"You can just start your computer and have it running for two days and then you have a level 30 account that you can use to conquer or fight in gyms, and that's ruining it for others" (focus group, Participant 3)

In most cases people cheat because they can justify doing so, either because they think that it does not affect others or because the game does not offer enough excitement at its current state. Only a few players articulated the response that they simply do not care, they focus on their own experience and could not care less what others think of their way of playing.

Furthermore, many see these as a missing part of the game:

"It should be okay to measure IV, because it's important to the game. It's a part of it. You need high IV pokémons to compete" (open interview, Participant 5)

"Pokevision is fine to use as long as the tracker is broken. How else are we gonna find pokémon when niantic disables the tracker? I'll probably stop using it when the tracker works again." (digital ethnography)

DISCUSSION

In this section, we discuss the most important findings on why people cheat in location-based games, specifically Pokémon GO. To answer this, we organize the discussion in three main themes: *Playing is not always location-based* in which we discuss the location-based nature, *Making the game more fun* where we discuss engagement and *Acceptable cheating* in which we discuss how players justify cheating. Being that not much literature is published on cheating in location-based games, we compare our findings to existing literature on gaming in wider terms. We then make a series of considerations for designing location-based games to control and reduce cheating, based on our study experience.

Playing is not always location-based

At the very base of every location-based game lies the fact that players must physically navigate their surroundings to participate and play the game. Through our research, we learned that some players choose to eliminate the location-

based aspect of the game, some permanently, others for single sessions when circumstances do not allow for play. One player explained that he felt like he had to stop playing normally, because if he switched between playing in his physical surroundings, and spoofing to Copenhagen he would risk being banned, but the experience when playing by spoofing simply beats the experience of normal play. Others GPS spoof when circumstances do not let them play as usual. This includes having to care for others, being busy, bad weather conditions and physical impairments, and sometimes it is a mix of several factors.

The low number of Pokéstops and low amount of Pokémons in many areas outside of the city are other reasons for GPS spoofing. To experience the game in the same way as urban players, some players resort to GPS spoofing which again means that the location-based aspect is removed from these players' experience. In this way, it is the very design of the game that creates a perceived need to cheat. From collecting more than 3000 comments and interviewing more than 50 players through the last year, we only encountered a single player that GPS spoofed because he did not want to play the game by moving around, as he explains:

"I spoofed. I don't need exercising and all that stuff, all i really want are the best pokemon and the most. In my small town there aren't many of those" (digital ethnography)

Eliminating the location-based aspect of the game removes one of the characteristics that makes the game pervasive, but it is not necessarily that players do not want to play in the intended way, but that they want to play even when they cannot play in that manner.

It has previously been established that players of location-based games cheat by manipulating their phone's GPS, so it is not surprising that this also happens in Pokémon GO. As pointed out by Li et al. [19], in Google Ingress this practice is a common way to circumvent having to spend time moving around physically, but it is heavily criticized by many players.

"If someone is ruining the game cheating, then I will play more aggressive ... I will denounce them all on Facebook Group, so their character will be marked as "cheater"'" (semi-structured interview, Participant 4)

However, our findings highlight several other reasons why people do so, which have not been explored to great depth in research so far. It also makes it very clear that GPS spoofers are not just immoral, lazy people with no willingness to make an effort, as many self-proclaimed 'pure' players seem to think. When some players choose to not make use of the spatial expansion that pervasive games offer as described by Montola [23], it is not because they do not want to physically move, but they choose to occasionally only play in the virtual world and not in the

blended realities because they want to play even when they are not capable of playing in the intended way.

We also learned that it is hard to please every user. With the current setup focusing heavily on urban players, Niantic has chosen the utilitarian approach of trying to please a group as big as possible. This leaves out a group, which then feel that they have to cheat to create excitement and to make the game fairer to them.

Making the game more fun

Cheating is not exclusively a way to turn a boring game into an exciting experience, as Consalvo explains [5]; it can also be used to increase the pleasure in an already-pleasurable experience. Cheating can be a way to discover secrets and alternative options or a way to re-experience the game in a new way after already having completed the game.

One of the biggest issues for Pokémon GO players is to keep a constant level of excitement to avoid the bad and frustrating aspects of the game experience. This is consistent with Consalvo's research on offline and online video games, where cheating is a way to enhance the pleasurable experience when feeling that the game has become repetitive or when they want more from it [5].

We identified at least three relevant areas of cheating in Pokémon Go that relate to making the game more fun, which we discuss in the following sections; *Boring and repetitive tasks*, *Difficult game tasks* and *Developing your own story*.

The three points all have in common a desire to renew the game or some game aspects.

Boring and repetitive tasks

By design players continuously need to walk around to collect Pokéballs and other items that allow them to catch and evolve. This is one of the aspects of the game that many players dislike because the task feels repetitive. Niantic offers players the ability to purchase these items through an in-app store so that they do not need to collect them manually. Unwillingness to pay for items in a free game pushes some players to attempt to remove this repetitive aspect of the game and they do so by automating the collection process through using a bot.

Not wanting to pay for game items is hardly a surprising reason to cheat and has been seen in other types of games as well. Consalvo suggest that players cheat to speed up certain game aspects [5]. Skipping tasks such as catching Pokémons or collecting Pokéballs by automatization allow players to save time, using maps also allows players to save time.

An interesting additional finding is that the use of bots results in a new form of excitement; an excitement that is derived from getting the bot to work and from the curiosity of discovering what the bot has collected. We have not found any literature that deals with this topic.

Difficult game tasks

Certain game tasks might be too difficult for some players. Conquering a gym or capturing a rare Pokémon could

transform the game into a challenge too hard to achieve for some people.

Consalvo identifies a similar occurrence in video games, when players experience the feeling of being stuck in certain part of the game [5]. They feel that their cheating actions are “justified” because of the game difficulties due to a bad game design. The perception of difficulty is of course individual, but in Pokémon GO it is impossible to complete certain tasks without going to extensive lengths.

One of the most common reasons to cheat in Pokémon Go is to complete the collection of Pokémon. It is necessary to walk and play for long time, to be able to capture all the Pokémon in the game.

Some of them are rare and it could be very difficult to catch them, even after many days of playing. Moreover, there are so called “regional Pokémon” that are present only on a specific continent. It is basically impossible to complete the Pokémon collection without travelling the world.

So, in order to fulfil the task, some players are using GPS spoofing to reach and catch specific Pokémon. Using this kind of cheating technique to reach the feelings of accomplishment and arousal from catching and conquering can be seen as engaged-behaviors in continuation of our previous work [13]. These behaviors indicate that the players are engaged in the game, which suggests that GPS spoofers are not cheating only to make the game easier but also because they are mentally invested in the game.

Developing your own story

A peculiar aspect of cheating in Pokémon GO is related to developing a personal story within the game. This aspect, which we discovered in our previous study, is emphasized through the use of external maps [13]. The players imagine hunting Pokémon in the wild, using the application as a hunting weapon and a digital map as a supporting tool.

Maps are an active part in hunting Pokémon, helping players to locate targets. Moreover, it helps players relate themselves to their avatar and identify with it, blurring the border between the physical world and the fictional one. The expansion of the spatial aspect of the game circle [23] is supported by the use of external maps that facilitate the blending of real and fictional worlds, which contributes creating an engaging experience.

In our previous study, we determined that the blend of the worlds can make players perceive themselves as an actual Pokémon trainer, but that cheating supports this blend was an interesting discovery. In relation to Consalvo’s work, it can be interpreted that this kind of cheating is another way to increase the pleasure of an already-pleasurable experience.

Acceptable cheating

Another interesting discovery is that players have different perceptions of what kind of game Pokémon GO is, some believe it is a single player game, others that it is a multiplayer game.

We did not investigate whether one group is more prone to cheating than the other, but we did learn that the majority of

players cheat in some way. A recurring way to justify common ways of cheating such as using maps, scanners and IV measurers is by claiming that it does not affect other players and therefore is not really cheating.

Not affecting others is an interesting concept that we encountered several times throughout the study. While not directly being a reason for cheating, it seems to be the most common way of justifying cheating. Furthermore, players agree that the use of some cheats is generally accepted by the player community, while others are not, and the perception of how much the cheat affects others seems to dictate whether it is accepted or not.

