Designing a conceptual framework for reusable Alternate Reality Games

Master Thesis in Media Software Design 2014

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Abstract

The main drawback of Alternate Reality Gaming, compared to other genres, is that it lacks reusability; typically it cannot be played freely by anyone, anytime, anywhere. However, with the help of modern technology, especially in the mobile devices section, this can be overcome, at least to a certain extent. Therefore, we propose a conceptual framework built upon these challenges raised by other ARGs, a framework meant for game designers and developers that wish to create reusable ARGs, to add reusability to their own ARGs or even turn their digital games into a mixed experience. We designed it by reviewing relevant literature of past ARGs that had a reusable or a digital component, from which we have drawn conclusions and mixed them with our own ideas. Then we tested it iteratively by developing two prototypes and evaluating them through user feedback.

Keywords: alternate reality game ARG, augmented reality AR, conceptual framework
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<tr>
<td>ARG</td>
<td>Alternate Reality Game</td>
</tr>
<tr>
<td>AR</td>
<td>Augmented Reality</td>
</tr>
<tr>
<td>NPC</td>
<td>Non-Player Character</td>
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<tr>
<td>API</td>
<td>Application Programming Interface</td>
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<tr>
<td>OTA</td>
<td>Over The Air</td>
</tr>
<tr>
<td>PC</td>
<td>Personal Computer</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>AI</td>
<td>Artificial Intelligence</td>
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<tr>
<td>QR (code)</td>
<td>Quick Response Code</td>
</tr>
<tr>
<td>SMS</td>
<td>Short Message Service</td>
</tr>
<tr>
<td>MMS</td>
<td>Multimedia Messaging Service</td>
</tr>
<tr>
<td>OS</td>
<td>Operating System</td>
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<tr>
<td>POI</td>
<td>Point of Interest</td>
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<td>ADT</td>
<td>Android Development Tools</td>
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<tr>
<td>SDK</td>
<td>Software Development Kit</td>
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<tr>
<td>UI</td>
<td>User Interface</td>
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Chapter 1. Introduction

The video game industry is one of the largest components of the entertainment industry nowadays with billions of dollars in revenue [1] and it is continuously growing through newer and more powerful technologies. However, almost all games try to turn the player into someone else, to bring the user into that character's fictitious world. Therefore, this paper proposes a conceptual framework for a game that does the opposite, it brings the game into the user's world, with the help of one of the most common component of our everyday life, the mobile device. This device becomes a magical artifact, a tool that connects the game world and the reality through the use of Augmented Reality.

The idea of bringing the game into reality is deeply explored by the concept of Alternative Reality Games (ARGs) [2]. This macro-trend [3] represents the future of gaming as “all types of entertainment have been unconsciously converging on an ARG-like destination” [4]. The term of ARG will soon disappear as it will “merely be assumed to be the case for every type of entertainment or game” [4].

However, at the moment ARGs present a major drawback, and that is reusability [5], or the absence thereof. First, these games are played only once, during a specific time frame, they evolve around specific locations and with a limited number of players who discovered the game before it started [Figure 1]. Therefore, they lack repeatability because of time and location constraints. Second, ARGs require a large amount of human effort in order to run successfully, as a game master and actors as NPCs\(^1\) [2].

\(^1\) Non-Player Characters
These two challenges will be explored in this paper through a design research [6], [7] approach. This exploration will focus on two research questions:

**RQ1:** *What suitable design principles can be identified when designing reusable ARGs?*

**RQ2:** *What technological challenges can occur when designing and developing reusable ARGs?*

The design research will be based on a literature review and two iterations of prototype development, as explained below.

We will first look into the background of this gaming genre and review relevant literature of past ARGs that had a reusable or a digital component.

Then we will propose a conceptual framework built upon the challenges raised by other ARGs. Consisted of four key components (communication, visual, audio and content generation), this framework is intended for game designers and developers that wish to create reusable ARGs, add reusability to their own ARGs or even turn their digital games into a mixed experience. Each component was specifically designed to add a new dimension to the ARG, by turning the backbone of the game from live (human controlled) to digital (computer generated), from a one-time event to a technological any-time-any-place opportunity for anyone to enjoy. By making the ARG repeatable (no more restrictions on location and time) and by massively decreasing the human effort involved, it decreases development and running expenses and it allows an increased number of people to enjoy the game and expand the universe of this gaming genre.

Next, we will test the proposed framework by developing game prototypes and evaluate them through user feedback. The users are the people who play the game, with the mention that a special group of users will not be specifically targeted when testing the prototypes. They will be given qualitative questionnaires before and/or after gameplay, allowing us to evaluate the user experience of playing the game prototypes. As these prototypes were developed based on the proposed framework, it would therefore demonstrate the usefulness of the conceptual framework itself.

Throughout the development process, we will also explore the feasibility of using open APIs (e.g. Google Places API, Foursquare API) to generate location-based triggers for Augmented Reality content.

Lastly, we will describe the challenges and technical limitations encountered and we will analyze the data gathered through questionnaires and user observation.
Chapter 2. Related Research

Alternate-reality gaming blends real-life treasure hunting, interactive storytelling, video games and online community—and may be one of the most powerful guerrilla marketing mechanisms ever invented.

— John Borland of C|net News, Blurring the Line Between Games and Life

As presented in the previous chapter, an Alternate Reality Game (ARG) is an interactive narrative that takes place in the real world and uses multiple media to reveal a story [8]. It is a real life experience that is played during a specific time frame, that revolves around specific locations with a limited number of players and that requires a large amount of human effort in order to run successfully, as a game master and actors as NPCs. We see these as major disadvantages compared to regular gaming, as they limit repeatability and adaptability of an ARG, and we search to design a conceptual framework able to overcome these drawbacks while attempting to answer the research question: What suitable design principles and what technical challenges can be identified when designing reusable Alternate Reality Games? In this chapter, we will begin by looking into the background of ARG and its most famous applications, and then we will focus on a number of studies with implementations that had a reusable or a digital component.

2.1. Background

A typical ARG is run by a “director” or “puppet-master” who develops a story, litters clues on the internet, and when the players solve them, they are led to further clues or a staged event featuring live actors [9]. These games can run from a few days, up to a few years (e.g. Games of Nonchalance), can have a few hundred players or even millions (e.g. The Beast) and can even take advantage of huge budgets (e.g. Why So Serious). There are no actual rules except that they all tell a story using the real world as a platform and they all lack an essential factor, repeatability.

The most famous ARGs were a means of viral marketing for different products [10]. The Halo 2 PC-game was promoted through I Love Bees in 2004. It started with the members of an ARG community receiving jars of honey in the mail with cutout letters leading them to a website with mysterious countdowns [11]. At the same time, that same website address was also shown for a split second at the end of the first Halo 2 cinematic trailer. During the three months period, the players had to go through different tasks, like discovering GPS coordinates of pay phones across the U.S. that would ring at a specific time, greeting the player with a prerecorded message and asking him a series of questions using game related keywords.
Nine Inch Nails' *Year Zero* rock album had a massive ARG devoted to it [10] and players had to even analyze the spectrogram of one of the band's unreleased songs in order to see a hidden clue. This song was to be found by a fan on a USB flash drive in a bathroom stall at one of their concerts in Portugal.

Movies like *A.I.: Artificial Intelligence* and *The Dark Knight* were promoted through *The Beast* (2001) and *Why So Serious* (2007), where people saw the first clue written in the sky [Figure 2] during the San Diego Comic-Con [10]. And there were many others, e.g. *A.I.: Artificial Intelligence, Cloverfield – Slusho!, etc.*

![Figure 2. Why So Serious? – The Dark Knight ARG](image)

Google’s *Ingress* is a worldwide mobile game, considered an alternative reality game by some, and an augmented reality game by others [12]. It is a massive multiplayer game where players from 2 opposite teams use the GPS on their mobile devices to find specific points [Figure 3], and by reaching that location they can accomplish certain goals, as gathering resources or destroying enemy portals [13]. The downside is that it relies merely on GPS and does not take advantage of the other functions that the mobile device can offer to augment reality.

