

# The IronMan-Experience

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**Abstract**—Did you ever wanted to feel like a superhero? - With this game it is possible. In the 'Iron Man Experience' you can play as Iron Man, and really feel like him. This game is a virtual reality (VR) game, in which you are fighting against Iron Man's enemies using your own hands and try to defend the little village.

## I. INTRODUCTION

THE IronMan-Experience is a game which was developed by Jeremy Joel Harisch, Sunung Mun and Yeongsang Jang. It is a virtual reality game which uses the LeapMotion-sensor as an input device. Inside of this game, the player slips into the roll of IronMan. He is a member of the 'Avengers', which is a team of superheros trying to save the world from all the bad. Tony Stark, the real name of IronMan, fights against his enemies only with the help of technology, he does not have any superpower. Thus, he is the perfect member to create a realistic simulation. The player sees the game from a first person perspective via a head-mounted-display (HMD), like a Oculus RIFT, and uses his own hands as a controller. The hands will be scanned by a LeapMotion-sensor attached in front of the HMD.

## II. MAIN PART

### A. Goal of the game

The IronMan-Experience is an endless shooter, thus this game has no real goal than beating your own highscore or the one of your friends. There are three different types of enemies, which have different outward appearances, damage and health stats: blue Zombies, pink zombies and huge yellow hell elephants.

TABLE I  
ENEMY STATS

Enemy	Health	Damage
Blue Zombie	100	20
Pink Zombie	150	20
Hell Elephants	300	50



Fig. 1. Left: Blue Zombie, Middle:Pink Zombie, Right: Hell Elephant

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The player has a health of 300, and if an enemy reaches the player it will attack every second. The player can see his own health in his health status bar at the top of the screen, but we will talk about the HUD later on. Furthermore, the game will get harder over the time, in this way it will be very challenging to the player. After he dies, he has to enter his name or his nickname. For this, he has to use three characters between 'A' and 'Z'. To enter his own name, he has to use simple swipe gestures. Hence, the player can stay in the virtual reality without using any additional devices.

### B. Environment and HUD

In total there are two different environments the user can be in: The lobby and the actual game. Both of them are in the same little village, but the lobby is a kind of the intro screen where the game and the controls are explained. Furthermore, the player can have a look at the top five highest scores inclusive the gamer tags. In the actual game, the light switches from day to night, all the screen from the lobby disappear and the actual HUD is shown. The HUD includes the player's own health bar, his score and every time he gets hit by an enemy a damage hit will be shown. Moreover, while playing the entire game a challenging instrumental song is playing and supports the feeling of being a hero. Besides this the enemies are making different sounds while walking and taking damage.



Fig. 2. Entrance at the lobby

To support all the given visuals, some new visuals will be triggered if the user makes use of the weapons. He can see different animations depends on the weapon he uses, like shooting direction of the laser and the lightning effect in his hands while using it. If an enemy gets hit, you see particles falling to the ground from this enemy and you hear him getting hurt, until he actually dies. If he dies, he falls to the ground and the user gets feedback of his dying screams. Furthermore, after an enemy dies the score is being updated to the new score.

### C. How to play

At the beginning when a user start up the game, he is remembered to plug in his LeapMotion sensor and attach it to

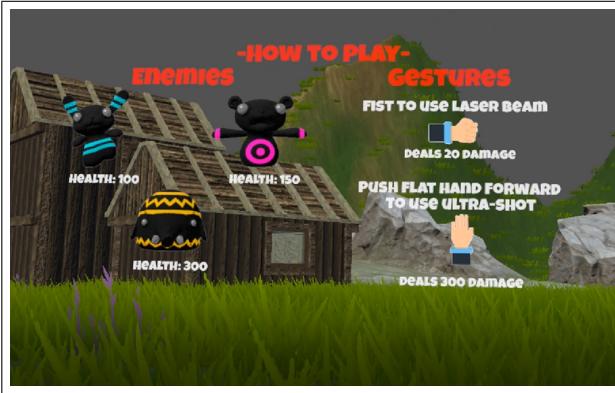


Fig. 3. Left side of the lobby: How to play the game



Fig. 4. Right side of the lobby: Scoreboard

the front of his HMD, which also should be plugged in. After the game is booted up, the player is spawned in the middle of the lobby. In this lobby, the user can test all the weapons before he actually starts to play the game. In this way, he can get used to the controls and will not be directly killed and disappointed from the whole game. Furthermore, he can have a look at the top five scores, to know how much he needs to score to set a new high-score. If the player wants to leave the lobby and wants to play the actual game, he has to clap with both hands in front of the sensor.

After leaving the lobby, the main game is started and the zombies are starting to come towards the player. Most of the zombies are spawning in regions which the user cannot see from his point of view, but he can still hear the noises the zombies are making. At the beginning of the game, there will be only blue and pink zombies. The huge hell elephants will spawn after some time being alive in the game. Besides this, the spawn rate of every enemy time is increasing by time being alive, thus it keeps on being challenging for the players.

In this version of the game the user can two different types of weapons: The laser beam gun and an ultra-shot rocket. Each of them deal different damage and have different activation methods. Of course the user can use both hands at the same time, and he can even uses two different weapons at the same time.

After the user dies, the game-over screen will be shown.

TABLE II  
USER'S WEAPONS

Weapon	Damage per shot	Activation method	Need to redo activation method after every shot?
Laser Beam Gun	20	Fist the hand	No, if the player keeps the hand as a fist, it will fire 5 shots per second.
Ultra-Shot Rocket	300	Push flat hand forward	Yes

In this screen the user can look at his own score again. In addition, he can enter an own gamertag to save his reached score for him. To choose a gamertag, he has to enter three letters via swipe gestures. At the beginning the name will be set on 'AAA'. The selected letter will be shown in turquoise. Via left and right swipe gestures he can select the letter he wants to change. Via up and down swipes he changes the selected letter. If he is ready, he claps to go back to the lobby. If he reached a score which is one of the best five scores, he can see his name on the leaderboard to his right.