Doherty et al. suggest that these ethical aspects are formed by the player community of multiplayer games and not in the games themselves [8]. However, in most games there is a very clear division of single player and multiplayer modes, but this division does not exist in Pokémon GO, which results in groups of players perceiving the game in different ways. The ethical dilemma becomes apparent in the fight for Pokégym, and players that consider the game to be a multiplayer game often recognize this. This makes the ethical considerations in Pokémon GO different from many other games, because it relies on the player’s perception of the game.

Consalvo showed that the community has a very negative view on players that cheat [5], we experienced this negative view when talking about cheating in Pokégym and botting, but other than that we generally experience relaxed attitude towards other kinds of cheating.

A unique finding comes from an interview with the creator of one of the most used maps in Denmark. He explains that he gets pleasure from seeing and hearing how his map helped improve the gaming experience for other players. We have not found prior studies that focused on why people share their mods or other attributions to games, but we do believe that this adds an interesting insight to why people might share this kind of content with other players.

Recommendations for Location-Based Game Design

When designing location-based games we suggest taking the following issues into consideration.

An unequal distribution of game elements across locations results in a perceived unfairness because there are less elements available for players outside of the major cities. We suggest that developers let players contribute by continuously adding game elements in new locations as the game evolves. This supports a feeling of contribution in players in rural areas, instead of leaving them to feel overlooked and is one way of creating a positive experience based on a lack in the game.

Cheaters can be a precious source of information regarding the discovery of bugs and weaknesses. Game designers can use this knowledge on cheating as an inspiration to improve the game for others, by learning from cheaters instead of fighting them. An example would be to improve the internal map tracking system. Adding a map function can make the game more fun to play because it supports the perception of

having a mission to accomplish and of having a chance to actually catch all the available Pokémons in the Pokédex. Giving a sense of a mission to complete supports the blending of the player with the game character making it more engaging.

LIMITATIONS

The aim of this paper is to give precious insight into a little explored research area, not to definitively determine universal factors that make people cheat in location-based games. Our main limitation in this study is that it was conducted with a limited number of participants in a relatively small part of Denmark, that being Northern Jutland, and mainly in the city of Aalborg. However, through our multi-method approach, we did counteract this geographical limitation to a certain extent by looking at online sources, in our digital ethnography, from other regions around the world.

Another limitation we encountered was the difficulty in finding participants willing to talk about certain types of cheating. Cheating is a sensitive topic for many people and it is often considered a sin by the player communities, both online and offline. The communities' closed and often aggressive attitudes towards cheating made finding players willing to talk openly very difficult. In several instances, we even encountered people hindering the research by e.g. threatening to show up at the interview sessions to expose the cheaters. This in turn limited the number of participants that we could recruit within our limited time frame.

CONCLUSION

In this study, we discuss the reasons behind cheating in location-based games, using Pokémon GO as a case.

We used a multi-method approach that includes digital ethnography, field interviews, semi-structured interviews and a focus group to explore and understand the research area.

The analysis of the collected data, helped us to refine and isolate information unique to Pokémon GO and location-based game cheating.

Through the different phases of our project, we obtained data regarding cheating in location-based games, which we have shaped into recommendations for designing location-based games.

With this work, we add precious information and data to the limited research existing on cheating in location-based games, thereby contributing to this gap in existing knowledge.

Many players ignore the location features at times, playing the game almost as a classic video game. This is often claimed to be because of bad game design choices or because of external factors such the lack of time or bad weather conditions. Furthermore, the limited in-game interaction between players creates different perceptions among players on whether the game is a multiplayer or single player game. We point out that the different perceptions directly affect the cheating behaviors of players.

Additional studies on other location-based games would strengthen these findings and likely show differences within the genre. Large scale studies or studies focused on other geographic areas or demographics could likewise contribute to a more generalizable body of knowledge.

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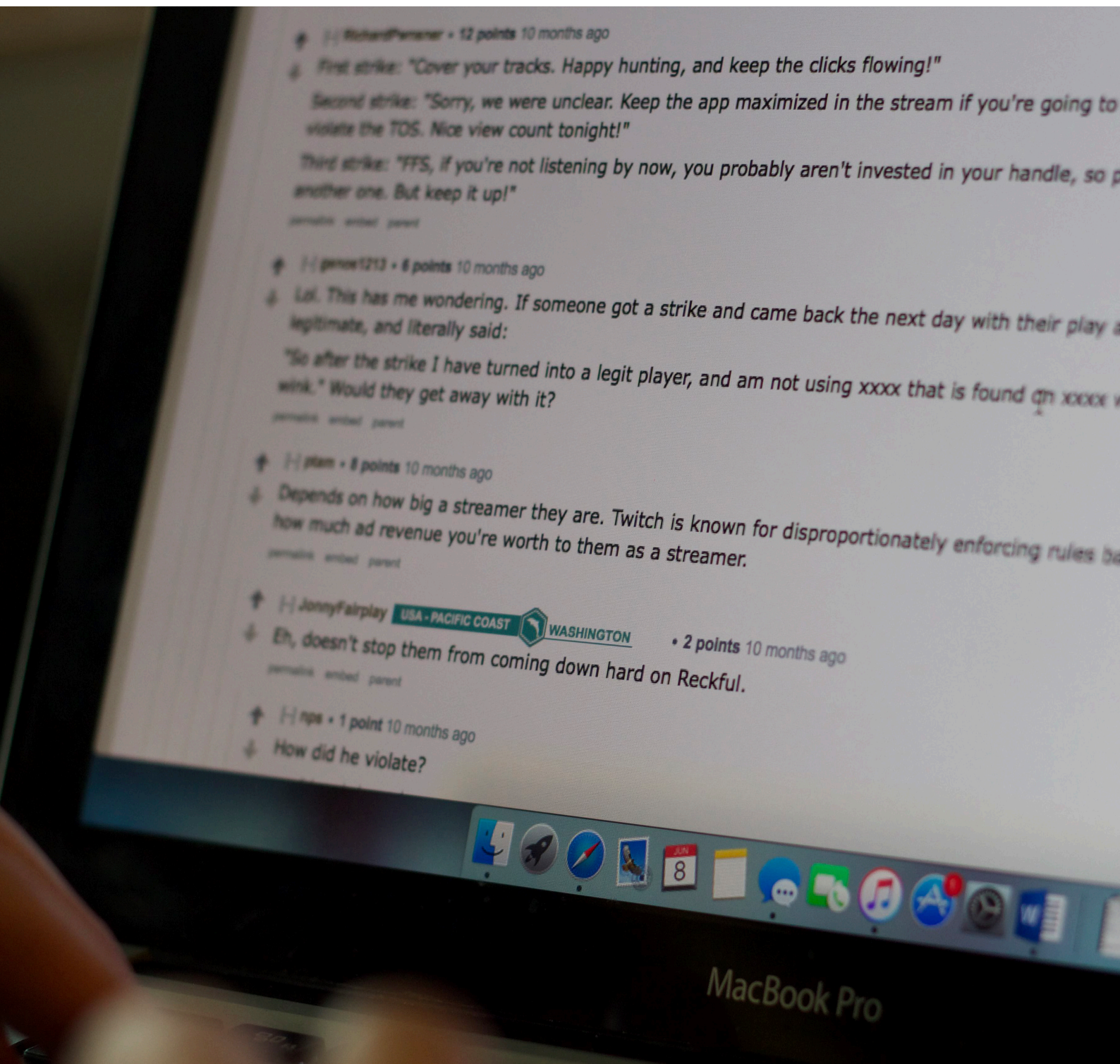
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APPENDIX A