![Figure 3. Ingress gameplay](image)
Compared to ARGs, an Augmented Reality (AR) experience is an episode in which computer generated information is overlaid onto real world locations or objects [Figure 4]. It combines the real world with the virtual world through computer-generated sensory input such as sound, video, graphics or GPS data [14]. AR games are typically simple games that take place in an AR environment, most often they make use of video/graphics through tracking special markers (e.g. pictures, QR codes or GPS coordinates). One example is the yet unreleased game *Clandestine: Anomaly*.

![Figure 4. Clandestine Anomaly – AR generated content](image)

### 2.2. Reusability

Many scientific papers focus on designing traditional ARGs by following the common guidelines, but very few look into these drawbacks and try to overcome them [15], [16]. Derek Hansen et al. [5] acknowledge that most ARGs are designed as a one-time experience, which limits the number of potential players and reduces the return investment of time and resources. ARGs require significant resources in both design and implementation, therefore the authors’ proposed framework is designed to enhance ARG reusability while paying a particular attention to these problems. Their research is based on interviews they conducted with expert ARG designers, systematic reviews of semi-reusable ARGs and numerous group sessions from designing their own ARG. The questions they mentioned as per below, highlight the design challenges for reusable, yet still authentic ARGs:

- “How can a genre that prides itself on the improvisational interplay between game designers and players be replayed?”
- “How can those replaying ARGs, which require online research and participation in online communities, shield themselves from the puzzle solutions and story spoilers that are scattered across the web?”
- “How can ARGs that rely upon geography be authentically ported to other locations?”
- “Is it possible to individually experience ARGs when their very nature requires collective problem solving and experiences?”
- “Can an ARG be “repackaged” or even archived in the first place, given that it plays out in such a multitude of media platforms?”
With three core design goals in focus (repeatability, adaptability and extensibility), Derek Hansen et al. [5] identify specific barriers for each and provide strategies to overcome them. According to their research, reusable ARGs are influenced not only by the size of the player community, but also their individual characteristics, time dependence and run-time, game mechanics (i.e. resources), location, platform dependence and intellectual property. Therefore, they propose numerous strategies, some of which are explained below:

- **Game is connected to a recurring event or a short ongoing exhibit.** This adds replayability from the designer’s perspective, but not the player’s. Also, the small group approach would remove the need for synchronization between different player communities.

- **Pre-scripted narratives through multiple media channels.** Using different media channels (e.g. phone, email, sms) to draw players into the experience.

- **Multiple story paths.** This would add replayability from the player’s perspective, as he can now experience the story from multiple angles.

- **Secret player community.** Keeping the content updates “locally” inside a group of players adds to the adaptability factor, as it keeps it adaptable to the group’s unique needs, while also decreasing the possibility of spoilers.

- **Multiple seasons or episodes, for easy extensibility.**

- **Story frame to support “stories within stories”.**

- **In-game missions.** Similar to “stories within stories” approach, small extra missions can be added that are or not related to the main context.

From their proposed strategies we drew the conclusion that the story (i.e. the context) is mostly technically constructed, which is in contradiction to the work of Martin Flintham et al. [17] who aims to show that the context is more socially constructed, than technically. Their research focuses on human-to-human understanding and use of context sets in comparison to information being triggered by applications. Two tag-games were designed and analyzed, and the players were divided into two groups: online players and professional runners on the streets. This division aspect is similar to the individual characteristics key factor presented in Derek Hansen’s work [5].

The two previously mentioned tag-games [17], with the difference only in the groups being reversed, mainly explored the impact of GPS inaccuracy and the importance of different sources of information, like real-time audio. Runners could talk over walkie-talkies and online players could communicate via text and each group had their own interface with advantages and disadvantages. The challenges they encountered with both GPS and real-time audio led us to believe that the research results were not entirely successful, even though the games were greatly appreciated.
A similar approach to ARGs is taken in the fAR-PLAY project [18] where the real world location-based gaming is combined with online virtual worlds through Second Life and Open Simulator where the players could also interact and play. The authors’ approach is a treasure-hunt style game framework to support development of educational games. Though this strategy does not explicitly mentions reusability and adaptability, this double-world concept could be a method to add to these factors. Three ARGs were based on this framework, though a formal evaluation was not conducted, yet “early results have shown that this can result in a wide variety of enjoyable ARGs”.

2.3. Location and Context Awareness

One important factor for overcoming the presented drawbacks of ARGs, is location awareness. Location was also a key factor present in the Designing Reusable Alternate Reality Games paper [5] and GPS positioning was a challenge in the Where On-Line Meets On-The-Streets: Experiences With Mobile Mixed Reality Games paper [17] discussed earlier. Their results show as expected, that “highly location-dependent events discourage replayability in other locations by different audiences”; or players get more discouraged the farther they have to go. The location-awareness component addresses primarily the scalability issue of an ARG, the ability to play the game without being constrained by the location of the player, or where the game action takes place. In their work, Mark Riedl and Andrew Macvean [2] investigate not only this element, but also the one of automating the role of the game master and the non-player characters, through end-user content authoring. Therefore, they created a suite of tools that supports end-user content generation based on the player’s location.

Another study on position and context recognition was conducted by Christian Reimann and Volker Paelke [19] by introducing Augmented Reality on a mobile device to an Alternate Reality Game. Their design challenge was that by using a mobile device, the context can change continuously, therefore the game must remain playable and enjoyable in different environments. The game they created could be changed between Augmented Reality mode and a completely virtual mode, similar to the Second Life approach taken by the fAR-PLAY [18] creators earlier. There, the virtual world was accessed online through a PC (Second Life), in comparison to this mobile device local representation. The AR mode is described as a “location aware mobile game that aims to make meaningful use of real world features” and it merely follows the device’s GPS and camera based interaction. Specific real world locations are linked to the game content so that when the player uses the device’s camera for a photo of his surroundings, they would be augmented with the graphical game content. The results acquired through observation were only related to the player’s behavior. Test-users would only check for new information occasionally instead of using the device continuously. Also, having two options of completing the game, one of them not location-dependent, was greatly appreciated.
2.4. Conclusions

While different authors take different approaches at designing new experiences of ARGs, there is a shortage of literature that aims to explain or investigate the drawbacks of the genre. Authors focus on the process of designing the game and few hardly offer a framework. Even so, we have drawn some important conclusions that might affect the design and development of our prototypes, or at least highlighted certain aspects that might be worth investigating further.

In order for an Alternate Reality Game to be reusable, it needs to have a repeatable, adaptable and extensible framework. Therefore, it can be connected to a recurring real-life event, but adaptable to the players’ surroundings/location, scalable and easily expandable to new contents and groups of people. The story can be technically constructed, but the human-factor should be taken into consideration. Challenges might occur with GPS and real-time audio, but providing the option play the game “offline” (all virtual) could improve the user experience or not, depending on the story and the atmosphere created.
Chapter 3. Methodology

Design Science Research is a foundational paradigm used to “characterize much of the research in the Information Systems discipline” [7]. Knowledge and understanding of a problem and its solution are achieved through building and application of the designed artifacts [7]. Such IT artifacts are represented in a structured form that may vary between different fields, but software is the choice in this paper.

The design research process includes six steps: problem identification and motivation, definition of the objectives for a solution, design and development, demonstration, evaluation, and communication [6] and we follow this process, while going through two development iterations.