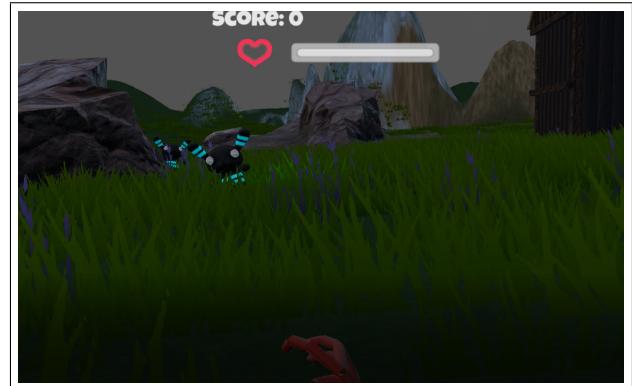


Fig. 5. Blue Zombies running towards the player



Fig. 6. Player makes use of laser beam gun

If the player feels sick while playing, or he has some different reasons to break the game, he has to clap with both hands together to go back to the lobby.



Fig. 7. Player uses two hands to be more efficient against enemies



Fig. 8. Before using ultra-shoot rocket



Fig. 9. After using ultra-shoot rocket

### III. TECHNICAL DEVICES TO PLAY THIS GAME

#### A. Head-Mounted-Display

The output of the game will be shown on a head-mounted display (HMD). But to play this game you need to have a HMD which works with SteamVR, like Oculus RIFT or HTC



Fig. 10. Player inputting his gamer tag

Vive. This is because the game is being implemented on Unity and the most common used framework is the SteamVR, which is also used in this game. Besides this, this is also the most used one, so the game can be played by the most gamers which are having a HMD.

#### B. LeapMotion

To interact with this game, you need to have a LeapMotion sensor attached to the front of your HMD. With this sensor the game is going to track your hand movement in front of the HMD. And because 'LeapMotion' is a small USB peripheral device, which can track both of your hands wireless, just with the use of cameras, infrared sensors, and complex maths, you do not have to wear additional gloves. Sadly, the working area of this sensor is quite limited, so you cannot use your hands behind your back. But still as a player you can see both of your hands inside of the virtual reality in front of your HMD, and with a written gesture detection, you will be able to navigate through the game, like explained in the chapter before.

## IV. USER STUDIES

#### A. General valuation of the demo

Our team made some questionnaire to research what users really think and feel about our demo. Below table is the result of survey.

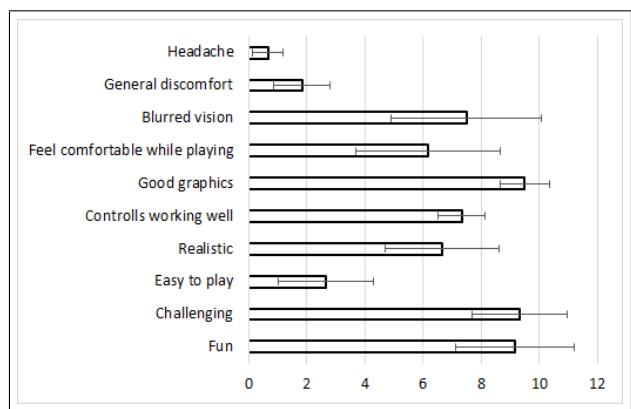


Fig. 11. The results of questionnaire from 6 users after playing the game

### B. General detection issue

The problem arose that the laser did not come out through the way the user intended, when we built the prototype of this game. So, we implemented two types of shooting systems: First, we used the data of arm directions by substituting 3-d vector position data of elbow and wrist. Second one is the data of finger direction. In the interior test and developer alpha test, our team conceded that the second one reflect users intention more properly. But there still can be a lot of improvements done.

### V. IMPROVEMENTS

At the beginning, when our team demonstrated our prototype, most of users were defeated in a few seconds, and it meant that the demo is totally failed to set proper challenging environment. As you have seen above, the average score of our project valuation the subject "easy to Play" is 2.3. Thus, the difficulty curve has to be revised.

Second, the secondary weapon has the same visual user feedback as the main weapon. And because of this, it makes it hard for the users to recognize which weapon they have triggered.

In addition, the way of calculating the direction of the shoots should be improved to have a higher accuracy while using your own hands as a controller.

### VI. CONCLUSION

All in all, we can say that most of the users had a lot of fun while playing this game. Of course, they were a bit disappointed that they did not reached the score they wanted to reach. But as a conclusion we can say, that this game was very successful and suggested a new type of human computer interaction although it still needs some improvements.

The whole team learned a lot of new knowledge about using the unity engine and different kinds of sensors. And for the amount of time and effort we have put into this project, we are proud of our results because this is our first experience to implement a VR game.

### REFERENCES

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### Roles of team members:

Idea and game concepts	Jeremy Joel Harisch 33% Sunung Mun 33% Yeongsang Jang 33%
Decision of techniques using for the project	Jeremy Joel Harisch 33% Sunung Mun 33% Yeongsang Jang 33%
Implementation	Jeremy Joel Harisch 45% Yeongsang Jang 45% Sunung Mun 10%
Testing of prototype	Jeremy Joel Harisch 45% Yeongsang Jang 45% Sunung Mun 10%
Final Report	Jeremy Joel Harisch 45% Yeongsang Jang 45% Sunung Mun 10%
General correction and improvement of the report	Jeremy Joel Harisch 33% Yeongsang Jang 33% Sunung Mun 33%
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