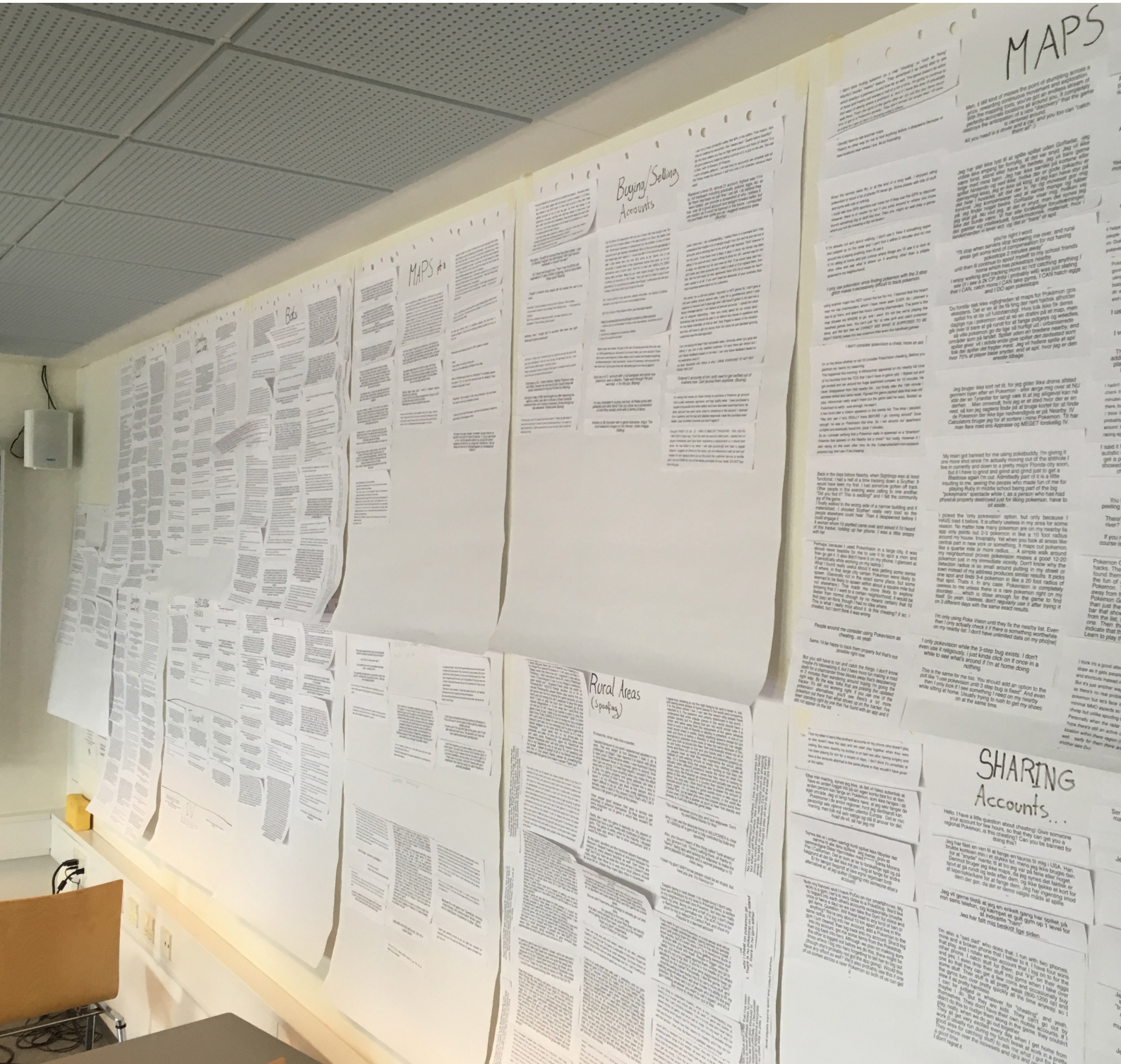
Digital Ethnography



Scanning the web

Reading and collecting comments about cheating.

Digital Ethnography



Affinity Diagram Wall
All the data through Digital Ethnography
organized in clusters.

APPENDIX B

Field Interviews



*Cheating in Kildeparken
A player is using three different accounts
at the same time.*

APPENDIX C

Semi-Structured Interviews

I dette interview vil vi komme ind på en række forskellige emner. Hovedfokus ligger på forbedring af spiloplevelsen gennem brugen af forskellige redskaber eller strategier. Nogle vil mene, at brugen af disse redskaber er det samme som at snyde. Det er vigtigt at forstå, at vi ikke er interesserede i hverken at dømmе folk for deres måde at spille på eller at fastslå hvad der er etisk og uetisk. Det vi gerne vil opnå med vores interviews er at; danne overblik over hvordan folk her i Danmark spiller og hvordan oplevelsen af spillet påvirkes når der spilles på en anden måde end hvad Niantic opfordrer til.

Introduktion: Først og fremmest vil vi gerne høre lidt om dine tanker i forhold til spillet. Dette afsnit handler hovedsageligt om de følelser som du oplever når du spiller. Formålet er, at få et indblik i din holdning til spillet.

- 1.Hvad nyder du mest ved at spille Pokémon GO?
- 2.Hvad føler du, at du følelsesmæssigt får ud af at spille?
- 3.Hvad er det som gør, at det bliver ved med at være sjovt?
- 4.Har du nogensinde købt noget i appens shop? (Hvis ja, hvad og hvorfor?)
- 5.Har du gjort andet for at forøge glæden eller spændingen ved at spille?

Spillemåde og strategier

Dette afsnit omhandler din måde at spille på. Dette er for at danne et indblik i hvordan du normalt spiller og hvilke redskaber og/eller strategier du gør brug af.

- 6.Hvilke strategier/work arounds/tricks bruger du for, at gøre det sjovere at spille?
- 7.Bor du tæt på et eller flere pokéstops? (Hvis ikke, hvordan føler du at dette påvirker din måde at spille på?)
- 8.Hvordan bevæger du dig mellem pokéstops og forskellige områder hvor du spiller?
- 9.Har du nogensinde prøvet at udklække æg på andre måder end blot ved at gå med din telefon? Hvis ja, hvilke og hvordan kom du på ideen?
- 10.Samarbejder du nogensinde med andre mens du spiller Pokémon GO? Hvis ja, hvordan?
- 11.Har du nogensinde logget ind på en anden persons account eller ladet en anden person logge ind på din? Hvorfor?

*Semi-Structured Interview Protocol
-Danish Version Page 1-*

Dit syn på “snyd” og regler

Dette afsnit handler at forbedre spiloplevelsen ved at omgå eller ignorere nogle af de regler som Niantic har fastsat. Vi er som sagt ikke interesserede i at fastslå hvad der er eller ikke er snyd, men vi vil meget gerne høre din holdning til dette. Vi vil gerne forstå din spillemåde og dine holdninger til forskellige måder spillet kan spilles på. Du må meget gerne uddybe dine svar i dette afsnit.

12. Hvilke regler i spillet synes du godt om, og hvilke synes du ikke om?
13. Føler du, at du er forpligtet til at spille på en bestemt måde på grund af andre spillere?
14. Bruger du eller har du brugt eksterne redskaber, websites eller apps mens du spiller Pokémon GO? Hvis ja, hvilke? (udover dem som du evt. allerede har nævnt)
15. Hvordan lærte du, at (eks. spoofing) var muligt? (og de andre redskaber du har prøvet)
16. Hvorfor har du valgt at spille på denne måde? (eks. at bruge spoofing, osv.)
17. Hvordan synes du, at spiloplevelsen har ændret sig siden du begyndte at spille på denne måde?
18. Hvad ser du som værende snyd når det kommer til Pokémon GO?
19. Hvordan har du det med, at din account risikerer at blive banned -og har dette evt. holdt dig fra at overtræde reglerne på andre måder?
20. Oplever du, at andre synes at noget er snyd, uden at du selv er enig?
21. Hvad føler du når andre siger, at din måde at spille på er snyd?
22. Oplever du nogensinde frustration eller negative følelser når du spiller? Uddyb gerne hvad der påvirker dig og hvordan.

Til sidst vil vi gerne vide om du eventuelt har andre kommentarer du gerne vil dele? Det kunne eksempelvis være noget du synes, at vi mangler at vide i forhold til din måde at spille på. Det kan også være kritik til vores spørgsmål eller noget du gerne vil have at vi spørger andre om.

