FOGGY FOREST a Tower Defense Audio Game

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ABSTRACT
Foggy Forest is a tower defense audio game [5] for smart phones. We have developed the game concept with visual impaired people in mind. Every player will be playing on equal terms whether you have a disability or not. The interaction in this game concept depends on the built-in sensors of the smart phone like accelerometer, gyroscope and 3D audio based on binaural recordings [8].

Author Keywords
Responsible Design; Audio Game; User Experience; Inclusive Design.

INTRODUCTION
This project is a part of the course Interactive Design 2 at KTH. The duration was four weeks, with one critique session each week. The theme of the project was Responsible Design in the field of leisure with mobile devices. In this our aim is to describe the process and the game concept of Foggy Forest.

PROCESS
The design process will be described in six different parts: Investigation, Specification, Initial Idea and Realization, Final Concept, Prototype, and Results.

INVESTIGATION
The starting point for this project was to focus on helping the people in need that normally would be neglected by the market. Given only the topic of "leisure" — which was the course theme — we explored 3 broad areas of interest which were revolving around "senior citizen", "gender equality" and "the visually impaired". After a few iteration and after a first critique session in the course, we narrow down to the topic "games for visually impaired and sighted users for social inclusion". The multi-billion dollar gaming industry (see Figure 1 according to [1])has its focus on users without visual impairment and therefore a limited amount of inclusive games are available. According to the WHO there are 285 million people visually impaired of which 10% live in higher income countries. 82% are above the age of 50 [11]. These people have only limited access whatsoever to the culture of computer games and we can only estimate how many would like to try and participate in this culture. This is the main reason why we are focusing on games which are suitable for both visual impaired and sighted users and allow for multiple players regardless of their skills or impairment. We found a few examples which mainly work for one player like "Nighjar"[10], "A blind legend" [4] and "Access Invader" [7].

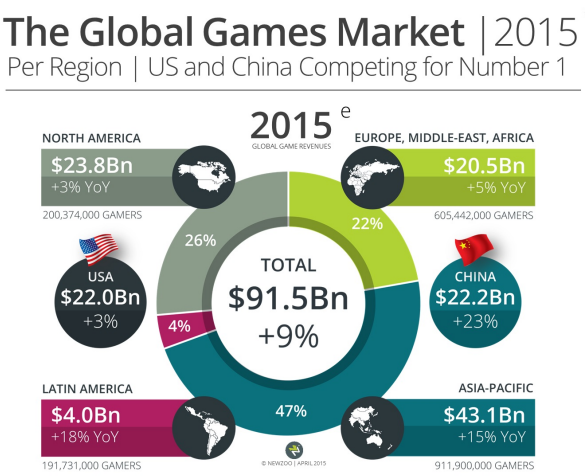

Figure 1. The global game market according to NEWZOO.

The games "Nighjar" and "A blind legend" are both 3D audio games which can be played on a smart phone with headphones. The goal in both games is to navigate and act only upon audio cues. The graphics are on the smart phone screen have limited functionality and are mainly for decorative purpose and to show that the game is running. Both games to great care of the production of the audio content and create a immersive audio experience. The game "Access Invader" tries to address the needs of people with diverse abilities and to create a game logic and content to achieve accessibility. We found this research inspiring especially the concept of parallel game universes which allows each player to act in a different "game universe" and then somehow project each universe to the other players. Rather to try to address a diverse set of inabilities — as the researchers of the game "Access Invader" did — we focused on the visually impaired.

SPECIFICATION
We started exploring ideas along a few boundaries which help us to keep focus. An essential part of our game is the enabling

