# VIRTUAL HUMANS
## FOR SERIOUS GAMING
### FINAL REPORT

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# 1 Introduction

## 2 Overview

# 3 Reflection

In this section we will reflect on the product and the process from a software engineering perspective. We will give information about how to improve and which lessons we have learned during this project.

## 3.1 Product

The final product we have made, is not the product we had in mind at the start of this project. We expected to have more interaction with the bot and to have a much better strategy. At the start of this project we expected that we had to implement a bot for the Tygron game and that the connector had all the information we needed. That we had to write a strategy for our bot so it was able to play in the Tygron game. Unfortunately we were wrong. We also had to implement the connector. We had to make sure all the information we needed for the bot, was implemented in the connector. So instead of using the percept, we had to write the percepts. This caused a big change in our plan. Because instead of focusing on a strategy, we needed to focus on implementing code to get percepts before even thinking about a strategy. So our final product is now a basic bot, who is able to do basic steps, like building and buying. But a very nice strategy or interaction with other bots, is not really there. The improvement for our bot is to have this nice strategy. We weren't able to have this, because we didn't have the information implemented in the connector. Now we have. So if we had another ten weeks for this project we should be able to build the strategy we had in mind. We should be able to think of a strategy and implement this using our code from the connector, because then we don't have to implement anything new in the connector, .

## 3.2 Process

Our process was quit organized. We used SCRUM to plan our sprints and almost every day we worked together. We discussed when we needed to approve pull requests and we helped each other out when there were issues with computers. Because sometimes, some computers had problems running Tygron. Then we would run the code on another computer. We had one team member, that was always late and sometimes didn't show up at all. He also did not do much for the product. We learned that communicating with the TA's can help a lot. Because we communicated each time he didn't show up and reported the exact hours everybody spend at something, instead of just filling in so everybody had enough time, we were able to show that he was a problem in the team. But he decided to stop and we became a team of 4 members. We kept communicating with each other when somebody was late or didn't show up, so we knew what was going on. Also we kept filling in the right hours even if this caused somebody to have less than 28 hours. IF you had less, then you had to make this extra hours the next week. An improvement of our process should be, to meet everyday and make sure the expected hours are spent. In this case we would be able to finish more tasks during a sprint.

# 4 Description

# 5 Interaction Design

## 5.1 Goal

The goal of our user study was to see how other players interact with our bot and how they experienced it. Because we need to replace a human by a bot, it should almost be like playing with a real human. So we needed to know what were the difference between playing with a bot or playing with a human.

## 5.2 Procedure

We tested six persons using our code. All six test persons were TI students which are also doing a context project, but they had another context. First we had to explain the tygron game to our test persons, because they need to have an understanding of the game and it has a lot of options. So we needed to take time for explaining this.

Then we need to explain them the tasks they had to do. The needed to play the game as the stakeholder municipality twice for 10 minutes. This could be twice against a bot, or twice against a human. Also it could be once against a human and once against a bot. When a human was playing it was just playing and not trying to simulate the bot. In this way we made sure we got the differences between bot an human, because our bot should look like a human not the other way around. They had to play the game and reach there goals in the games. This could be done by building, buying, selling and demolishing. By doing this they also had to interact with the other player.

After they played the game, we asked them how it went and if they thought they played with a bot or a human. Also they need to explain why they thought that.

These results were gathered together and written down. In this way we could find out if they could sense that they were playing against our bot.

## 5.3 Results

The complete results are given in appendix B. When we looked at the results, we saw that everybody was right about when they played against a human or a bot. There is only one person who doubt a little bit. But most of the times it was very clear when they played. The overall comment we got, was that the bot wasn't building on logical places, so We could adjust this to add more strategy in deciding where to build or buy. Another reaction we got was that when buying land and getting rejected, it tries to find another piece of land to buy instead of accepting to buy this land for a higher price. We intended to do this, but if the municipality keeps rejecting our request, then we have to buy it for a higher price. The last comment we got was that the bot is faster than a human.

## 5.4 Conclusion

Our conclusion is that we need more strategy in order to build at more logical places. Also we need an improvement for our strategy in buying land. We should be able to detect when it keeps getting rejected. We need to give a higher price when this is happening. It is not really possible to slow down the bot. The only thing we can do is to make sure it is going to the event module each time it has executed an action. In this way we get the most recently percepts and we are

faster in reaction to those changes. Also it should slow down building, because it has to go to the event module before it can build another building. So for the next time, we would extend our strategy. We won't focus on slowing down the bot, because this is not what we want. We don't want to build in a delay. We want the bot to think about what he needs to do instead of being as slow as a human.