...og så vil vi gerne sige tusind tak for, at du tog dig tid til at svare på disse spørgsmål. Det er til utrolig stor hjælp da det gør det muligt for os at arbejde med dette spændende emne!

*Semi-Structured Interview Protocol
-Danish Version Page 2-*



NVivo visualization of coding references for semi-structured interviews

APPENDIX D

Focus Group



Focus Group discussion

The participants explains when it is acceptable to bend the rules in Pokémon GO.



*Focus Group activity
The two groups comment
on results of the cards sorting activity.*

Introduction of ourselves and our research project.

Explanation of the focus group:

This session is centered around a group discussion and a couple of assignments that we would like you to solve. It's important that you know, that no answers are considered right or wrong, we simply want to learn about your opinions and views, so please don't hold anything back. If you do not agree with what someone else says then please do tell, we would like to hear about different of each situation, and even small details can be very valuable to our study.

Everything that you say within this room is considered confidential, we will not share your names or opinions outside of our research. However, we would still like to photograph and audio record the session so that it becomes easier for us to analyze it and to make sure that none of your opinions or ideas are overlooked. If you do not want to be recognizable in the pictures just tell us so during the session, then we will make sure to blur out your faces.

Icebreaker activity: One-Worders

Sharing thoughts on a common topic.

60 seconds of group discussion; 30 seconds to write notes; 2-5 minutes of presentation

First topic: Playing Pokémon GO

Second topic: Cheating

Engagement questions

What is your favorite thing about playing Pokémon GO?

Describe in what ways you feel excited about playing Pokémon GO.

Icebreaker activity: Card sorting

Initial sorting: Could you sort these cards, according to what you consider cheating and what is not.

Follow up: Could you sort the cards you consider cheating, by the grade of severity

Explorative questions

What has influenced the way that you play?

What are the pros and cons of using enhancing tools to play pokèmon go?

Can you give any examples of cases where it would be acceptable to bend the rules?

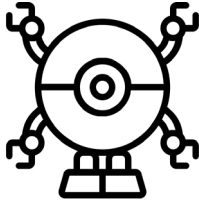
What do you feel about the balance/unbalance of the game?

How do you feel about yourself due to the way you are playing?

Exit question

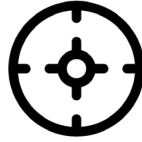
Is there anything else you would like to say about the way that you enhance the gaming experience when playing Pokémon GO?

The Focus Group Protocol



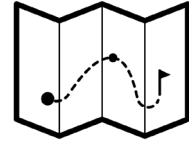
Bot

Automatiserede programmer som eksempelvis kan bruges til at samle Pokébals eller fange Pokémonns uden at man selv skal gøre noget som helst.



Spoofing

At manipulere telefonens GPS, så man eksempelvis kan spille hjemme fra sofaen mens ens avatar er i New York, Tokyo eller Fisketorvet.



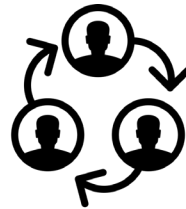
Maps

At bruge maps til at finde specifikke Pokémonns.



IV

At bruge websites eller apps til at måle en Pokémonns IV.



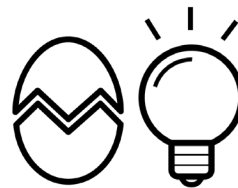
Account Sharing

At dele accounts og fange Pokémonns for andre på deres account, eller at få andre til at fange Pokémonns for én.



Account Buying /Selling

At købe eller sælge accounts.



Creative ways to hatch eggs

Forskellige metoder, som eksempelvis at spænde telefonen fast til sin hund og lade den løbe rundt for at udklække æg.

Cheating Cards

The cards used during the second Ice Breaker activity.

Bot: Using automated programs to carry out game tasks.

Spoofing: Manipulating the phone's GPS position through an external app or the phone's Developer Mode.

Maps: Consulting maps that display Pokémon's positions or using functions that alert the user when a specific Pokémon appears.

IV: Using apps or websites to obtain information on individual Pokémon's stats that are not directly visible in the game.

Account Sharing: Sharing login information to gain an advantage from playing for others or having others play for oneself.

Account Buying/Selling: Purchasing accounts that others have levelled up, often through botting, or selling accounts that oneself has levelled up.

Creative ways to hatch eggs: manipulating the distance measurer to hatch Pokémon eggs, e.g. by strapping the phone to a dog or a ceiling fan.

APPENDIX E

Previous Study

Pokémon GO: Understanding Engagement in Location-Based Augmented Reality Gaming

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ABSTRACT

There is much research in the factors associated with engagement in desktop gaming environments, however, very little research has been done to investigate what it is that engages people in gaming that happens out in the real world. Inspired by the phenomenal world-wide up take of the Pokémon GO mobile game, this paper investigates the concept of engagement as applied to location-based Augmented Reality games, using the specific case of Pokémon GO. Through empirical investigations, we extend an existing engagement model, developed for desktop video gaming, to include new aspects of engagement that apply to mobile gaming. We discovered important factors, unique to engaging with location-based Augmented Reality games that are related to behaviors in the physical context of mobile gaming. With Pokémon GO in particular, we can report that exercising, nostalgia, pleasure in self-improvement and support all play an important role in engaging players.

Author Keywords

Engagement, Engaged behaviors, Augmented Reality, Mobile Gaming, Location-based games, Pokémon GO

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Augmented Reality (AR) games are complex games that merge a virtual layer with the real world. The result is an immersive and fun experience for players. AR games are one example of the application of Augmented Reality. Yuen, Yaoyuneyong & Johnson [29] define Augmented Reality as, “*an emerging form of experience in which the real world is enhanced by computer-generated content which is tied to specific locations and/or activities*”. AR

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games are heavily dependent on digital technologies such as camera, mobile phones, GPS and other type of sensors. AR games are often considered an advanced type of pervasive games [11] that expand the space, the time and the social aspect of traditional games, blurring the borders between real life and the game [12].

AR games are often designed with features characterizing another type of pervasive game, i.e. location-based game. They shift the classic game or video game elements, such as environment and objects, from the digital world to the real world [13]. Players move between different spots, which could include parks, streets, monuments and buildings, and perform game-related actions in a real environment [23, 24].

Location-based games empower and expand the spatial dimension of AR games, allowing people to experience the physical environment, as well as the digital one by tying the two together through knowledge of the player’s current location. Location-based games are often mediated by mobile phones [27] that offer useful technologies, such as GPS, internet connection and cameras in order to engage players, allowing them to fully enjoy the game experience. However, despite many people recognizing AR as an important, upcoming technology within gaming, most location-based and AR games have had limited success and people often do not continue to play these games in the long term.

In July 2016, Niantic released Pokémon GO, a location-based augmented reality game developed for mobile platforms. The game is record-breaking in many ways, it managed to generate \$600M in in-app purchases merely 90 days of its release [1]. It took other games such as Candy Crush Saga more than 200 days to achieve this, while it took Puzzle & Dragons more than 400 days and Clash of Clans more than 500 days [1]. In addition to this it was a mobile game, that requires people to physically seek out game elements in their environment, which takes more of a personal commitment to the game than simply opening it on your mobile phone where you happen to be. While the exact number of installs is somewhat unclear, it is estimated that the game was downloaded more than 500 million times across multiple platforms [3]. This indicates that Pokémon GO has become a huge global success and an interesting

phenomenon to investigate when trying to understand what it is that drives so many people to play it.

Engagement is a phenomenon that frequently has been explored within the domain of Human Computer Interaction, and although there are various definitions, they are often vague and the concept is used interchangeably with concepts such as flow, attention, involvement, etc. Exploring what engagement is and what form it takes in relation to location-based AR games is relevant in order to understand what engages people in the experience of playing Pokémon GO.

Much of the research on these kind of games, educational as well as commercial ones, is more than a decade old. Players are becoming more and more engaged by these games, due to technology evolution that allowed developers to create more involved strategies and more advanced graphics in their games. Research on the relation between engagement and location-based AR games is extremely limited, and there are only few engagement models that are directly applicable on them.

With our study, we aim to investigate the engaged-behaviors in a location-based AR game and contribute to the understanding of engagement in this specific domain, and propose a model, which offers an alternative to the generalized gaming models.