For this paper we performed a literature review [Chapter 2] and we designed two prototypes for which we conducted qualitative surveys in the form of questionnaires [Chapter 4]. In addition to that, the second prototype retrieves statistical data automatically from the users devices.

In his book [20], J.W. Creswell describes three types of research approaches: quantitative, qualitative and mixed methods. Qualitative data refers to the qualities of the results, while quantitative data refers to numeric quantities of the results. Mixed methods include both quantitative and qualitative approaches. The reason why we chose the mixed method is because we are constantly looking for feedback and ideas for improvement, but we are also interested in the bigger picture, especially related to the technical side. Each method is used with a different goal, qualitative for user feedback and quantitative for technical and general aspects. This is a project in its early stages and the focus in our user reviews needs to be mostly on “why” and “how”. A quantitative approach on the feedback would have been more suitable for a fully developed product, to gain the overall opinion of the market. It would have also required a huge amount of subjects in order to be conclusive.

The first iteration followed the prototype in a controlled environment at a public event. To gather user feedback, the surveys were designed for pre- and post- testing of the prototypes [Appendix 1]. The initial questions were related to the player’s background into ARGs and their expectations of this experience, while the final questions asked for their play impressions, likes, dislikes and other feedback or questions. Information was also drawn through observation of the players and their reactions.

The second iteration followed the prototype in a free uncontrolled environment by having it released publicly and advertised through social media. Only one survey was created for post-testing [Appendix 2]. The questions followed the same lines as the ones described for the first iteration, but they are more numerous and go into more depth, like enjoyment, difficulty, understanding, mechanics and specific elements encountered throughout the testing process.
The qualitative data was analyzed by searching for implicit and explicit keywords that would denote the user’s positive or negative experience in general. Then it focused on those keywords addressing the details for each of the framework’s components. The statistical data retrieved (tables, graphs) would emphasize the aspect of reusability across different places of the world, times of play, or multitude of devices used for playing. The statistical data could also be adapted to follow the user’s behavior during play (e.g. specific play time, choices made, decisions), but that is beyond the scope of this paper.

The results are presented for each iteration in the next chapter. Focusing on the conceptual elements and not the technological implementation, we believe that a positive and constructive feedback on the prototypes would reflect a positive feedback on the design framework itself, and therefore, justify its usefulness.

The literature review followed the two research questions mentioned earlier, in papers related to alternative reality gaming, augmented reality gaming and mixed reality gaming. A number of articles were downloaded via Google Scholar and skimmed, paying more attention to the abstracts and conclusions. Then they were sorted and classified according to their findings, and only the ones related to the questions at hand were kept. The remaining articles were read and analyzed, then combined into a consistent report, as per Chapter 2.
Chapter 4. Iteration 1

*De facto:* Iteration 1 is represented by previous work (2013). It followed the same design objective (reusability), however it was implicit rather than explicit, as it was based on the same two problems (repeatability and human effort) that the second iteration builds upon.

4.1. Conceptual Framework

We will only focus on Android smartphones since they occupy more than 70% of the smartphone market worldwide [21] and the operating system provides great access to certain system components. The goal is for the game to use as much of the phones features as possible as it will be the main tool that will help the player get over different obstacles and investigate clues, along with the use of a PC for internet access and more advanced functions.

From a technical point of view, the game’s back-end can be divided into four main parts that can even be considered stand-alone projects, each focusing on a different function or feature.

4.1.1. Communication

First and foremost, the game needs to communicate with the player, provide clues and instructions. The most direct and realistic way of achieving that, is via SMS messages and phone calls. Faking SMS messages renders the easiest implementation, as the system is mostly universal on Android phones. The only aspect that might differ is the message icon that pops up in the notification bar. Also, implementing an MMS is very similar to implementing an SMS. A notification is created to show that the message was received and the message contents are “inserted” in the inbox.

Faking phone calls is more difficult as each Android version has a different call screen interface. Even more, different smartphone manufacturers devised their own different call screens. That means that the buttons can have different colors, icons, positions, and the same with the caller’s picture, name or phone number, all depending on the phone model. For the best user experience, the game needs to have all (or at least as many as possible) call screens developed individually and the proper one shown to the users depending on the phone or OS version they have.
4.1.2. **Visual**

Secondly, after the direct communication between the user and the game, the video camera is of great importance, or where the visual Augmented Reality comes into play. Content (like photos, videos, sounds, 3D models etc.) can be displayed over pictures (called *markers*) or QR codes using 2D image tracking, can be displayed over real-life 3D objects using 3D tracking, or in a specific place using GPS tracking. These cannot be usually mixed in the same view and not all of them are available in all AR software systems. And there is a multitude of AR development toolkits available, the most well-known being Metaio/Junaio, Aurasma, Argon, Vuforia, Layar, Wikitude, ARToolKit and String.

4.1.3. **Audio**

Reality can also be augmented via sound recognition, even though this field, or at least this type of use, hasn’t been researched so far as much as the latter. Comparing to visual, the audio recognition is lacking behind because of the shortage of available development tools. Soundhound, Shazam, TrackID, Hound and musiXmatch are just a few names that only provide *song id recognition* for regular users, but none of them provide tools for developers to use in their own apps. Only three other do that, and they are Echoprint, Gracenote and Rovi, but they are all limited in a way or another. Qualcomm Gimbal also developed a similar platform, but has not released it to the public.

Sound recognition in AR is important because it adds another dimension to it and makes the whole experience much more interactive and varied. Similar to visual markers, audio markers can be used to initiate any content, but in different situations that would make more sense, like for example, “translating” some indecipherable sounds.

4.1.4. **Content Generation**

We want it to be a worldwide game, so automatic content generation based on player’s location is required. Using the GPS facility of the mobile device and Open Data\(^2\) from the web, the game will generate locations that are important, in the vicinity of the users. The players will have to go to that location to unlock a specific AR content. Other content will be unlockable from the privacy of their own home, over the internet. But the intent is to have the players engage in one way or the other, with their environment.

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\(^2\) Open data is data that can be freely used, reused and redistributed by anyone - subject only, at most, to the requirement to attribute and share-alike [28].
4.2. Prototype

To test the impact of this style of gameplay and to test technological limitations, a basic throw-away prototype was developed early 2013, that included the following functions:

- A text messaging system that can send fake SMS messages to the user at specific times.
- A GPS proximity system which alerts the users when they reach a specific location, usually by an SMS.
- An AR system that can recognize 2D images and display AR content over them.
- An AR system that can display POIs on specific GPS locations.
- Also, a map system for locating specific coordinates, but any other mapping software would do.

4.2.1. Design

The prototype was designed over a period of two months and evaluated each week during the Media Design Projects class. The main goal was to focus on the technical implementation, while developing a more general backstory that would put the implementation into context and would leave enough room for interpretation.

A paper prototype for the story was also created and tested during class [Figure 5], feedback was received and certain improvements were made while eliminating some parts due to time constraints [Figure 6].

As per figure 6, the users would start the app and watch an introductory movie, which ends in providing the first clue, a number that would represent a longitude coordinate. Few moments later, they would receive an SMS instructing them to look through the AR camera over the game’s poster, as it may hide some additional information. By doing that, they could see the latitude coordinate, and by inputting both coordinates into the map view, they would be shown a location nearby, where they would have to supposedly go. Arriving there, another SMS would arrive telling them to look around through the AR camera. Looking up to the sky, between the clouds there would be a website address written. That website would display a countdown timer and a sound file that when played, a voice would tell this game is at its end.
Figure 5. Paper Prototype – Scenario
Figure 6. Storyflow
4.2.2. Development

The application was developed in Eclipse with ADT. The main screen [Figure 7] is a minimalistic interface with three buttons for navigation and instructions to play the introduction movie in the upper half. The movie was created in Adobe After Effects, as it shows a few words with a typewriter effect and displays a sound wave for the voice that is talking.

