Project Deliverable D: Conceptual Design GNG1103 – Engineering

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Section B4, Group B6

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Abstract

This report is a conceptual design for the final project in GNG 1103. For the project, the OCULUS SDK will be used to develop the program. The VR system will include a user friendly interface that allows patients to easily swap videos, there will be a program that can play 180 degrees stereoscope footage, a headset program that can be used by client and patient. There will be an option for subtitles, age friendly menu options and positioning prompts. It will include a bilingual interface and rewind, pause, play and forward option for the comfort of the user. Accessibility and customization of the program by family/general public is important for the project. Three designs will be discussed in this report. The main purpose of the project is to create a program that is configurable so that the client can make VR simulations in the medical field.

Introduction

The Ottawa Hospital is looking to provide a VR system for cancer patients. The objective of the project is to create a safe and informative environment for patients for their upcoming medical procedure. The hospital will upload videos to an interface to allow patients to experience their upcoming medical procedure. The objective of the project is to build a configurable program which is configurable by the client. The client will be able to build simulations to simulate the experiences of the patient's treatments. The final product will reduces anxiety and fear of the actual treatment while ensuring the patient has knowledge about their treatment.

Related Work

For the project, the OCULUS SDK and HTC VIVE will be used. These two headsets are virtual reality (VR) headsets. VR headsets are used to create a "virtual world" where the user is able to view a 360 degree rotatable canvas that is responsive to movements. The project will be developed through UNITY. Unity is a game engine that is used to create VR games with C++. The final program will run through the games launcher STEAM VR.

Project Designs

The following designs are all possible implementations of the project. For all of the designs, there will be no cost associated with them, this is because the software used is free and the only thing that needs to be done is to manually implement the code. The only issue that can be encountered in the following designs is the difficulty in programming, which is why a good understanding of C++ and unity will be required to implement the following designs.

Design 1

The first project design will be designed with the idea of creating fluid functionality for both the patient user and doctor user. Design 1 will focus on two major parts: the build and functionality of design on the patient's end, and the build and functionality on the doctor's end. The user will be able to select any option through the use of the VR controller, using either the motion sensor or specifically assigned buttons.

For the patient, the objective is to make a simple and fluid layout that is easy to use regardless of their experience with technology. On the patient's end (using the VR headset) there will be only three pages: the main menu; the simulation screen; and the simulation selection screen. The main menu is designed with only three options to select while also showing the currently selected simulation. These options include Select simulation, play simulation and exit. Exit will be used to exit the application. The Select simulation option will bring the user to a page with a grid of all the completed simulations. When the user selects the simulation the menu will update the currently selected simulation. The play simulation option on the main menu will start the simulation. When the simulation is being played there will be

many functionalities the user can use these include: stop; pause/play; mute/unmute; increase/decrease volume; turn subtitles on/off; turn sound cues on/off. These specific functionalities will be either mapped to buttons, or show up when the user brings up the functions with a predetermined menu button.

For the Doctor, the layout and functionality will be relatively the same as when the patient uses the program with the VR headset. From the doctor's end (using the computer) there will be only four pages: the main menu; the simulation screen; the simulation selection screen; and the "create a simulation" screen. The main menu is designed the same as the main menu from the patient's point of view with the same functionality for every option and their own respective screens. The only difference between the main menu is the "create a simulation" option. The "create a simulation" screen will allow the user to select a 180 degree video file from their computer and add rotations, sound cues, and subtitles. The following image shows the main menu and it's options to select on the client's side of the program.