BACKGROUND

Pokémon GO is a location-based AR game developed by Niantic. It has been reported as one of the most popular mobile games of our time. Within four days of its release it was downloaded more than 40 million times, and it holds the title of most-downloaded iOS App in 2016 in spite of only being available for download for less than 6 months of the year [18]. The phenomenon has already gathered much attention across many domains, e.g. medicine and sports science [2, 19, 28], and computer science [25].

In Pokémon GO, you play as an avatar in the virtual game but you control the avatar by physically navigating the surroundings in the physical world. Spread all over the virtual game map there are special spots, called “pokéstops”. The pokéstops are based on physical landmarks and the attached GPS coordinates. The pokéstops can be e.g. monuments, buildings and fountains. The interaction with a pokéstop will result in the player obtaining a series of game objects, such as pokéballs or cure potions which are necessary to play. It is possible to interact with a pokéstop every 5 minutes. Virtual monsters roam the streets around you, and your mobile phone is used to locate and catch them. This lets the players wander the real world and explore their surroundings while exercising, which is as the name suggests an important part of the game. The more pokémons you catch and evolve, the better chance you have of becoming powerful enough to battle other players and take over your neighborhood’s pokémon gyms. A pokémon gym is a special spot. Like the

pokéstops, pokémon gyms are geolocated and linked with real places, but the interaction with them is different.

Players can “conquer” a gym, leaving inside a maximum of one pokémon for each player. Other players can fight the pokémons inside the gym with their own virtual monsters, conquering it for their team or empower it if is already owned by their team. There are three global teams and each player is assigned to one them at the beginning of the game.

RELATED WORKS

We present a short overview of related studies and products of location-based AR gaming, as well as a brief introduction to engagement and engagement models related to HCI. We choose one of these models as the primary theory and later explore how it can be applied to Pokémon GO.

Location Based Augmented Reality Gaming

Geocaching is one of the early examples of a worldwide-spread location-based game. It is a global phenomenon born in 2000 [5], that could be considered a modern variation of a treasure hunt. Players of this particular game hide items in specific spots and share the GPS coordinates with the player community [15]. Other players must then use their mobile phones or just a simple GPS tracker, to locate different spots and find the items. Then, they usually put them back and upload proof of finding on a geocaching website, that usually is a picture of the item. The game is still played globally and the community is very active.

Another early example of study on location-based AR games is PAC-LAN [20]. It included elements from the classic video game PACMAN, combined with RFID technology and early mobile technology. In this game, one player acts like PACMAN, walking in a real environment, collecting small RFID enabled plastic discs, using a mobile phone to read and tag them. Four other people play the roles of ghost, chasing and hunting the PACMAN player. The PAC-LAN game was developed to support research on how physical objects and a physical environment could improve interaction between players in digital gaming, and to study how they develop strategies to play.

MAGIS is a newer example of an educational mobile AR game [26]. It combines AR technologies, involving GPS, phone camera and 3D rendered graphics with narrative-base game. This framework was later used to develop Igpaw: Intramuros [21], a game that allows players to explore the city around them and learn the Philippine history “in the field”. Users explore their surroundings looking for clues and interact with fictional characters spread across the city. In this way they participate in a first-person interaction with history. The feedback from players in this research project indicated that location-based AR games could indeed be an effective learning tool for learning about historic places.

KioskAR similarly offered users a way to explore their surroundings with a virtual overlay, this time in the form of art kiosks, linked to physical spots where students display

art pieces such as 3D models, videos and photos [22]. The more users explore, the more points they get. Evaluations of this game concluded that players show involvement and have a sense of social participation. However, they also highlight some difficulties in social interaction and collaboration between strangers.

Ingress is another location-based AR game, developed by Google and Niantic Lab in 2012. It is considered the commercial precursor of Pokémon GO. Collaboration between players, strategies and a strong background story (including videos shot with professional actors and many live events worldwide) are the core features of this game.

Engagement in Gaming

Engagement is a phenomenon that is frequently explored within several different domains. In the field of Human Computer Interaction alone many definitions exist, as well as an array of different methods for measuring, assessing and exploring it. Through a review of existing papers, we identified a tendency towards assuming an agreed common definition, as several authors decided not to clearly define what engagement meant in relation to their paper.

Relatively non-complex definitions are found in dictionaries, where engagement either refers “to an initiation of contact” or to “the concept of being occupied with” [16]. From this perspective it can either be the start and the process of an interaction, or it can imply a sustained interaction. Comparing different definitions and theories on engagement within HCI there is a clear overlap in spite of the vagueness of many definitions. Several definitions refer to engagement as a process or an individual stage in a process [16]. However, it can also be considered as a state of mind, an experience, a degree of involvement or an “indicator of the state of an interaction” [16]. Concepts such as: attention, interest, involvement, immersion and flow are often used as subparts in explaining engagement. In other cases the concepts are used interchangeably, as if they were the same [16].

O’Brien and Toms [14] argue that engagement is a phenomenon clearly distinguishable from constructs such as flow and play. They define engagement as: “a category of user experience characterized by attributes of challenge, positive affect, endurance, aesthetic and sensory appeal, attention, feedback, variety/novelty, interactivity, and perceived user control.” [14] They argue that engagement is made up by the presence of these attributes and that the level of intensity of the engagement is dependent on the “combination of user and system attributes that emerge during the interaction” [14]. They propose a model of engagement consisting of four elements: point of engagement, engagement, disengagement and re-engagement [14].

A model of engagement designed specifically for AR games is proposed by Pyae and Potter [17]. They adopt the definition, stating that “Engagement is the degree of

activity or attention someone gives to a person or object over a period of time” and propose a definition of what they call game engagement, saying that “*Game engagement refers to how players experience a game how they can connect emotionally and mentally to a game’s features, and how they play a game to succeed their goals in the game*” [17]. They then propose that engagement can be explored through structured observations transformed to personas and user scenarios developed from their concepts of Player, Play, Presence and Place [17]. This represents an early instance of considering the physical dimension as part of engagement theory.

Bouvier, Lavoué and Sehaba [4] provide a comprehensible walkthrough of engagement and many related constructs such as attention, immersion, involvement, presence and flow, which they include in their proposed model. Their view on engagement focuses not primarily on the overall process but on engaged-behaviors. Four types of engaged-behaviors are defined: environment-directed, social-directed, self-directed and action-directed. They operate with three factors outside the game: media factor, content factor and player factor; which have to match the suspension of belief for engagement to occur.

From our literature search, we can see that there is a lack of knowledge on how to approach location-based AR games when studying engagement. Therefore, we adopt a definition of engagement that we believe suits the investigation of engagement of these type of games.

Bouvier et al. [4] distinguish between engagement and presence, which is considered a more intense state. Each type of engaged-behavior is related to a psychological need, specific behaviors and elicited emotions [4]. They distinguish between engagement and presence, which is considered a more intense state. Each type of engaged-behavior is related to a psychological need, specific behaviors and elicited emotions as shown in the grey area in Table 1.

With respect to *environmental engagement*, they claim that, “*Environmental engagement depends [...] on the variety and aesthetics of the world, and on the possibility of exploring or modifying the environment.*” [4]

Bouvier et al.’s model includes behaviors such as contemplation of the game environment, curiosity and willingness to explore the game world and its limit. The curiosity affects also the game features and interfaces and not only the game world, bringing some players towards the practice of *modding*, which means modifying parts of the game. Emotions like escapism, curiosity, surprise, imagination, and relaxation are strictly linked to these behaviors.

The *social engagement* is related to the social aspects in the game. These include sharing the moment with other players and expanding the network of friends and contacts. These

behaviors result in the pleasure in social connectivity, in collaborating or competing and in getting recognized as players.

The *self-engagement* refers to the relation between players and their avatar in the game “though identification and/or ownership aspects” [4]. The possibility to customize their own character or creating a story around it, results in a series of emotions that includes the pleasure of possessing or managing an avatar and in disguising themselves, and identifying with their character.