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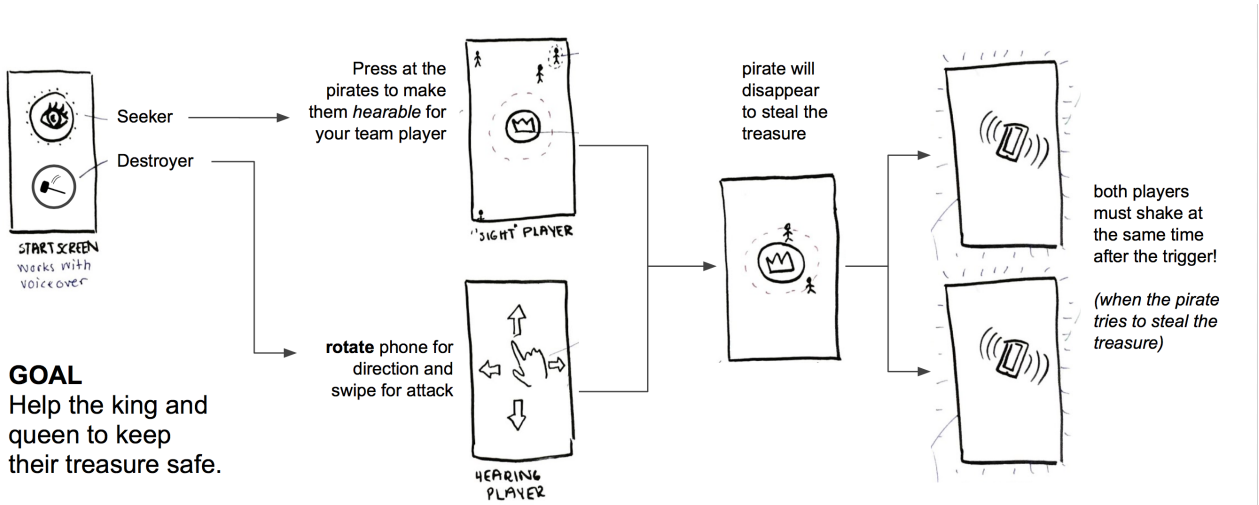

Figure 2. The first game concept 'Help the king and queen to keep their treasure safe from pirates'.

all players without restricting or patronizing. Therefore the game play and experience shouldn't give the impression of being designed with disabilities in mind. We want the players forget about their disabilities and enjoy the leisure activity. Also the game should emphasize team play. Based on these specification we created three concepts which we presented in a plenum of students to give feedback on.

Our intend with the first concept — "Superpowers" — was to turn the term "disability" inside out. Instead on emphasising disabilities and therefore adjusting the game mechanics accordingly we wanted to enable the players and make them feel empowered with "Superpowers". Each player has a certain ability which differ from each other but also unleash special abilities when one player teams up with another player.

The second concept — "Try walking in my shoes" — should address the empathy from one player to another specifically towards the impaired player. Many games already underlined on this aspect by "immersing into the life of a blind hero" (blind legend ref). This concept was quickly discarded due to the violation of one our boundaries — the impression of being designed with disabilities in mind — we set ourselves in the beginning. We believe this creates a negative tone to the experience rather then leisure satisfaction.

The third concept — "Be my eyes, I'll be your ears" — tries to adjust flaws of the "Try walking in my shoes" concept by combine it with the "Superpowers" concept. We explored this concept further by prototyping a possible game.

INITIAL IDEA AND REALIZATION

Our first game concept was "Help the king and queen to keep their treasure safe from pirates". A team game with target group sighted and visual impaired children. The game design both consists of visual graphic but also 3D sound to give an immersive game experience for everyone. Depending on the limitation of eyesight you will either be "the eyes" or "the ears". The challenge is to help each other, where the eyes points out the pirates from far distances by a binocular — as the role of the seeker. The ears will then be able hear from which direction the pirate approaches, and when the pirate is close enough he will kill the pirate — as the role of the destroyer. The goal is to defend the island from pirates who are trying to steal the treasure from the king and the queen (see Figure 2).

In this concept the two team members plays two different roles in the story, with different task, interactions, and different game design. Due feedback we realized that this concept creates a problem. Instead of making the players forget about the disability, the game enhance it. The design does not let the players play on equal terms, they are relying on each others abilities. The first idea does not always have to be the best one, which in this case it was true. We decided to kill our darling and take a step away from our main concept "Be my eyes, I'll be your ears", even though we like it. Instead we focused on the equality, and came up with our second game concept "Foggy Forest".

Figure 3. To the left - App logo. In the middle - Start screen. To the right- The only visual graphic in the game, which will not help the player at all.