![Figure 7. App screen](image)

Detailed in Figure 8, the AR View, accessed through the first button (See What I See), is powered by the metaio SDK engine. We chose this one over the others, because it provides the most AR power, versatility and best forum support. With metaio, “if you want something, it can be done” one way or another. Also, metaio Creator was used for creating the tracking configuration files.

The second button (Hear What I Hear) would access the sound recognition function, but this feature hasn’t been implemented. Even though it doesn’t do anything, the button was put there merely to provide an idea of what other functions the end product might have.

The third button (Be Where I’ve Been) opens a mapping screen created with Google Maps API V2. It shows the current user location and provides the option to input coordinates by longitude and latitude, displaying a location marker when doing so.
When the application is first opened, two services start running in the background. One is a timer that sends an SMS message after a minute, and another is a proximity alert that sends an SMS when the user reaches a specific location.
Due to time constraints and technical difficulties, the location is hard-coded and cannot be changed in an instant, which is why automatic content generation is wanted, as described in the previous section.

4.3. Evaluation

The concept idea received very good feedback. The idea and the prototype were presented during the poster sessions of the MIXITUP festival in Karlskrona, but unfortunately, the game was only tested by a small number of people, so the survey results are inconclusive.

At the event, two people tested the game. They were given questionnaires before and after gameplay [Appendix 1]. Both of them had known about ARGs before, but never played one. They loved the combination of digital and reality while exploring and its mystery, and the only negative aspect they mentioned was the distorted voice being hard to understand directly from the phone’s speakers. This issue does not affect the results in any way, as it can be easily resolved by using a pair of headphones [Figure 9], which would be up to the player to figure out.

Outside of the event, the game was tested by four more people and the feedback was very good, however it was not recorded.

As this prototype only scratched the surface, the amount of work and time required for this concept to see a final product is very high. Like we mentioned earlier, this game requires a combination of a few stand-alone systems, each one able to make a research project on its own.

The first step would be to improve the systems already built for the prototype, especially the messaging one. Sending a message after a specific time creates a different thread with a counter, which may restart due to different factors, resulting in resending the same message over and over again. Using the alarm function in Android may resolve this issue. Also, creating “fake” phone calls can only increase the realism of the game and improve the user experience.
The sound recognition function and the automatic content generation are two very important and very complex projects to work on. But these are only “back-end” systems. The “front-end” requires a very stable and intriguing story to keep the player motivated, proper content, from AR content to internet webpages, social networking and media.

All these would lead to developing a better prototype, a full-scale game or at least a part of it, starting with Malmö only, and then extend it to be played in any other town or country. The idea of turning the game into a multiplayer one also came to mind, but that would be far into the future.
Chapter 5.  Iteration 2

The first prototype built a baseline for this game and its impact on players, and the good feedback it received, improved our confidence in the success that this project might have one day. Therefore, the second prototype was developed as part of the master’s thesis in 2014.

5.1. Conceptual Framework

In the second iteration we will follow closely the concept built in the previous iteration, while improving it as much as possible. We will still focus on Android smartphones, however we will try to expand the range of devices by increasing backwards compatibility through using custom libraries. The phone is the main tool of the player, it sends out information, instructions, and it allows him to pass certain tasks. It replaces the AI of a regular computer game and brings it to life as a real-life component. In the ARG context, it replaces the puppet-master (human) with a AI, a computer generated game controller.

The back-end is comprised of four systems designed to assure reusability. Each one is completely different than the other and can be used individually in other projects.

5.1.1. Communication

As we have mentioned earlier, the smartphone represents the center AI of the game and it is the main method of communicating with the player. Therefore, text messages are generated inside the phone to look as if they were real, sent by a person. This is easily done by inserting the line of text into the sms database and creating a notification popup. While this describes only a one way communication, it could be extended to a two-way by implementing a chatbot server that would be able to reply back in case the player tries to initiate a conversation.

Moreover, calls can be initiated as well, however inconsistencies may occur if not implemented properly. The Android OS does not allow access to the phone call system, therefore the interface must be designed manually. The issue is that each Android version and each manufacturer has its own call screen UI, therefore, different call screens have to be designed and configure the game to choose which one to use based on the build version and manufacturer.

Along the smartphone, the second method of communicating with the player are websites and we will not expand on that as they are very standard to ARGs.
5.1.2. **Visual**

Augmented Reality through image recognition can be a powerful tool if used properly. However, the amount of AR used and the context in which it is used can make the game feel closer to reality, or closer to Sci-Fi. This, of course, gives the ability to the designer/developer to easily adjust his game story and content to his desires. The AR technology is constantly improving and advancing, and only one year after the first iteration, it can track real-life objects without any setup markers through (rough) edge based tracking, it can render 3D objects with advanced 3D effects like shaders and occlusion or it can even get close to Virtual Reality by using all of the smartphones sensors to follow the users movement through a 360° generated panorama [22].

For Android development, metaio remains one of the best AR systems available, as they offer a free and very powerful SDK, while also providing quick and helpful customer support.

5.1.3. **Audio**

Audio recognition is used by hundreds of millions of users monthly [23], only through mobile apps like Shazam or Gracenote. However, implementing audio recognition to augment reality is nowhere near close to the image recognition alternative, as described earlier. While there are a few systems available that offer SDKs or APIs only as a front-end access to their songs database, only Echoprint allows complete control. Described as “an open source music identification system that allows anyone to build music fingerprinting into their application” [24], it allows developers to host their own servers and build their own song/sound file database.

5.1.4. **Content Generation**

The concept of reusability requires the ability for the game to be played anywhere in the world, at any time. The location of the player is given by the GPS in his smartphone, and APIs like Google Places and Foursquare Venues can generate points of interest in his nearby surroundings. Therefore, content can be generated individually based on his general location (country/city), but also more specifically to his immediate surroundings (a few meters). There are many similar services available (Tixik, MapQuestApi, etc.), but Google and Foursquare own the biggest databases and have the most feasible and stable services.
5.2. Prototype

As the prototype of iteration 1 was very successful (based on the limited number of testers), a more advanced prototype was developed as part of the master’s thesis mid 2014. The goal remained the same, to further explore the impact of this style of gameplay and especially, the technological limitations. Though it follows the lines of the first prototype, all the systems were completely rebuilt from scratch and we will describe each one into more detail in section 5.2.2. In addition to the mobile app, three websites were created and a Linux server was set up for the sound recognition component.

5.2.1. Design

Before we started developing the story, we had in view two ideas: occult-magic or sci-fi-bomb attempt. Upon receiving some user feedback, we have decided on the occult approach. We did research on occult and magical elements, the Hermetic Order of the Golden Dawn, Aleister Crowley etc., most of which ended up influencing the game’s story. The content of the story however was designed to leave room for imagination, and it can be interpreted by the player in multiple ways.

The diagram below [Figure 10] details the storyflow of the game and next we will briefly explain each level.
Figure 10. Storyflow
Intro Level

In general, ARGs have a specific entry point where the user gets drawn into the game by discovering something out of the ordinary. Therefore, we have decided to have an introductory level consisted of a basic Snake game [Figure 14]. When starting the application, the player is presented with hidden instructions to die twice at a specific score, and by doing so, a magical tool activates that turns out to be an entry point to a secret cult.

The Snake level was individually tested with 5 users and upon feedback, we increased the number of clues provided to the player to make it easier.

In the initiation screen [Figure 14], the player is faced with a choice that will affect in a small manner the story that follows. One option follows the story normally, him being in contact only with the cult leader Aleister Crowley, while the other will involve another character, a detective named Lewis Lee Cart.

If the second option is chosen, the player is denied entrance, the interface locks and he receives a phone call from the detective who asks for evidence against the cult and disables the lock.