The *action engagement* involves all the behaviors related to actions that they perform within the game. This actions includes practicing mastering the game and completing challenges, and elaborating strategies to beat the game or to obtain better results. The players will feel a sense of accomplishment, a self-esteem boost or arousal while performing this actions.

Bouvier et al. point out that players’ behaviors presented in the model are non-exhaustive [4] and there is room to add new ones. We believe that this provides basis for an extensive look into what is actually behind the concept of engagement, which is why we base our approach on their theory.

STUDYING POKÉMON GO IN THE WILD

Data Collection

For this study, we decided to collect data using a multi-method approach. The reason for adopting such a heterogeneous methodology is that at the beginning of our study, it was unclear what we were looking for. We wanted to explore the aspect of engagement in Pokémon GO, learning step by step in the field. We kept our approach open-ended in order to not miss any important data that could prove useful for the research, this way we learn which methods are useful for our need during the process.

The first phase of the study was conducted in the field, with open observations followed by unstructured interviews in the field. Due to the mobile nature of Pokémon GO, observing and interviewing players while playing in the game environment was a suitable approach.

The ethnographic field studies method suggests that researchers work in the field that is relevant to their research [7] in order to reach a better understanding of it, by submerging themselves into the relative environment, rather than conducting studies inside controlled laboratories. As pointed out by Lazar, Feng & Hochheiser [9], ethnography is a powerful set of tools that helps researchers understand the context of use of a specific technology and artifacts.

The second phase included a series of semi-structured interviews that were conducted after the field observations, in a more controlled environment with different types of players. The interviews allowed us to investigate areas of interest that were left undiscovered after the observations and the field interviews. We developed an interview

protocol based on the data we collected during the first part of the study, combined with Bouvier et al.’s engagement model (see Table 1 later in the paper).

Field Observations

We identified two places in Aalborg that are often crowded with players due to the high density of pokéstops – these are Kildeparken and Togbroen. Kildeparken is a central green area in Aalborg while Togbroen is located under a train bridge, close to the fjord, but still in the city center.

We began the data collection with three open observations that lasted 3 days, but after the first session, we decided to focus exclusively on the Kildeparken location, as there were only few players at Togbroen. This was possibly due to the weather conditions and the fact that we conducted this study during the autumn, and when many people were at work or at school.

Based on the data acquired in the first three observations, we structured another series of observations also lasting three days. This time we followed a precise agenda, observing players during the same time of the day, focusing on specific behaviors, recognizing different types of players such as group players, couples, single players and families. We also drew a map of the place, highlighting where most people played and the paths they walked. These can be seen on Figure 1, as crosses and dotted lines in brown.



Figure 1. Kildeparken observation map

The players observed were a heterogeneous group, containing male and female players, estimated aged between 6 and 60. During the different observations, we took notes on player behaviors, actions, types of players. This set of notes, added to what we observed, was the starting point for developing a story that we used to order the notes. This story was then coded in the analysis phase.

Field Interviews

After each observation in Kildeparken, a series of unstructured in-field interviews were performed. Using

information gathered during the observations, we developed a list with key points to address during the field interviews. We kept the questions open and adapted them when necessary. This kind of approach was interesting and resulted in a set of precious data that contributed to developing our interview protocol, which we later used for the semi-structured sessions. Even though some of the field interviews were short, since some players did not want to be disturbed or distracted from the game, they offered an important insight on behavior, motivation and feelings toward the game.

We approached players, asking for a short talk while highlighting the fact they could continue playing while talking. This allowed us to observe them from a close distance, and to ask them about their behaviors in that precise moment.

We conducted a total of 16 interviews in the field with players belonging to each of the four groups. We interviewed 3 single players, 8 pairs, 3 families with kids and 2 groups. One group consisted of 4 teenagers and the other of 3 young adults. One family interview included 2 parents and 2 children, while the remaining included 1 parent and 1 child. The majority of single players and pairs were young adults, but we did not exclude any participants based on their ages, but on their willingness to be interviewed. Roles were divided between the researchers, one conducted the interviews while the other observed and took notes. After every interview, the researcher who ran the interview wrote down what information he took notice of. This was then combined with the notes of the other researcher.

We decided to not film the interviews because most of the players were uncomfortable and stressed about being filmed. We respected their decision, preferring to avoid an intrusive approach using a camera. We also took pictures when permitted by players, especially when we noticed peculiar activities such as individual players running three devices and gameplays at the same time (Figure 2).



Figure 2. A player is managing three accounts on three different devices

Semi-structured interviews

We created the protocol for the semi-structured interviews and planned the procedures to follow, basing it on the Kvale and Brinkmann guide [8]. It was organized in sections, following the categories from the Bouvier et al. engagement model. Questions were designed to explore the Environmental engagement, Social engagement, Self-engagement, and Action engagement. We also got inspired by information gathered from the observations and the open in-field interviews. We wanted to investigate each area of the model in depth, especially self engagement, which seemed non-existent from the observations. Another part of the interviews was dedicated to exploring the players' motivation to play the game, and finally we asked the interviewees what they think makes Pokémon GO so engaging.

The interviews were conducted in a room at Aalborg University. We did a total of 8 semi-structured interviews, which involved 12 participants, 4 of which play on elite teams. Our participants were 7 males and 5 females, age 23-35. We conducted one couples interview and one group interview with 4 participants.

Each interview session was audio recorded in digital format. We chose to not film the interviewees, to ease the pressure and to keep the mood and the interview environment relaxed and informal. During the interviews, one of the researchers took notes, while the other was leading the interview. We estimated that each interview would take no longer than 1 hour. Depending on the interviewee's level of comfort and willingness to elaborate, the interviews lasted between 15 and 55 minutes. The sessions included a warm-up and introductory phases, the main questions and a summary phase.

Data Analysis

We used a combination of two approaches for data analysis: a priori coding and emergent coding. Both approaches include a series of steps to follow, to ensure that the coding categories are clear and the data is subsequently coded in a proper way.

The data obtained through the observations, the field interviews and the semi-structured interviews were treated separately. We drew inferences across the different methods, comparing them to each other, highlighting differences and similarities in terms of the derived data.

To code the three different datasets, we created three different code lists that consisted of initial themes we collaboratively derived from conducting each data collection session, combined with the themes from Bouvier et al.'s framework [4]. We then used each of these code lists with its corresponding dataset (observations, field interviews and semi-structured interviews) to code that data.

Identify key coding categories

A priori coding implies the use of theory or framework to identify the coding categories [9]. Our theoretical framework was Bouvier et al.'s engagement model. It was useful in the research phase, in designing research questions, but also in finding major categories, helping us to keep them organized.

Following this procedure, we used all the sections and sub-sections of Bouvier et al.'s model as coding categories. However, since the research on location-based AR game engagement is limited and this particular engagement model is commonly used for desktop video-gaming, we decided to add the emergent coding approach to our analysis procedure.

Emergent coding is a practice that entails the creation of a series of coding categories, based on researcher's interpretation [9]. We independently read and analyzed the data, creating two sets of concepts for each dataset. We compared the two lists, found similarities and discussed the differences, and then combining them to develop a unique list. After that, we used affinity diagramming to help us to refine the list and visualize clusters and identify the key categories.

According to Lucero, affinity diagrams are *“used to externalize, make sense of, and organize large amounts of unstructured, far-ranging, and seemingly dissimilar qualitative data”* [10]. Affinity diagram is a *“hierarchical representation of data that is built from the bottom up”* [6]. Each piece of data was written as a note, on post-its or digitally and then printed, the data was then organized on a wall according to their affinity to each other [6]. Each diagram results in a list of key coding categories, one for each dataset.

These two approaches to coding helped us generate our code lists. Each code list, one for each dataset, was composed of the code categories from the a priori coding and the ones from emergent coding. So, for example the observation code list was made from the code categories taken from Bouvier et al.'s framework and the categories we generated from the observation data.

Coding the data

We coded our datasets separately. Each data source was coded using its appropriate code list. To avoid strong subjective coding and keep the quality at a satisfactory level, we worked on the data independently, later comparing the results, discussing and reviewing the parts where we found inconsistencies. It was common to have the same data coded in two or more different categories, especially the ones that fit with the theoretical framework. Even if elements are in different parts of the model, the categories are strongly related to each other. For example, creating a group strategy fits both in the social and the action section of Bouvier et al.'s model.

