Using Virtual Reality to determine and visualise peripheral vision impairments in Hemianopia Patients

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Proposal

Motivation

Perimetry testing often requires visiting an opticians or medical practice where suitable, expensive equipment is available. Virtual reality (VR) could offer the opportunity of an affordable and mobile-way of measuring a user's perimetry. Perimetry testing in VR will create an opportunity for the instantaneous display of any peripheral vision impairments in a fashion that allows for an easy interpretation of results.

Aims

The aim of this project is to develop a virtual reality environment that allows for an accurate measurement of a user's peripheral vision. The FOV of the headset should be scaled to allow for the results of the test to be overlayed on the display from the two forward-facing cameras inbuilt in the headset.

Progress

- Game Engine chosen: project will be built using Unity Game Engine (v2019)
- Packages chosen for VR headset integration as well as passthrough: Using SteamVR (OpenVR) plugin to connect unity environment to headset display, SRWorks used for passthrough (HTC SDK). Specific version to allow for compatibility
- Main menu created with interactable in-scene (within game environment) UI
- Previously mentioned SteamVR plugin allowed for bindings to be created between VR controllers and the environment
- Background papers and other resources researched, to be used later in the background section of dissertation
- 3 scenes within environment, Main menu, testing and display. Navigation between main menu and display setup, with functionality for other transitions in place.

Problems and risks

Problems

- Compatibility between different packages and Unity Engine. Took a lot of research to find a suitable combination of packages and their correct versions.
- Main menu the other two scenes were created so I could upon them separately. Scene transition was complete but I installed a package (Vive Wave) to access passthrough but it destroyed my scenes by overwriting my bindings, camera rig ("the player") and various other VR aspects… Then I realized the packages I was using would not be compatible and had to start again from scratch.
- Office and Computer access has been limited due to a large backlog of requests to the administrative staff. At least three weeks of no office access and hence no ability to run my program in VR.

Risks

- Compatibility issue later on. **Mitigation:** regular back-up using GitHub incase imported package causes issues
- Not sure how to assess and evaluate the success of this project. **Mitigation:** research into similar projects in field, and ask for guidance from supervisor
- Work load potentially unachievable. **Mitigation:** Hopefully not the case, but if the workload is too substantial, will focus on a successful automated perimetry test using VR headset. Overlay of results may become further work

Plan

- Dec 15th – Jan 5th: Perimetry Test & Passthrough
    - Passthrough displayed on VR headset (no overlay of results), Accurate perimetry test with results stored
- Jan 5th – Jan 15th: Passthrough overlay
    - Results of AP test should be overlayed on a scaled FOV of VR passthrough (calculated from users results)
- Jan 15th- Jan 31st: Refactor / Catch-up
    - Ideally any uncomplete work will be finished in this period. Any work that needs improved or optimised is done so.
- Feb 1st – Feb 14th: Experiments & Evaluation
    - Qualitative measurements from participants on the usability of the overlay. Quantitative analysis of the accuracy of results of AP test.

- Feb 15th – Mar 8th: Formatting Results & Dissertation First Draft
    - First draft of dissertation, submitted to supervisor for feedback 2 weeks before deadline.
- Mar 9th – Mar 22nd: Final Stretch
    - Project should have been completed fully well-before now. Focusing purely on writing and refactoring the dissertation.