According to the Golden Dawn leveling system, after initiation there are four levels in the Outer Order, each one represented by a classical element (Earth, Air, Water, Fire), followed by a Portal (a test) to the Inner Order.

Level 1 – Earth

The player receives an SMS with instructions to a specific website [Figure 11] where a tree grows out of the earth and a paper scroll as its fruit.

Figure 11. “Earth” website
Using Visual Scanner (AR) [Figure 14] uncovers the number 4 which is the solution. It should be noted that the position of the circles [Figure 12] also represents the key to the last level (Fire).

![Figure 12. “Earth” clue - before and after AR](image)

**Level 2 – Air**

Next message proposes a meeting at a specific location close to the player. When arriving at that location, a new message is received saying that it may be too late, but clues were left behind. By using AR, the user can see a symbol flying through the air, that when clicked, opens the “sound website”.

**Level 3 – Water**

This website holds a media player with a sound file of a man talking in enochian\(^3\). The Audio Scanner (sound recognition) [Figure 14] can play the translation in English.

---

\(^3\) Enochian is a name often applied to an occult or angelic language recorded in private journals late 16th-century in England. Men claimed that the language was revealed to them by angels. The language is integral to the practice of Enochian magic.[29]
Level 4 – Fire

The Fire website [Figure 13] holds a number of circles that can start fires. When setting on the specific fires as in the Earth solution, the center crystal ball displays a message with a link to the Facebook profile of Lewis Lee Cart.

![Figure 13. "Fire" website](image)

Ending - Portal

The Facebook profile reveals that Lewis Lee Cart is actually an anagram for Aleister Crowley. The player is accepted as a Facebook friend and can see the last section of a movie.

It must be noted that throughout the game, different bonus content is provided: four ambigram images representing the four elements, and four parts to a movie.

5.2.2. Development

The mobile application was developed in Eclipse with ADT (Android Development Tools). It consists of several individual systems interconnected. They can be used individually, or together, increasing the software reusability or making it easier to transform it into an SDK, if eventually desired.

Backwards compatibility was assured for devices up to Android 2.3, by using external libraries like HoloEverywhere [25], NineOldAndroids [26] and TypefaceTextView [27].
Figure 14. App interface (screens)
Communication

As explained earlier, the main method of communication is by SMS. This function triggers on an time alarm based system, as a regular wake-up alarm app. The text is introduced into the sms inbox database and an “SMS Received” notification is created for the user.

Beginning with Android 4.4 (KitKat), Google changed the way the messaging system works. An app no longer has access to use the messaging feature unless it is set as the default messaging app. This issue was discovered very late in the process, during user-testing. Since this game does not have the capabilities to send and receive regular SMS, a quick workaround had to be implemented, therefore we added a History screen where all of the messages received from the game are stored and displayed.

If the player chose the second option during the initiation screen, he would receive a phone call [Figure 15]. Due to time restrictions, we designed only one call screen modeled after the version on a Samsung device with Android 2.2.

![Figure 15. Call screen](image)

The call starts on the same alarm system as an SMS, but it has the ability to turn the screen on, unlock the device, play the device’s ringtone, just as a regular call screen would do, and then play a sound file as if someone would be talking on the other side. If the user does not pick up, the call is retried two more times at a 15 minute interval and eventually an SMS is sent as a last resort.

During the Level 2 - Air task, when the player reaches the specified location, he receives a text message based on a proximity alarm. This alarm sets up a GPS proximity radius of 80 meters, and when the player enters that radius, the SMS is triggered. This works on a completely different thread than the timer alarm system specified earlier.
Both the time alarm and the proximity alarm implement a boot receiver as a backup. If any alarm is not triggered and the phone is restarted, then the alarm is recreated at boot.

**Visual**

To augment reality, we implemented the latest metaio SDK (v.5.5). 2D image tracking and GPS tracking use different tracking techniques and therefore cannot be implemented in the same view. The solution we found was to add a switch button to change between the two and call it Indoor / Outdoor. To make this difference noticeable to the user, the Indoor (2D) view starts a scanner animation (a line moving up-down), while the Outdoor (GPS) one displays a viewfinder.

The tracking configuration file for the 2D AR that includes the reference pattern and attributes of the overlaid content (like size, position and rotation), was created with metaio Creator.

The GPS AR also works on a proximity type implementation and the content can only be viewable at a range of maximum 100 meters from the source. As a compass shows the direction of the content, it is only activated when the proximity SMS is sent, to reduce the possibility of cheating.

**Audio**

Sound was augmented by implementing the Echoprint identification system, which runs on two components, the server and the client.

A Linux server had to be implemented on Amazon EC2 to hold the Echoprint server-side. The client is only supported on Windows and iOS, therefore we needed to compile the library manually for Android.

The mobile app records 30 seconds via the microphone, generates an audio fingerprint and sends it to the server where it is compared to the fingerprints stored in the database. Being an OTA (“over-the-air”) recording, the match score will usually be ~50-70%, the recognition will be declared successful and a “translation” sound file will start playing.

Both image recognition and sound recognition act as triggers. We have decided to display visual content and audio content respectively, which is the usual approach, but they can be changed to perform any other function.

**Content Generation**

During the initialization screen, the app retrieves the user’s location (coordinates) from the device’s GPS or Wi-Fi service and makes a get request via Foursquare Venues API. The request calls for the top five nearby places marked as “sights” on a radius of maximum 5km. The “sights” type implicitly represents tourist attractions. If none is returned, another request is made for places of “arts” and then “outdoors”. Out of those 5 locations, one is randomly extracted and set for the Level 2 – Air.
We chose Foursquare Venues API over Google Places API especially because of the “sights” type. This returns the most well known places in town and Places API does not have this function. The goal was to avoid marketing private establishments.

Other

The control of the user interface was made through the use of a splash screen and a database for saving user data and progress. The splash screen is responsible for unpacking the data and displaying the content based on the current point in the story (the user’s level and the actions that he took).

The mobile app includes Google Analytics for retrieving statistical data. This data is discussed in the next chapter.

In addition to the mobile app, three websites were developed in Visual Studio that contain mainly HTML5 and JavaScript canvases.

5.3. Evaluation

The mobile application was uploaded to Google Play under the name *Snakes On A Mobile* and advertised both verbally and online, on Facebook and LinkedIn groups. Statistical data was retrieved via Google Analytics detailing elements like number of devices, data traffic, country etc.

One week after the release, the mobile application had 46 users in 10 countries across the world [Figure 16], with an average session duration of ~13 minutes.

<table>
<thead>
<tr>
<th>Country / Territory</th>
<th>Users</th>
<th>New Users</th>
<th>Sessions</th>
<th>Screen Views</th>
<th>Screens / Session</th>
<th>Avg. Session Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sweden</td>
<td>18</td>
<td>16</td>
<td>25</td>
<td>514</td>
<td>20.56</td>
<td>00:09:36</td>
</tr>
<tr>
<td>2. Romania</td>
<td>13</td>
<td>13</td>
<td>35</td>
<td>1,154</td>
<td>32.97</td>
<td>00:13:58</td>
</tr>
<tr>
<td>3. Germany</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>488</td>
<td>54.22</td>
<td>00:10:44</td>
</tr>
<tr>
<td>4. Hong Kong</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>226</td>
<td>56.50</td>
<td>00:17:36</td>
</tr>
<tr>
<td>5. Canada</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1.00</td>
<td>00:00:00</td>
</tr>
<tr>
<td>6. Spain</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>874</td>
<td>218.50</td>
<td>00:44:20</td>
</tr>
<tr>
<td>7. France</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.00</td>
<td>00:00:00</td>
</tr>
<tr>
<td>8. Greece</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>79</td>
<td>19.75</td>
<td>00:10:50</td>
</tr>
<tr>
<td>9. Malaysia</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.00</td>
<td>00:00:00</td>
</tr>
<tr>
<td>10. Nepal</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.00</td>
<td>00:00:00</td>
</tr>
</tbody>
</table>

Figure 16. Users/Sessions by country
Half of those users passed the Snake level, reached the actual ARG (Initialization screen) and made the first choice [Figure 17].