FINDINGS

In this section we introduce our findings from the observations, open interviews and semi-structured interviews. Although we have treated each method separately, parts of the results proved to be similar across the different methods. Each different method did result in unique data, but due to the many similarities, we choose to present the results by themes rather than by method. The unique data will be discussed in the corresponding theme, with the associated method emphasized. Firstly we present findings with respect to Bouvier et al.'s main categories: Environmental Engagement, Social Engagement, Self-Engagement and Action Engagement.

Environmental Engagement

The gaming environment of Pokémon GO consists of the digital environment, such as the pokémons, pokéstops and the map, as well as the game interface, but also the physical world that the player moves around in. Escapism plays a central role engagement-wise and is a main motivation for playing. The game provides a way of disconnecting from everyday-life by offering an alternative reality that the player immerses into.

Exploration is another key concept related to the environment. Spontaneous urban exploration is a consequence of exploration of the game environment, which many players enjoy. Exploring the pokémons and the game environment, triggers emotions such as escapism, relaxation and imagination, and these emotions are the reason that many enjoy the game.

Although the game graphics are relatively simple, 3 of the semi-structured interviews indicated that the aesthetics of the game do cause emotional responses, one player explains: *“I kind of have a crush on a pokémon [...] I just want all the ones that I think are cute”*. A lot of the pleasure comes from wandering around, catching pokémon and relaxing, one player summarizes: *“it's about not thinking”*. Players' imagination is stimulated by the game. They become amused and involved by mashing a fictional world with the real one, creating their own imaginative stories. Several players reported in the open interviews that they had always dreamt about becoming pokémon trainers since watching the tv-show as children, and 2 players confirmed this in the semi-structured interviews.

Players are very engaged in strolling in the environment and are curious in finding and hatching pokémons, an associated feeling is the sense of surprise when they meet new pokémons or when an egg hatches. Two players from the semi-structured interviews engaged and motivated themselves by modding the game through the use of maps, which shows nearby pokémons. One player created his own contraption that lets him play on 3 phones with separate accounts simultaneously (see Figure 2).

Social Engagement

The pleasure in social connectivity, derived by spending time with other players, is one of the most frequently mentioned emotions. It is common to see people playing in groups or pairs, many report feeling happy when they are playing accompanied by and interacting with others, whether it is friends, family or strangers. Even players that consider themselves anti-social felt that the connection with others is one of the most important aspects of playing Pokémon GO. The interaction with others does not have to be long-lasting for it to make an impact on the player, pleasure can be derived from short interactions as well. In the semi-structured interviews five players reported having formed several friendships that transcends simply playing together. All the interviewees have played Pokémon GO with others that they previously knew, while all but one interviewee had played with or talked with strangers while playing.

When playing with friends, the game is often considered a secondary activity, where enjoying the togetherness and sharing moments were the main focus. Interactions with strangers are usually initiated because players recognize that others are playing the same game as them.

Another key point of social engagement is pleasure of collaboration. This is often related to creating strategies and sharing information about places, pokémons, tricks and tips. One interviewee explained: *“I met small kids, that yelled ‘oh there’s something cool’ and then I’ve helped them find something. That makes you feel as if there’s kind of a purpose to what you’re doing and that it isn’t completely ridiculous”*. There is a clear tendency of satisfaction from helping others, and players that have received help when starting out often continue to help others.

The competitive feeling was identified in 6 out of 8 semi-structured interviews and in several open interviews. Many consider this of minor importance, however, one player did say that *“I care about becoming one of the best players”* and that he is *“keeping on until people would see my name and recognize me”*. Being recognized as Pokémon players actually made 2 players want to play less. This indicates that competition and social recognition generally are of less importance engagement-wise.

The social aspects of the game and the derived pleasure have contributed to forming a strong, growing, local community and several smaller groups of elite players, which players are proud to be considered a part of.

Self engagement

Self engagement is the area that was touched upon the least throughout the interviews, mainly because the game features little interaction with the avatar, and most of the people we observed and interviewed were not interested in wearing pokémon accessories in real life, thereby choosing to omit customizing the real-world character. However, the semi-structured interviews showed that a small number of

players had changed the appearance of their avatars to signal their team affiliation or to make the avatar fit their personal preferences.

Action Engagement

The data from our observations was useful in identifying an interesting aspect of action engagement, i.e. elaborating strategies to play in order to complete challenges and master the game.

We identified at least three types of play strategies: circuit, static and collaborator. The first two strategies are related to players’ movement while the collaborator involves a social aspect. A circuit strategy involves a deep knowledge of a precise area, the number of pokéstops in the area and the shortest path to reach all the stops. The player will follow a precise route, strategically cover all the pokéstops, and calculate the refresh time of each point. Opposite to this is the static strategy. A player who adopts it, spends several hours in the same spot, usually because there are many pokéstops close to each other. In this way, he/she can collect different goods without moving and getting tired. The collaborator strategy is enacted when at least two players collaborate to gain benefits in game, like discovering new pokémons faster or fighting together in the gyms to make it easier to conquer it.

Players can adopt several strategies simultaneously. We observed an example of the collaboration strategy during our 4th observation session. A group of children, 10-11 years old, met in the central spot of the park where we did the observation. They talked together for a while and chose two of them as *“seekers”*. The two seekers split from the rest of the group, exploring other areas of the park, looking for rare pokémon, while the others stayed in the same spot, collecting pokéballs and goods from the closest pokéstops. As soon as one of seekers found a pokémon, he would run back fast to the group, to share the information. Finally, the group moved to the spot pointed out by the seeker and then came back to the initial starting point. They shifted the roles two times before leaving the park.

Through the interviews we found that completing challenges that the game offers, like finding a rare pokémon or hatching a powerful one, seems to be important for the players. All the small challenges, when fulfilled, contribute to the feeling of beating and mastering the game. It could be considered a sort of competition against the game. Pokémon GO arouses the players deeply. The players found the game dynamics to be fun and involving whether they were solitary players or social players. Players generally report that the feelings that come from playing and reaching the goal of mastering the game are *“Happiness”* and *“Excitement”*. The sense of accomplishment is another emotion involved while playing.

Several themes were discovered during analysis that contribute to the understanding of engagement in location-

based AR games, but that cannot be fully justified by Bouvier et al.'s model. We organize the main discoveries in 4 themes: Motivation, Collaborating, Simplicity and Disengagement.

Motivation

The semi-structured interviews were very useful in the exploration of players' emotions. Through these, it became apparent that the players' motivations made them engage with the game in different ways. This theme involved motivation for playing, how they see themselves as players and what they like about playing. The interviews made it clear that several players do not consider the dynamics of the game itself as being the main motivation for playing. Many players use the game as a way to kill time. The fact that they can play the game as a secondary activity is likewise important. Furthermore, Pokémon GO is used by some, as a mean of creating and supporting a kind of structure in everyday-life. This includes dealing with being unemployed, using the game as a tool in a rehabilitation process and using it as a therapeutic tool for dealing with the challenges of OCD and Asperger's syndrome.

In the open and semi-structured interviews 6 players reported to use the game as a mean for finding motivation to perform physical exercise or gaining pleasure from exercising. The feeling of nostalgia was a recurring motivation or pleasure mentioned by 10 interviewees, which seems to be an engaging factor that is not considered by Bouvier et al..

Collaborating

Collaborating accounts for mentions of players using unintended technologies and tools to play and the behavior of collaborating, rather than simply feeling joy from collaboration as accounted for by Bouvier et al. The semi-structured interviews proved that players happily offer their help to others, which indeed is a behavior - but it is not in all cases that players report actually deriving pleasure from it. Collaborating was initially observed in Kildeparken and then elaborated on throughout the interviews.

Simplicity

Simplicity, or ease of use, was mentioned by 2 participants of the semi-structured interviews as being an important aspect of the game. Simplicity allows players to play the game without necessarily focusing a lot of attention on it, the players explain this emotion as disconnecting. It is closely related to escapism and relaxation, but it concerns playing the game as a secondary activity. One player explains: "*It's relatively simple and it's not hard to understand what you need to do, and you can multitask while playing*". It extends on engagement by not requiring a high level of skills but still engaging players.

