

Final Report

Group: House Gryffindor (1)

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1. Introduction

1.1. Preface

The goal of this report is to provide an overview of our project and to give insight into our product and working process during the project. This report consists of seven sections and each section gives insight into crucial parts of the workflow of the project and the developed product. The first section gives a general overview of the most important parts of our product. The second section gives more insight into the issues that were faced during this project. The third section gives a description of the structure of the product. The fourth section is about the Interaction Design. In the fifth section an evaluation of the developing process and the final product is given. The sixth and final section gives an outlook of the entire project where there will be discussed things that could have gone better and what we did successfully.

1.2. Problem description

The main goal of this project was to add functionality to a system which will be used to help people in dealing with psychosis problems. The main functionality we had to implement was grabbing objects in a virtual scene with the Manus VR. This is the most important thing in the system because the psychosis patient has to experience the same things as he does every day in the real world. This is an essential feature to make the therapy more effective.

1.3. Requirements

The most important requirements for our client and the users of this system are:

- Being able to pick up and put down an object in the virtual environment.
- Being able to move in the virtual environment.
- Being able to see their body and how they actually move in the virtual environment.
- Being able to use the Manus and Kinect intuitively.
- The user shouldn't be able to put his hands through an object in the virtual environment.

The system also needs to be stable and reliable so that the patients will have a comfortable and realistic experience while moving around the supermarket simulation and picking up groceries.

2. Overview

We have implemented all must and should have that we had defined in the beginning of this project. Our main focus was implementing the grab functionality and the possibility to let a user move in the scene.

The final product is a virtual scene in which a user can act. The objects in the simulation are physics based. This means that the user can interact with them as he would with real objects. He/She can pick up an object, put down an object, when the user touches an object the gloves vibrate, the user cannot put his/her virtual hand through objects.

The hardware that is used to make these functionalities possible are the Manus VR and the Kinect. We use the Manus VR to track the movement of the hand and fingers, while the Kinect is used to track the other body parts, specifically the hands/arms and legs.

With our product the simulation will be more realistic and stable and the patient will feel more comfortable and self-assured when using the supermarket simulation.

3. Reflection

When reflecting upon the overall development process throughout the entire project, there were several bumps in the road. The first problem we had to face was getting the hardware that we needed, the Manus VR and Kinect and then setting everything up because without the hardware we could not really make any crucial progress. Working with the hardware itself, in particular the Manus VR was also challenging because we were given only one piece and we needed to share it with the other group that was working on the same project. Luckily the communication with the other group went very well and we never had a misunderstanding about who would get the Manus VR on which day **etc.**

A second issue was that we had to deal with and that we spent a lot of time on was testing our implementations. Since we had to make our project in Unity using C# scripts,

we did a little research on which testing tool we could use and ended up using NUnit to make test cases which make use of Unity game objects. This didn't work out really well because the test cases could not be executed since Unity game objects can not be created outside of Unity. Next we tried using the NSubstitute Framework but it also did not work out because this framework only works with mocking interfaces. Eventually we found a way to test our code and now the only issue left was getting the test coverage. This also cannot be done in Unity, so we had to test everything manually to get an indication on how well we have tested our code. In a future project we would not

Besides the problems, the scrum part of and development process of the project went very well. The communication between the members was very good, with no late reactions and no arguments. We divided the tasks very well and it was clear for everyone what had to be done and when everything had to be finished. We helped each other when someone had a problem, answered questions very rapidly and always reviewed each other's code. This went very smooth and fast because we would always meet up and work together on the project instead of communicating via communication apps.

4. Description

The developed functionalities are as follows:

- + (points will be extended for the final version and pictures will be added throughout the whole report)

Object grabbing

- We have added functionality for interacting with physics objects such as being able to move them around, rotate them and throw them.
- When an object is picked up, the hand does not go through the grabbed object, instead the hand is neatly placed around the object.

Haptic Feedback

- Feedback is given to the user when the user picks up an object by using the vibration motors of the Manus-VR gloves.

Shopping Basket

- The shopping basket is made to look realistically and it moves around with the user.
- Items can be added and removed from the shopping basket.

- Removing

5. Interaction Design

This will be in the final version.

6. Evaluation

In the final version, our product contains all must and should have requirements. The initial users of this product are the CLEVR developers, but the end users are the psychosis patients. The final functionality of our product is consistent with our initial plans and thoughts about it. In the process of developing this product we tried to make it as stable and easy to understand as possible.

The main focus were the CLEVR developers because they will eventually use our product to add functionality to their product which will be used to treat psychosis patients. The only requirements that we did not manage to implement are some of the could haves that we had defined at the beginning of this project such as:

- The patient could push other “people” in the environment.
- The patient should be able to buy the selected products by the cash register.
- The patient could push a shopping cart instead of holding a basket.
- Simulated people could be animated to look like they’re picking up items.
- The client should be able to provide the necessary functionality for the patient to actually walk around the supermarket without using a joystick.

7. Outlook

After 8 weeks of working on this project we are pleased with our end product. However, not everything was perfect so we do see possibilities for improvement and extension of certain features.

7.1. Improvements

We could have made the planning a little bit better. We did more work in the second half of the project, relatively to the first half, but that was also a bit because things were not always clear, especially in the first couple of weeks when we didn't really know what was actually expected from us. But if we had planned better we could've had a better distribution of work over the weeks and maybe even implement some could haves.

We also did a lot of things right . Especially the cooperation of the team was very pleasant. It was never a problem when it came to decision making and splitting tasks among all team members. The ambiance in the team was very nice but also very productive. We had a lot of meetings at which we would work together and eventually it all worked out.

7.2. Extensions

A possible extension/improvement would be to smoothing the movements of the body tracked by the kinect. That way the user would be more aware of how he moves in the simulation.

Another thing that would be interesting to add is a shopping cart and also going to counter and actually buying the items that the users has collected in his/her shopping basket.