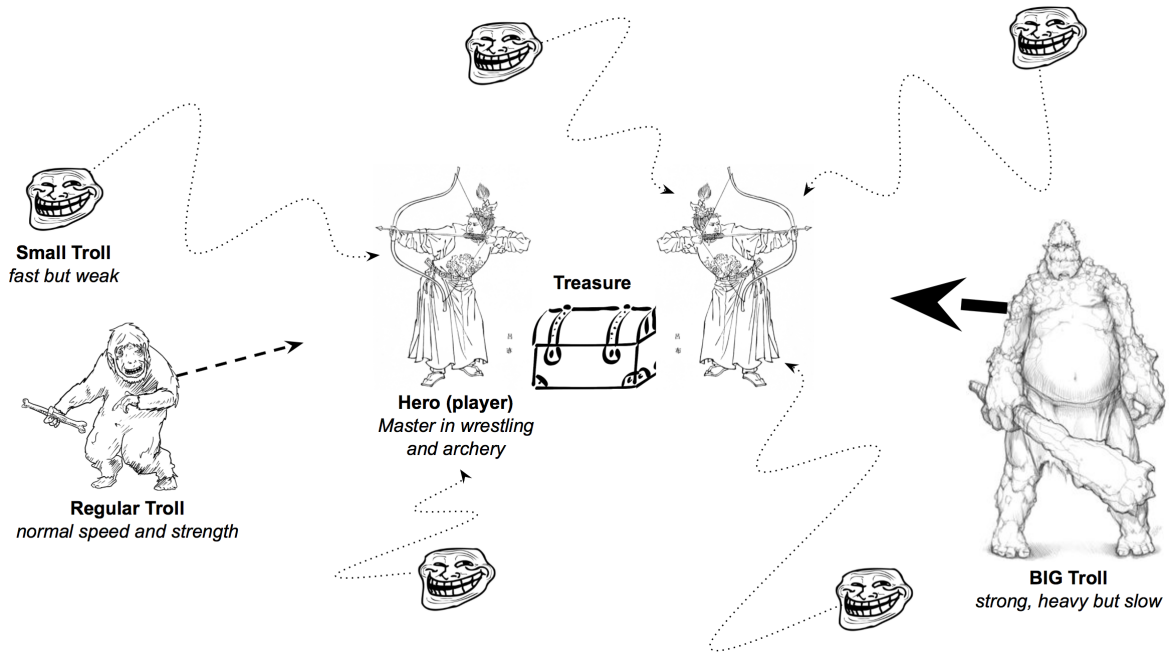

Figure 4. The game setup for the final concept.

FINAL CONCEPT

Even thought it violates again our boundary — the impression of being designed with disabilities in mind — we simplified the game by focusing sole on audio. We believe by telling the right story and setup for the game with the right amount of guidance make this boundary unnecessary.

Our game design is on a mobile platform e.g. iOS or Android and headphones to have a full immersive experience with 3D sound. The interactions are mainly through gestures as the user plays in a first-person manner and therefore relates the input by the game to the own body. This claim has support through [9] which states that "...gestures emerge from perceptual and motor simulations that underlie embodied language and mental imagery."

"Foggy Forest" is a multiplayer game and the players are allowed to either sit or stand. They don't have to be in the same room and it doesn't matter which way they are facing. To be able to execute gestures the phone needs to be held in the preferred hand as shown in Figure 5.

The game "Foggy Forest" is build upon the game mechanics of "tower defense"[3]. The main principle of a Tower defense game is to stop the enemies from reaching a specific point on the map by building a variety of different towers which shoot at them as they pass. In our case the players turn into the towers and the enemies are trolls.

Our story revolves around a forest which is submerges in fog all the fucking time and there is no way anybody can see a fucking thing. In this forest lays the Foggy Kingdom ruled by King Albert. He posses a huge treasure which attracts trolls and other creatures which want to steal the treasure. Because of these malicious reasons, the King needs the player's help to defend his treasure from the thieves.

Figure 4 shows the setup for foggy forest. The players are virtually positioned in a circle around the treasure in their backs and are facing outward into the forest. The forest provides a ambient sound scape of rustling leaves and hissing winds.

There are three kinds of trolls (see Figure 4) which appear out from the forest and try to attack the players from the front. The trolls produce all kinds of noise like grunting, breathing, laughing, stomping and cracking branches while they are moving towards the players. The trolls will try to wrestle with the players and steal the treasure. While they are wrestling the player's phone will vibrate.