Disengagement

The semi-structured interviews were also useful in understanding players' dislikes of the game, factors that decrease their motivation and factors that make them stop playing.

DISCUSSION

Using Bouvier et al.'s engagement model, as a theoretical framework, proved insightful, but several factors, mainly related to the specific characteristics of location-based AR games, were not covered by the model. Therefore, we propose an extended model that includes aspects relevant to location-based AR gaming. This is shown on Table 1 where the grey area represents Bouvier et al.'s original work and the white areas our contribution.

Bouvier et al.'s framework proved very useful in assisting us in identifying engaged-behavior related to the in-game experience and the elicited emotions. A few of the behaviors and emotions are only present in a very limited scope. Themes that came out of the data relating to Engagement in location-based AR games include: lack of clear definitions, motivation, collaborating and physical environment. In the following sub-sections, we will describe these.

Lack of clear definitions

Bouvier et al. list practicing as an action behavior. None of our methods gave much insight on this. A single semi-structured interview accounts for the only mention of any behavior that we classify as practicing. This may be a consequence of the simplicity of the game dynamics. However, it also underlines the importance of clearly defining elements of a theory. As only a few behaviors are defined by Bouvier et al. we cannot, with certainty, conclude that our perception of practicing coincides with Bouvier et al.'s.

Motivation

Our data indicates two motivations for playing that are not considered by Bouvier et al. Exercise is a main element of Pokémon GO, as suggested by the name. A recurring discussion in the interviews was exercise, in fact several players use the game as a motivational tool and do not care much about completing tasks. These players are engaged by the exercise and the game is secondary.

An element that did not originate from Bouvier et al.'s model was the reported feeling of nostalgia. Naturally, this is specific to certain games, such as Pokémon GO, due to the popularity of the franchise in the 1990's, and is not necessarily any more common in location-based AR games than another kind of game.

Collaborating

Early observations indicated that many players that play in pairs or groups do cooperate. Siblings would help each other to catch pokémon by taking turns to throw pokéballs, while others would split up in order to locate interesting pokémons and then regroup after one had been found. This behavior was confirmed by participants of the both the open and semi-structured interviews. Bouvier et al. include pleasure in cooperation, but do not mention behaviors relating to cooperation.

	Environment engagement	Social engagement	Self-engagement	Action engagement
SDT basic psychological needs	Autonomy towards the environment	Relatedness	Autonomy toward the character and the player himself/herself	Competence & Autonomy towards the actions
Elicited emotions	Escapism, curiosity, surprise, imagination, relaxation, aestheticism, <u>nostalgia</u>	Pleasure in social connectivity, collaboration, competition, social recognition	Pleasure in possessing or managing an avatar, pleasure in disguising themselves, <u>pleasure in self-improvement,</u> <u>support</u>	Accomplishment, self-esteem, arousal
In-game behavior	Contemplative, curious, exploration, modding	Expanding social network, livening up the group of actual friends, sharing moments with others	Customizing the character, developing a story around the character	Mastering the game, completing challenge, practicing, elaborating a strategy
<u>Related behavior in the physical world</u>	<u>Contemplative, exploration, modding</u>	<u>Expanding social network, livening up the group of actual friends, sharing moments with others</u>	<u>Signaling involvement, developing a story around oneself, exercising</u>	<u>Collaborating</u>

Table. 1 Engagement model. In grey the original model from Bouvier et al. [4], in white our additions

Physical environment

The nature of location-based AR games requires paying attention to a dimension that is often completely irrelevant in other kinds of games, i.e. the physical dimension. In Bouvier et al.'s view, the user exists within a physical environment, in front of a computer or a console, and the more "involved" the player becomes, the less attention he/she pays to this environment. This is represented in the separation of "engagement" and "presence". Location-based AR games incorporate the physical surroundings as part of the gaming environment.

This noticeable difference makes it harder to differentiate between the two states. It also makes it less relevant to do so, because the surroundings are not merely considered as distractions - the physical environment is never meant to be ignored in location-based games. The dangers of reaching a state of not paying any attention to the physical surroundings when playing location-based AR games are clear, but exactly what does Bouvier et al.'s state of "presence" consider as the environment in a game that takes place in the real world?

The state of complete presence puts the users in physical danger as they are navigating complicated infrastructures while playing. We suggest that location-based AR games possibly should be approached with a slightly different view on engagement and presence. The switches between the states appear to happen quite often and rather quickly, and the difference between the states is seemingly more abstract than Bouvier et al. suggest. One cannot simply ignore the surroundings while playing Pokémon GO, because they are a part of the game, and if a state that resembles Bouvier et al.'s definition of presence is achieved, then it is unlikely that this can be maintained throughout a session, as one has to move around.

A number of accidents have been reported revolving around Pokémon GO players. The players' intense focus on the game is often blamed for this, so just how do we differentiate between engagement and presence when looking at such situations? Instead of considering these as two separate states, it might be advantageous to consider these as the extremes on a sliding scale of the level of engagement.

Revised Model of Engagement for Location-based AR

Based on the information collected through the three methods, we have identified new behaviors and emotions that relate to engagement of a location-based AR game.

We propose a revised model that contains elements that represent location-based AR games' extension to the physical world, the proposed changes are highlighted in Table 1. The proposed model features a separation of behaviors related to the in-game experience and related behaviors in the physical world. As the physical dimension is added, the player becomes an active part of the game, therefore we redefine self-engagement to not only involve autonomy toward the character but also toward the player himself/herself.

Related behavior in the physical world

Many players mentioned seeing new places as a consequence of playing the game and elaborated on experiencing a positive feeling in relation to this exploration of the physical space. Others are exercising and consider the app as a secondary experience, but gain pleasure from seeing improvements in their physical appearance. Signaling involvement with the game, by e.g. wearing Pokémon related accessories, was also seen in the observations and confirmed in the interviews.

Collaborating is a common behavior despite the game being focused on single-play. By playing in pairs or groups, players often seek an advantage in locating and catching pokémons. This makes collaborating an action-directed engaged-behavior.

These behaviors relate exclusively to the physical dimension, and emphasize the need for a separation of in-game behaviors and related behaviors in the physical world.

Elicited emotions

Related to exercise is the emotion "*pleasure in self-improvement*". Four participants of the semi-structured interviews and five in the field interviews reported being excited or happy simply from having exercised or about seeing physical changes in their bodies.

A similar emotion is the pleasure in overcoming difficulties such as social anxiety or in structuring one's daily life through the game, we categorize this as support. Four players in the semi-structured interviews and one in the open interviews touched this upon. Interestingly, this was primarily mentioned by "*elite players*", which are members of private groups who spend several hours playing every week. As these emotions relate to the player itself, we consider them a part of self-engagement.

Nostalgia is a concept related to imagination and escapism. However, it also revolves around childhood memories and having dreamt of becoming a Pokémon trainer. This feeling was identified in all semi-structured interviews. It is of course related to the specific franchise behind the game, but still of significant relevance when considering its impact on

engaging players. Nostalgia is a feeling evoked by the game environment and thus a part of environment engagement.

CONCLUSION AND FUTURE WORK

In this study we discuss the engagement in location-based Augmented Reality gaming, studied through the case of Pokémon GO. We adopt a multi-method approach including ethnographic observation, field interview and semi-structured interview to investigate the concept of engagement in Pokémon GO. Through analysis of empirical data, we derived information on player behavior and emotions that are unique to the mobile gaming context.

We use our findings to revise Bouvier et al.'s engagement model so that it accommodates both the in-game dimension and the physical dimension of play. We also add new sub-categories of elicited emotions, such as nostalgia, support and pleasure in self-improvement.

In our future work we want to test our revised model on different location-based AR games, exploring its potential for being applied to other AR games. Another interesting area to investigate is related to the use of different devices to play. We want to explore how the use of smartwatches or other wearable devices affects the engagement and the experience of players.

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" I don't cheat, I enhance gameplay ;)" "



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