A large variety of devices were used [Figure 18], over half of them manufactured by Samsung (55%), and almost all of them running Android 4.0+ (97%).

### Figure 17. User-made choices

<table>
<thead>
<tr>
<th>Event Action</th>
<th>Total Events</th>
<th>% of Total</th>
<th>Contribution to total: Total Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chose 666</td>
<td>24</td>
<td>100.00%</td>
<td>66.7%</td>
</tr>
<tr>
<td>Chose 777</td>
<td>8</td>
<td>33.33%</td>
<td></td>
</tr>
</tbody>
</table>

### Figure 18. Devices used for testing the prototype

<table>
<thead>
<tr>
<th>Mobile Device Info</th>
<th>Users</th>
<th>% of Total</th>
<th>Compared to site average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung GT-i9505 Galaxy S IV</td>
<td>11</td>
<td>46.67%</td>
<td>46.67%</td>
</tr>
<tr>
<td>LG Nexus S</td>
<td>6</td>
<td>22.00%</td>
<td></td>
</tr>
<tr>
<td>(not set)</td>
<td>3</td>
<td>60.00%</td>
<td></td>
</tr>
<tr>
<td>Samsung GT-i8190 Galaxy S III Mini</td>
<td>2</td>
<td>6.67%</td>
<td></td>
</tr>
<tr>
<td>Samsung GT-i7100 Galaxy Note II</td>
<td>2</td>
<td>6.67%</td>
<td></td>
</tr>
<tr>
<td>Samsung SM-N9005 Galaxy Note 3</td>
<td>2</td>
<td>6.67%</td>
<td></td>
</tr>
<tr>
<td>Vodafone 875 Smart Mini</td>
<td>2</td>
<td>6.67%</td>
<td></td>
</tr>
<tr>
<td>HTC 1000C Desire C</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>HTC Desire 500</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>HTC Desire S</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>HTC P9310 One X</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>LG D802 G2</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>LG E975 Optimus G</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>LG LGD886V1.0</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>Samsung Galaxy Nexus</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>Samsung GT-i9505 Galaxy S IV</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>Samsung GT-i9505 Galaxy S IV</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>Samsung SM-G600F Galaxy S5</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
<tr>
<td>SonyEricsson LT26i Xperia Arc HD</td>
<td>1</td>
<td>-46.67%</td>
<td></td>
</tr>
</tbody>
</table>
The purpose of all this data is to emphasize reusability, through independency of play time, location, device model or Android version.

The players were provided with a feedback form [Appendix 2] accessible through the app’s menu. Only 10 users, both males and females, filled out the questionnaire. Additional feedback was received through word of mouth and instant messaging.

The game received mixed feedback. Part of the users had absolutely no prior experience into ARG and to some, this type of game seemed too difficult, while to others it was very fulfilling. The users who managed to properly discover the clues, found the story very exciting and engaging. The mechanics affected the story in a very good way, and none of the users found all of the bonus content.

Negative feedback was received primarily on the difficulty and different technical issues that arose, though on the difficulty question, most of them answered moderate or acceptable. The hardest part was specific to the individual user, either going to the specified location, understanding the rules, or solving the last level. Most users would like to play a more extensive version of the game, though they would not contribute financially to its development.

The image below [Figure 19] details the behavior flow of the users and it correlates to the feedback received. The drop rate is the highest during the Snake level, followed by the Main screen, which is expected.

![User Behavior Flow](image)

Figure 19. User Behavior Flow

According to the feedback received regarding the four independent systems, the communication technology used was an interesting and great no-cost method of transmitting information. The recognition technology was harder to understand to some; the image recognition worked very well, while the sound recognition didn’t work perfectly on the first try. Some users were not happy with having to leave the comfort of their own home, so the use of this feature should be carefully considered in a final game.
Chapter 6. Discussion

While the second iteration builds upon the first, they differ in many ways. The first one was merely one level meant to be completed very quickly, in less than 15 minutes, while the second iteration was way more extensive and could be completed in at least half a day if the puzzles were solved quickly. Some players took a few days to reach the end. The first iteration was connected to an event, it was tested by a smaller group in a controlled environment, therefore the users could also be given questionnaires before gameplay, not just after, and could be easily persuaded to fill them. The second iteration was publicly released via Google Play (an uncontrolled environment), advertised through social media, and the players were kindly asked to fill the feedback form, but this could not have been imposed in any way.

On the technical side, the first prototype had hardcoded locations due to time constraints and technical difficulties, and the sound recognition feature was just suggested, not implemented. The second prototype would generate locations around the player and had both image and sound recognition. Along the SMS, it also added calling as a method of communication and it also provided fail-safes against disconnection from GPS or internet, or the user missing the call.

Even though the differences were many, the concept and the goals remained the same: to test the impact of adding reusability through technology to a gaming genre that defines itself as a one time experience because of specific drawbacks. By using the four-element based framework (communication, visual, audio and location awareness), we consider that we have overcame these drawbacks and our results show it.

While most of the players were excited after such an experience, others were not as much and we realized that this genre may not be for everyone, at least not in the current format or with the current approach. This was revealed by the numerous complaints regarding the difficulty of the game. An ARG does not have different difficulty levels, but the difficulty decreases together with the number of people playing the game as a group. When a game community has already been formed, new users will join, users that otherwise would not have been suitable as first testers. These first players need to be the ones with some ARG experience or who really enjoy a challenge, those that can ask for help between each other and thus, form the community themselves.

Overall, the second prototype improved over the first, but it is not and should not be considered a final version. Small technical issues can ruin a player’s engagement and experience, as seen from the feedback of both prototypes. The player is responsible with solving the puzzles, but the puzzle needs to be perfectly solvable from a technical perspective.
Android is a very permissive OS, however, privacy issues may arise. When installing, the app needs to request for a lot of permissions, and some users were initially concerned. This is not something that can be solved technically and the only solution is trust from the user that his information will not be used, sold, etc. A legal disclaimer might increase that trust. After few levels though, the players realized that all of those permissions had a proper reason to be there, and that is, to increase their experience by using as much of the device’s capabilities as possible.

Using an open API like Foursquare Venues API to generate location-based triggers was very feasible, though this feature should be used with great care. Sending players to a specific location without a very strong story motive might influence the experience in a negative way. However, it can be used in other contexts, to only add realism details to the story and the content, without having the player specifically go to that location. During our tests, the first batch of players had to walk a few tens of meters, outside of the event’s building, while the second batch had to walk up to 5km, depending on the response from the Foursquare API. Even more, if the initialization was done someplace other than home, as one player experienced, they had to walk even 10km or more. This element can become a drawback if the story does not provide a strong motivation for the player to be there. However, more technical players might find workarounds, for example, installing an application to override the device’s internal GPS coordinates, so that it thinks and acts as if the user is at the designated location, while he is actually still at home.
Chapter 7. Conclusions

The design principles described in this paper turned out successful. Based on the framework we created, we were able to develop a fully reusable game prototype, with a very small budget close to none, a prototype that is not limited by time of play, location, number of players or human effort to support the game. From the player’s perspective, it only requires an mobile device, a personal computer and an internet connection. The four design elements (communication, visual, audio and location awareness) were enough to provide an enjoyable and immersive user experience. Minor technical issues can arise, as with any mobile app, but no major technical limitations were identified that could gravely affect the development process or the framework in itself. For all the technical issues that we encountered, we have also provided the workarounds that we used.

