

Motion sickness in Virtual Reality

(max 2 lines)

Student Information

Name Joep Eijkemans
Number S1773534
Status Proposal _____

Client Information

Name Roessingh Research and Development
Web site <https://www.roessingh.nl/>
Supervisor(s) Roos Bulthuis - R.Bulthuis@rrd.nl

CreAte Information

Supervisor(s) Robby van Delden - r.w.vandelden@utwente.nl
Critical Observer Monique Tabak – m.tabak@rrd.nl
Timeframe Module 2A and 2B (schoolyear 2018-2019)

Situation

(200 words)

Children with DCD have a backlog in the development of motor skills and have trouble coordinating their movements. As a result, they have trouble with everyday tasks such as riding a bicycle. The Roessingh center of rehabilitation in Enschede provides these children with extra help, but simply riding a bicycle is different than riding a bicycle in traffic. As a means to realistically train participation in traffic, without putting the children at risk, a virtual reality cycling simulation was developed. The simulation uses an Arduino and Reed switches to measure the speed with which the rear wheel is rotating. It uses an HTC Vive controller to measure the orientation of the steering wheel. The head mounted display is also that of an HTC Vive. The speed and steering are then used as an input and allow the children to cycle through a virtual environment whilst on a non-moving bicycle. In this environment they will encounter realistic traffic situations involving traffic lights, cars or a family of little ducklings. The goal of this project is to eventually learn these children how to behave accordingly in traffic so that they can participate without any help or (significant) risk for their safety.

Challenge

(150 words)

The problem with this simulation is that it induces great amounts of motion sickness. Motion sickness is a common phenomenon. Other names for it exist as well such as sea sickness or traveler's disease. Motion sickness can also be induced by virtual- or augmented reality or even simulations using screens or beamers. In this case it is often called cybersickness or simulator sickness, but since this simulation uses VR, I'll call it VR induced motion sickness. The amount of VR induced motion sickness experienced with this simulation is so great that it really must be reduced, or the simulation can't practically, or perhaps even ethically, be used. The challenge here is that, although theories exist, the exact cause of VR induced motion sickness is unknown. This gives us very little input for ideas of reducing it. My approach will be using solutions that have been researched and have shown to decrease/delay symptoms (or I personally believe have potential) and apply these solutions to this simulation.

Question(s)

(max 2 lines per question)

Main question: how can the amount of motion sickness be reduced in this cycling simulation?

Sub questions:

- What is VR induced motion sickness?
In order to research VR induced motion sickness a definition is needed.
- What is the cause of (VR induced) motion sickness?
Discussing multiple theories enables me to estimate the potential of different solutions.
- What can be done to prevent or reduce VR induced motion sickness?
Discussing potential solutions that may be applied to our simulation.
- How can VR induced motion sickness best be measured?
In order to measure the effect a specific change on the simulation has, an accurate method of measuring VR induced motion sickness is needed.

Practical Aspect(s)

(100 words)

Although the target group of this project is children, these cannot be used for testing. Testing with young children cannot be done on any location, takes more time, requires permission from the parents or guardians, and has the ethical aspect of exposing these children to the risk of VR induced motion sickness. The ethical aspect remains with other test users as well, but those may be better able to understand this risk.

Another practical aspect will be the amount of testing. The list of potential solutions currently consists of 13 solutions. Some of these will be quite a lot of work to even apply to this simulation. It is also unsure whether and how these solutions will work in combination with each other. Proper planning is required to ensure the maximum efficiency of this short testing period.

Date : 18 / 04 / 2019

Signatures :
(student)

.....
(supervisor)