# 6 Evaluation

# 7 Outlook

## 7.1 Appendix B

In this appendix, we describe the full results of our user study. For each person, we have written there reaction to our questions after each session. Also is given if they were playing against bots or humans.

### 7.1.1 person 1 (played twice against a human)

**first time**
"It is great game!, I could demolish everything I wanted. I got some permits from other players for building items. It was weird, because the building was already there. When I rejected it, it took some time to let the building disappear. I think I played against a human, because a bot should be faster with reacting to my requests."

**second time**
"This time I played more seriously, so I build more parks instead of demolishing everything. I had to accept and reject the permits from another stakeholder. This time I am not sure if it is a human or a bot, because the placing of the buildings was quite nice and I heard this project wasn't going very well. So I expected not very nice behaviour of the bots. So I think this is a human."

### 7.1.2 person 2 (played twice against a human)

**first time**
"I was just waiting for the other stakeholder to do something. When I got a requests, then I would reject or accept randomly. I got multiple requests for buildings and buying land. It was all at logical places and the reaction time was normal. So I think it was a human."

**second time**
"This time i tried to buy, build and sell by myself. Also I accepted everything the other stakeholder asked. It was almost the same as the first time. So I think this should also be a human."

### 7.1.3 person 3 (played twice against a bot)

**first time**
"It went well, I could build some buildings and even was able to reach one of my indicator goals. I got a lot of requests from another stakeholder. I hadn't reacted to one and then the other was already there. It also had a lot of building at the same time. So Because this was really fast, I think it is a bot."

**second time**
"Also this time it went well. I also tried sold some land to another stakeholder for a very high price. But the stakeholder didn't accept this. The stakeholder did again build very fast and a lot, also not every building had a logical place. I doubt a little bit, because I would expected that is the stakeholder was a bot that he would accept the land I wanted to sell. A human wouldn't built at those places, so I think I was a bot."

### 7.1.4 person 4 (played twice against a bot)

**first time**
"It was a easy game. It looked like Sims City. I like the game. I found out that the municipality

wants to increase livability. Also I got requests for buying land from another stakeholder. I declined it, because I wanted more money, so I tries to sell the same land for a higher price. But the stakeholder rejected it and kept buying different lands for the same low price. So I kept rejecting. Because it never accepted my sell requests and kept going on trying to buy other lands, I think This was a bot."

**second time**
"This time I reached All indicators, so I won. Because I didn't need any land, I accepted the buy requests I got. Then The other stakeholder started building nice terraces and convenience stores, which was also good for my indicators. So I only had to accept the rice the stakeholder offered for my land. The stakeholder didn't have much variation in what he was doing, so I think it was a bot."

#### 7.1.5 person 5 (played once against a human and once against a bot)

**first time**
"It din't went as expected, because The game was very slow. It didn't react in the way it should. Also it is not possible to change your selected part for building. I saw that another stakeholder was building very fast. It had a lot of buildings in a small amount of time. That is why I think that I played against a bot. A human would never be able to build that fast."

**second time**
"The game still didn't work as expected. It was not clear which zone was the zone you needed for your indicator. Also it is possible to build a building inside another building, so it is not possible to reach this building, this is weird. The stakeholder was still building buildings and I got several permits. This time the building were build at more logical places and it was slower then the first time. So this time I think I played against a human."

#### 7.1.6 person 6 (played once against a human and once against a bot)

**first time**
"It went okay, I had to get used to the Tygron game, but after that I could play the game very well. I got a request to buy land and I accepted it. Everything went well when interacting with the other stakeholder. When I tried to buy something, it first rejected it, but when I offered more money it accepted. It was remarkable that the bot always had building of the same size and always next to a road. It lokked like the stakeholder was thinking about what he did, but it had some weird actions like building on strange locations. So I think this was a bot"

**second time**
"Everything went well and the eaction was fast when I send a request. I changed some stuff in my game and the stakeholder rejected or accepted alternately. It built at logic locations. There weren't very remarkable thinks going on. But the things that happen were less predictable, so I think this time is was a human."