As mentioned previously, the described conceptual framework is meant for game designers and developers that wish to create reusable ARGs, add reusability to their own ARGs or even turn their digital games into a mixed experience. Each of the four components, while being merely a digital representation of a real-world typical ARG element, it adds a new dimension to the resulted game by keeping the realism as close as possible to the original “real” experience, while minimizing human power and costs. For example, planes writing the clue on the sky are replaced by Augmented Reality, and location specific phone booths are replaced with nearby location generated by Foursquare API and fake calls on the user’s own phone.

The next steps to improve not only the conceptual framework itself, but especially the resulted game, would be to put more emphasis on the story and the user’s perception of it, its content and the back-end systems. Different call screens need to be created for different Android devices to increase realism. As we have explained that KitKat devices do not allow other apps to write to the SMS inbox unless they are the default messaging app, the game would have to be able to handle those system functions as well, so that it could be safely set as the default messaging app.

The recognition system could be improved in one of two ways, but we do not know which version would be better until testing. The first option is that both image and sound recognition would be set up to use an external server, and download the discovered content on the fly. This requires less processing power and decreases the app size, as it does not have to hold internally all of the sounds and reference images. The other option, is to eliminate the server completely and have both engines use internal files. This decreases maintenance costs, removes the need of an internet connection, but increases the app size considerably. While the visual recognition system already accepts both options, the audio recognition one only works with an external server at the moment, therefore it would need to be changed internally and recompiled.

Regarding user acquisition, a final game would require a different way of advertising, of getting people involved, and most likely, even more increased difficulty according to the
ARG genre. This is a powerful type of gaming entertainment that aims to bring people together to work as a group and do impossible things.

Chapter 8. References and Appendix

8.1. References


Picture References


[Figure 2] http://www.cracked.com/article_19346_the-5-most-insane-alternate-reality-games.html

[Figure 3] http://www.imore.com/googles-ingress-augmented-reality-game-headed-ios-2014-0

[Figure 4] http://augmentedblog.wordpress.com/2013/10/01/clandestine-bringing-augmented-games-to-a-new-level
### 8.2. Appendix

[1] Iteration 1 Survey

<table>
<thead>
<tr>
<th>Have you ever heard about Alternate Reality Games? And have you ever played one?</th>
<th>What do you expect out of this prototype? What do you think will happen?</th>
<th>Please describe this experience in a few words.</th>
<th>What did you like? (if there was anything)</th>
<th>What would you change, or what would you like to see improved?</th>
<th>Would you play a fully developed game based on this concept idea?</th>
<th>Any other feedback, ideas, suggestions or requests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, I’ve heard of them but never played before</td>
<td>I hope to figure out this experiment. ARG is live. No idea what will happen but I look forward to it.</td>
<td>Interesting to get to play and explore. I was struck by how much the fact that it was a borrowed phone intimidated me.</td>
<td>I liked the coordinates and having to walk around while playing a “digital” game.</td>
<td>It was hard to hear instructions.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes, but I have not played one yet (complete)</td>
<td>I think I will be presented with a game which explores different angles and themes than the ones I am familiar with.</td>
<td>Cool, mysterious, difficult.</td>
<td>The real-life part (See what I see)</td>
<td>Think about the distorted voice.</td>
<td>Yes</td>
<td>I would think about the audio factor. Maybe advice the use of headphones!</td>
</tr>
</tbody>
</table>
## Iteration 2 Survey part 1

