Integrated Visual Field Remapping for Hemianopia

Nik Harith Sharifuddin - 2673209B

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1 Status report

1.1 Proposal

1.1.1 Aims

The goal of this project is to design and develop a Virtual Reality (VR) application that enables the user to remap the visuals of that are displayed in the VR headset to 'fit' into the user's limited visual field. Moreover, the application will have the capability to take in data of a visual field test and automatically calculates and implement the remapping function based on it. The project also aims to integrate this remapping function module with the visual testing module made by another student.

By the end of this project, there will be a deployable application that would enable the functionalities above and would also integrate with the visual field testing module in a single platform.

1.1.2 Motivation

Hemianopia is a condition usually caused by stroke where the visual field of the patient is limited to half of the whole region. This condition can affect either on one or both of the eyes and patients have reported difficulties carrying out their daily activities such as navigating, using mobile devices and reading.

In recent years, the advancement of Virtual Reality (VR) technology have introduced head-mountable devices (HMD) or simply called 'headsets' that offers capabilities such as live camera feed and eye tracking. These capabilities offers novel opportunities to provide an accessible solution for hemianopia patients to increase their visual field and aid with their daily activities.

1.2 Progress

- Language and platform chosen: project will be using Unity with C# as its scripting language.

- Standardization of Unity version has been decided at version 2022.3.40f with other student that is working for the visual testing module.

- Initialised shared Gitlab repository for easy integration of the two modules.

- Literature review conducted on hemianopia, possible recovery and the state-of-art of using VR in ophthalmology.

- Entity-relation diagram of the system designed.

- Basic interface has been made to navigate into the two modules.

- Previous version of the remapping module has been explored and tested.

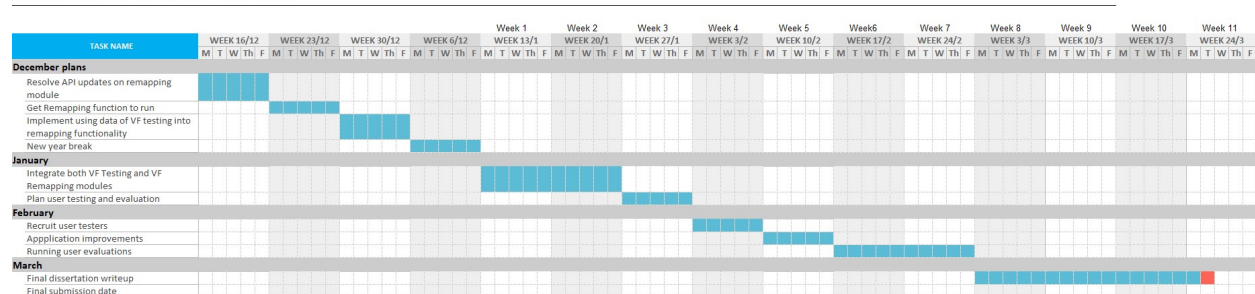## 1.3 Problems and risks

1.3.1 Problems

- Complexity of the problem has delayed the formulation of design works for the system.

- Multiple coinciding deadlines of coursework taken in Semester 1 resulted in reduced time contributing to the project - this is resolved by next semester as the critical courses have been taken.

- Keys to access supervisor's office for dedicated PCs and VR headsets to work on has not yet been obtained.

1.3.2 Risks

- Not getting timely access to dedicated workstations in supervisor's office. **Mitigation:** Request the keys to the room as soon as possible

- Uncertainty on choosing the evaluation methods to evaluate the success of the project. **Mitigation:** Review researched literature materials to gain insights how previous attempts were evaluated.

1.4 Plan

PROJECT PLAN GANTT CHART

TASK NAME	WEEK 16/12	WEEK 23/12	WEEK 30/12	WEEK 6/12	Week 1 WEEK 13/1	Week 2 WEEK 20/1	Week 3 WEEK 27/1	Week 4 WEEK 3/2	Week 5 WEEK 10/2	Week6 WEEK 17/2	Week 7 WEEK 24/2	Week 8 WEEK 3/3	Week 9 WEEK 10/3	Week 10 WEEK 17/3	Week 11 WEEK 24/3
December plans															
Resolve API updates on remapping module	███														
Get Remapping function to run		███													
Implement using data of VF testing into remapping functionality			███												
New year break				███											
January															
Integrate both VF Testing and VF Remapping modules					███	███									
Plan user testing and evaluation							███								
February															
Recruit user testers								███							
Appplication improvements									███						
Running user evaluations										███	███				
March															
Final dissertation writeup												███	███	███	█
Final submission date															

1.4.1 December plans

- Week starting **16 December** - update APIs in previous implementations.

- Week starting **23 December** - Test remapping function to run nicely. Think about how to conduct user testing.

- Week starting **30 Dec** - Integrating data of VF testing into the remapping module and performing the remap based on the data.

1.4.2 Semester 2

- **Week 1-2** - Integrate both VF Testing and VF Remapping modules into one application. **Deliverables:** A complete application that can run both modules.

- **Week 3** - Plan user testing and evaluation methods.. **Deliverables:** Detailed planned experiments complete with information sheet and plans for analysis.

- **Week 4** - Recruit user testers. **Deliverables:** Confirmed list of 10 testers.

- **Week 5** - Application improvements. **Deliverables:** Polishing final version of application, testing every functionality works and repository follows the correct structure and well-documented.

- **Week 6-7** - User evaluation commences. **Deliverables:** Qualitative data from the testing gathered from the list of testers.

- **Week 8-10** - Final dissertation writeup. **Deliverables:** Draft dissertation to be submitted on Week 9 before submission in Week 11.

- **Week 11** - Final draft submission on 25th March.

1.5 Ethics and data

This project will involve tests with human users. These will be user studies using VR headsets, and require no personally identifiable information to be captured. I have verified that the experiments I plan to do comply with the Ethics Checklist.