Through the entire game, the narrator King Albert will guide the players. He will explain the game setup, the scenery and the actions & gestures the player can execute. The explanation are incorporated in action e.g. while under attack the game pauses and the narrator walks the player through a tutorial. During this tutorial, the player can practice the gestures to defeat trolls and other movement. In table 1 are the possible actions and their corresponding gestures listed that can be executed by the player.

Most game actions only need one player to execute but to succeed against a big troll or a larger number of smaller trolls a single player needs to call for backup. The "call for backup" and "help other" actions intends to emphasize the inclusion of the visually impaired players because they can't participate in regular games in the same manner.

PROTOTYPE

By using the "Wizard of OZ" method [2] we created a self-explanatory prototype of the game, where we acted the role of the King Albert and the trolls. We let our test person be blindfolded and placed in the middle of and empty room. The instruction we gave was to hold a smart phone in one hand and interact with our directions. By calling to the phone we could illustrate the haptic feedback from the trolls by vibrations. We recorded the session to have the ability to analyze how the test person interacted with the play. When the person was ready King Albert started to walk around the person and read the following script:

"Ah, there you are, I have been waiting for your arriving. Welcome to the Foggy Kingdom, I'm King Albert and I am very pleasant to have such a great guardian here. I know the sight is very bad over here, and the view isn't that great either but you'll get used to it. Lately we have had some trouble with some trolls in the forest. They are attacking my kingdom, frightening my people and trying to steal our gold. I really need your help to defend us from those trolls, you are our last hope. Are you ready to begin? Let's go!

Melody starts playing and you hear the sound of the forest, Small troll sound.
Oh, did you hear that? It was a small troll. Listen carefully and try to locate the trolls, you will learn the trolls significant sounds.

Troll walking at a distance.
To explore the area around you need to point your phone, in your wanted direction.

Troll approaching and grunting.
When you have found a troll, shoot it. Use your bow by pointing your phone in the right direction and swipe down to fire the arrow.

Sound of shooting arrows and troll is getting closer and grunting – PHONE VIBRATES – sound of coins rattling.
Watch out, a troll has sneaked up from behind and are digging in the gold. Shake your phone to get rid of him.

Sound of dropped coins and the troll running away
Puuh, that was close. You will see that there are different sized troll out there, if you need help, call for backup by tapping on the screen multiple times. And remember, the small trolls are harmless you can just swing them off if they are getting close to the gold."

RESULTS

The result from testing our prototype showed that the concept was clear. All participants understood the concept and the instructions that was giving to them. We saw that both audio and haptic feedback helped the player to differentiate between interactions. They interacted as we wanted and predicted them to.

By testing our prototype on people we also got the feedback that the game could be further developed. One participant suggested more task and possibilities for the role of the guardian, such as collecting items and choosing weapons. But in general the feedback was very positive, and all the participants enjoyed the concept.

Actions	Corresponding Gestures
Navigation & orientation	Pointing device in the desired direction
Shoot arrows at trolls	Swipe down on device touchscreen
Wrestling a troll	Shake device
Call for backup	Tap repeatedly on device touchscreen
Help other players	Point device in the help seeking player & Tap once on touchscreen.
Team wrestling a big troll	All involved players shake the device simultaneously. Similar to [6].

Table 1. The game actions and their corresponding gestures.

FUTURE WORK

The game concept shows potential. Before actually creating a full-fledged game there is additional prototyping and testing needed. We propose a high fidelity prototype with an actual device with the targeted OS and several scenarios which then will be tested through the "Wizard of OZ" method. We also propose a larger number of participants with a diverse set of skills and impairments.

ACKNOWLEDGMENTS

Our purpose with this game was to design with responsibility, to create a game concept that would be equal no matter if the player is visual impaired or not. Because of the short time span, we were not able to get in contact to people who really have the disability and therefore we could not test the prototype on a visual impaired persons. This makes our result unilaterally and only shown from one perspective.

Figure 5. Still from a user testing video using the 'Wizard of OZ'method. The user (center) is pointing with the smart phone in her hands at the troll (right). The narrator is in the back.

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