<table>
<thead>
<tr>
<th>Your gender:</th>
<th>Have you ever played a game like this?</th>
<th>Have you ever heard about Alternate Reality Games before? If so, in what context?</th>
<th>How would you describe this whole experience?</th>
<th>How much did you enjoy the game?</th>
<th>What did you LIKE the most and why? (if there was anything)</th>
<th>What did you HATE the most and why? (if there was anything)</th>
<th>What would you CHANGE, or what would you like to see IMPROVED?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male ♂</td>
<td>Not sure / Maybe</td>
<td>The theme of the puzzles is not so clear, don't know what am I supposed to solve.</td>
<td>3</td>
<td></td>
<td>I like puzzle games in general and i think that arg games are a perfect match for mobile users. It seems that the author of the game has good imagination and is capable of delivering a captivating storyline.</td>
<td>The complete lack of instructions or hints on demand. Also, privacy concerns might become a serious issue for a game like this, in my opinion.</td>
<td>I would make the long story-like messages between the different tasks more focused on giving little tips about how the game functions or what the player should expect, for example having the GPS opened, receiving messages on the phone or having to interact with a computer for different tasks can be wittily put in the story.</td>
</tr>
<tr>
<td>Female ♀</td>
<td>Yes</td>
<td>I heard about them before and tried a few out but they don't catch my attention for too long</td>
<td>Interesting, yet too demanding for my personal taste.</td>
<td>3</td>
<td>What I liked the most was the initial snake-like game with a twist because it was easy to discover what you have to do and pass the level.</td>
<td>What I hated the most was receiving messages directly on my phone, as my phone was not set to notify me of messages and I didn't know the next step in the game required such a message, delaying my game play.</td>
<td></td>
</tr>
<tr>
<td>Male ♂</td>
<td>Not sure / Maybe</td>
<td>No, i have never played an arg game before, but i like the idea a lot. I think it adds more flavor to a game and gets you more involved.</td>
<td>Unfortunately i could not progress far in the game, but the snake round was fun. I like the idea of giving new flavor to old games and mixing various genres in a puzzle.</td>
<td>3</td>
<td>I like puzzle games in general and i think that arg games are a perfect match for mobile users. It seems that the author of the game has good imagination and is capable of delivering a captivating storyline.</td>
<td>The complete lack of instructions or hints on demand. Also, privacy concerns might become a serious issue for a game like this, in my opinion.</td>
<td>It would be good if a player could request hints on how to proceed when he or she gets stuck. Also, the game should show rules and instructions, after the splash screen. Difficulty levels could also be a good option.</td>
</tr>
<tr>
<td>Male ♂</td>
<td>No</td>
<td>The widely accepted first ARG was The Beast, designed as a promotion for the movie A.I.: Artificial Intelligence. I found out about it from papers and from my friends but i did not get the chance to play it.</td>
<td>I've got very attached to the game. I really felt like I become the character. I often put myself in the characters shoes, wondering how being in their situation would feel. My imagination ends up scaring myself of what i can find out in the surrounding world.</td>
<td>1</td>
<td>The player was able to follow a series of clues hinting that a guy was actually murdered which was actually exciting.</td>
<td>The hardest part was going to the designated location to solve stage 2 because was a little far from my house.</td>
<td>I would change the time interval expecting the SMS so you can pass to the next phase, and I would make an algorithm that calculates my actual GPS location and generate a closer point to get at stage 2.</td>
</tr>
<tr>
<td>Gender</td>
<td>Male ♂</td>
<td>Yes</td>
<td>Yes, ingress etc.</td>
<td>Unfortunately I’m stuck because of a bug pretty quickly. I do get a notification about the message from &quot;private number&quot; but I have no way to open it. If I click on it, it simply disappears. All I can read is the first sentence &quot;it began with a tree&quot;. I reinstalled the APP and got the same results. Android 4.4.4 on Nexus 5</td>
<td>4</td>
<td>You should add an Option to purge any changes the game made to the phone, i.e. the call history.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Female ♂</td>
<td>Not sure / Maybe</td>
<td>Yes, I heard about them in some web articles about a year ago</td>
<td>Extremely fulfilling entertainment and thinking wise</td>
<td>It kept me curious and engaged throughout the game. The commands on the snake game. Would have preferred on screen arrows instead of tapping the directions.</td>
<td>1</td>
<td>See above about the snake game. The links once accessed to be available in history like the messages for quick access. The page with the fire circle took me 8 refreshes to load and I had the latest Chrome version so that should be improved.</td>
<td></td>
</tr>
<tr>
<td>Male ♂</td>
<td>No</td>
<td>don't think so, maybe?</td>
<td>It was an unique experience. Not sure how to describe it, felt like Tomb Raider with a different story</td>
<td>I liked the concept, the blending of all this technology with the story. Going to that location didn't make much sense. He said there was a meeting and then it was over.</td>
<td>1</td>
<td>The app can be improved. Like with any other app, there's always room for improvement.</td>
<td></td>
</tr>
<tr>
<td>Female ♂</td>
<td>No</td>
<td>I used to play adventure type of games but this type is new for me.</td>
<td>Outstanding, very interactive.</td>
<td>The game made me feel like a detective from the movies. Hate... nothing, disliked the murder in the end and the fact that the call received from Crowley scared me a bit. The story should have been longer and the riddles harder.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male ♂</td>
<td>No</td>
<td>No</td>
<td>Weird. New</td>
<td>The tree Requires patience</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male ♂</td>
<td>No</td>
<td>No sorry i haven't. I want to know more about it!</td>
<td>Thriling, misterious, excinting. A whole new experince.</td>
<td>The part with the camera when you have to put it in front of a monitor to see what the human eye can't. Nothing to add here. More puzzles and misteries.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was it immersive?</td>
<td>Was it too hard?</td>
<td>What was the hardest part?</td>
<td>Did you understand the story?</td>
<td>Did you understand the technology used?</td>
<td>How did the mechanics affect the storytelling?</td>
<td>Did you find all of the bonus content?</td>
<td>Would you like to see and play a full scale version of this game?</td>
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<tr>
<td>No</td>
<td>No</td>
<td>Not really</td>
<td>No</td>
<td>I had no problem...</td>
<td>Though the mechanics are...</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>I personally didn’t feel immersed in the game as I struggled too much with technicalities of my phone (receiving messages) and my computer (typing long links with precision).</td>
<td>The game had an acceptable level of difficulty, to the point in which it might actually seem easy for people fan of this genre. Due to my struggles mentioned above, I probably had a harder time than others going through the game.</td>
<td>The hardest part by far was the coordinate task, from figuring out what to do, to reaching the coordinates and moving the game forward from there.</td>
<td>More or less. I understood the overall story-line, identified little details such as the movies being about his family, though the heavy vocabulary and the long, moving text did led me to skip quite long portions of it.</td>
<td>Understanding the rules, the objective and the gameplay. I could only complete the snake part. The next stage was too awkward, requiring access to some phone hardware. I could not understand what was required from me and gave up.</td>
<td>No. I did not see a connection of the classic snake game in the first round to the gloomy story in the next stage.</td>
<td>I think that the storytelling comes in too late in the game.</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes, it has good potential of being immersive</td>
<td>Yes it was, due to the lack of guidance.</td>
<td>No. I did not see a connection of the classic snake game in the first round to the gloomy story in the next stage.</td>
<td>No. I did not see a connection of the classic snake game in the first round to the gloomy story in the next stage.</td>
<td>More or less. I have no experience in android development, but I have some background in gamification.</td>
<td>I think that the storytelling comes in too late in the game.</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes, it was, that's why I expect a second part for this game.</td>
<td>Moderate difficulty, not that hard... but you need to use your imagination.</td>
<td>To turn on the correct flame pattern in phase 3.</td>
<td>Yes... otherwise I wouldn't have known how to get to further stages.</td>
<td>I have few knowledge in computer science but I can say it was complex.</td>
<td>The mechanics improved very much the storytelling and gave a vast understanding of the whole picture. Checking the end of the game breakdown, it was interesting to see how even the tiniest actions were factored into the ending.</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Yes</td>
<td>No</td>
<td>I can't tell</td>
<td>Yes</td>
<td>Some of it</td>
<td>In a good way</td>
<td>Almost</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>Moderate. If I would have been in a group playing the game, then it would have probably been too easy</td>
<td>Getting a hang of how everything works</td>
<td>Not sure. Who was the guy that died?</td>
<td>I understood what it does, not how it works</td>
<td>In a great way. I think also alternatives can be found, but those would cost probably a lot</td>
<td>What bonus movie?</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes, a lot.</td>
<td>From a scale from 1 to 10 I would say around 7.</td>
<td>Getting on stage 2 at the designated point.</td>
<td>Yes.</td>
<td>Yes I am familiar with most of the technology used.</td>
<td>Improved the game a lot. The mechanics made the ARG happen.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>A bit</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>I bit tricky I may add sometimes</td>
<td>The hardest part was where you had to go the specified location to see the next clue.</td>
<td>Yes I did. Out of this world!</td>
<td>No unfortunately. I would like to understand the technology used to create such an awesome game.</td>
<td>They didn't effect it at all.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>What do you think about the COMMUNICATION method we used?</td>
<td>What do you think about the IMAGE recognition aspect?</td>
<td>What do you think about the SOUND recognition aspect?</td>
<td>What do you think about the LOCATION based approach?</td>
<td>Any other feedback, ideas, suggestions or requests</td>
<td></td>
<td></td>
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<td>----------------------------------------------------------</td>
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</tr>
<tr>
<td>interestingly blended in the game</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>You are welcome and good luck!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>They were fun. My wife thought somebody called her from abroad for a job interview :)</td>
<td>I did not get it.</td>
<td>I did not get it.</td>
<td>The use of these phone features in the game was not clear</td>
<td>Good job! The idea is great. With a more intuitive gameplay and in-game guidance it will become a cool game.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very good technology if no money where wasted.</td>
<td>Worked very well recognizing the surrounding environment.</td>
<td>Worked a bit hard (1/3 tries) but the game is still in beta.</td>
<td>A little far from my house but it was reachable.</td>
<td>Make a second part with more steps and a hardcore version (implementation of latest technology required to attract more players and make them play together).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was a great way to create the overall experience</td>
<td>I liked using it in the game. It gave it a whole new level. Could be used in a lot of other fields, especially marketing.</td>
<td>It was a bit slow in recognizing the sound</td>
<td>It's really fun to play a game with location recognition for me personally, but I know a lot of people who have security concerns regarding having their location pin pointed by an app on their device.</td>
<td>You are one sick individual for coming up with the story but kudos on the technique :)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was awesome, when I got my first message I thought they got the wrong number</td>
<td>Worked very well and it's a great way to paint a new reality over this one</td>
<td>It was interesting to see this used to something else, rather than figuring out to what song I'm listening to</td>
<td>It's ok, but as I said, it didn't make much sense. Maybe a better story implementation would have been better. And people are lazy!</td>
<td>Good luck!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very good ... so much technology was involved and no money wasted... good, good.</td>
<td>That part impressed me the most. It was outstanding.</td>
<td>Wasn't so good but it was in beta.</td>
<td>Great idea but next time i would appreciate to be a bit closer to me.</td>
<td>Yes make more levels, improve voice recognition and GPS locater, and make it less creepy.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A new experience. Nicely done</td>
<td>Awesome</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolutely brilliant!</td>
<td>I don’t know what to say. Never seen anything like it before!</td>
<td>I was utterly impressed by it.</td>
<td>That part was the most tricky and time consuming of them all.</td>
<td>It had me fooled at the beginning.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It was a great way to create the overall experience.

I liked using it in the game. It gave it a whole new level. Could be used in a lot of other fields, especially marketing.

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You are one sick individual for coming up with the story but kudos on the technique :)

Good job! The idea is great. With a more intuitive gameplay and in-game guidance it will become a cool game.

Make a second part with more steps and a hardcore version (implementation of latest technology required to attract more players and make them play together).