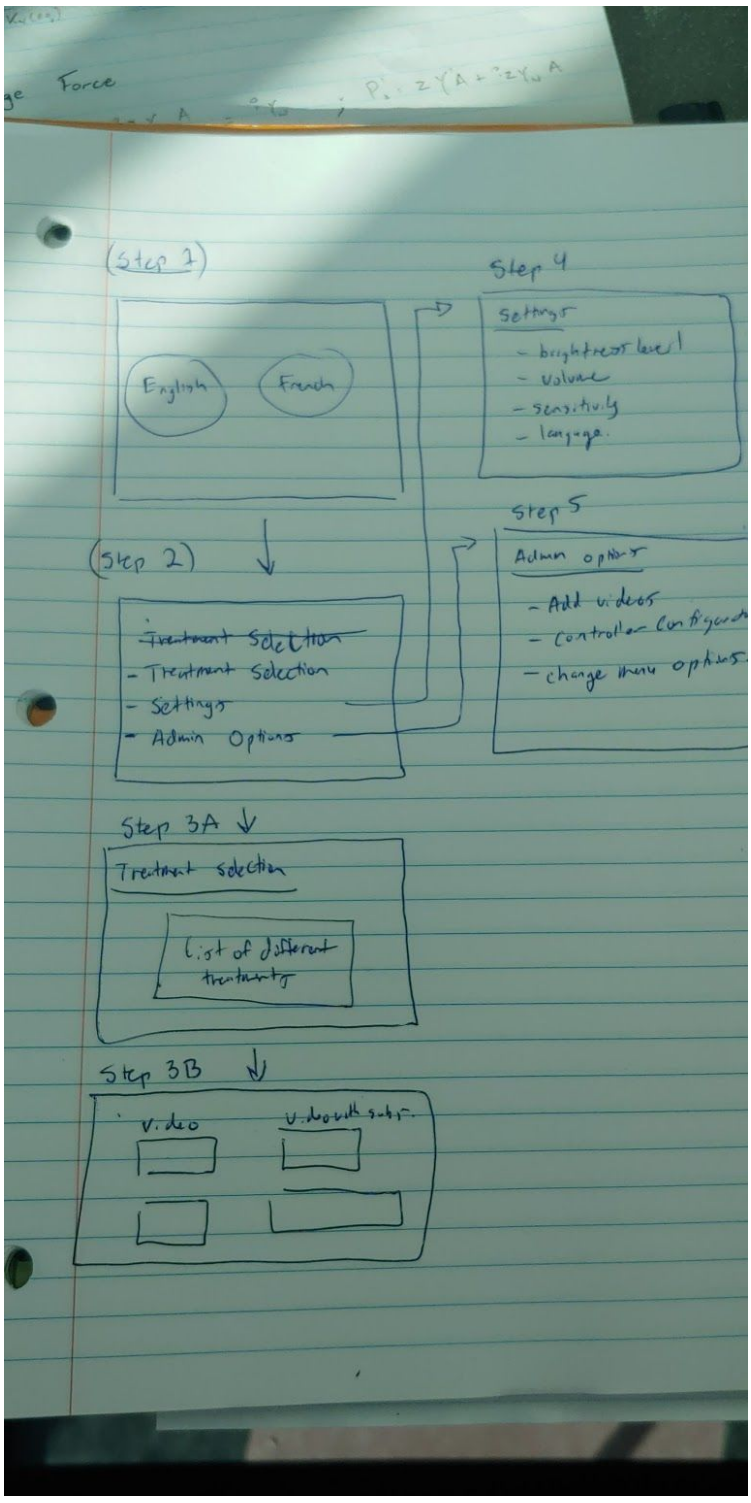
Design 2

The main focus of the design is to create a moldable and fluid system that can be used efficiently by both the practitioner and patient. This will be demonstrated through a menu design which will take into account all design criteria and offer the client with an interface that can be easily built upon and modified to best suit the patient and practitioner needs.

The interface will start by prompting the user to select their language as english or french(step 1). All future prompts will be stated in the chosen language. The program will then move the user to an option screen allowing them to choose between selecting treatment videos, accessing setting options, and accessing admin option (Step 2). If treatment selection is chosen, the user is sent to a screen where they can select from a variety of different treatments (step 3A). Once they have chosen one, they will be sent to a page where they can select the video they would like to view, as well as the version of video (subtitles or no subtitles)(step 3B). If the settings option is chosen, general setting options will be displayed such as brightness level and headset sensitivity (step 4). If admin option are chosen, the user is sent to a screen where they can develop the program with options like editing the menu, changing controller configuration, or adding new videos.

This menu design hopes to make the process of using this system as straightforward as possible. Controller options will also be used to make the program as easy to use as possible. Controllers will be programmed to stop, start and forward videos when video is playing. When video is not playing controllers will be used for selecting options.

The menu design breakdown can be seen on the next page.


Force
(Step 1)
English
French
Step 4
Settings
- brightness level
- volume
- sensitivity
- language
Step 5
Admin options
- Add videos
- change menu options
(Step 2)
~~Treatment Selection~~
- Treatment Selection
- Settings
- Admin Options
Step 3A
Treatment selection
List of different treatments
Step 3B
Video

Design 3

The main focus for this design is to create a simplistic “menu” design that is mainly for patient use but is easily compatible with doctors needs. This requires the doctors or hospital staff to have the ability to easily change the program such that they can effortlessly switch out or add treatments and videos. However, the priority of this design is to ensure simplicity and efficiency for the patient’s use.

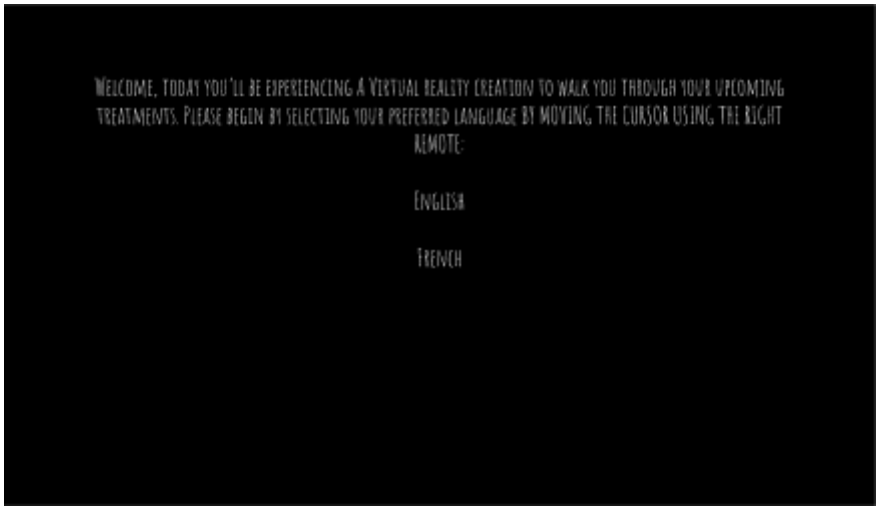
The first screen acts as a welcome screen that introduces the patient to how the program will work. It is meant to act as an introduction screen to the patient as not every patient may be familiar with the interface or how VR works due to the range in ages and differences in experiences in patients.

The second screen asks the patient which treatment video they would like to experience. This screen will be made such that the patient can easily pick a simulation to experience without any complications.

The third screen will act as a loading screen for the patient and give them basic information about their treatment. This screen is meant to help with the patients anxiety and make the transition into the treatment simulation as smooth as possible.

The last possible screen does not occur in chronological order. It is the settings screen which allows the patient to change the volume and brightness of their simulation. This screen may be accessed at any point past the initial language screen by the patient. In the case that the client would like to add to the video, they can do so in this screen by clicking on to the option. This option will be password protected such that it only works for the hospital but does not interfere with the patients experience, however can be easily accessed by staff.

The simplicity of the design is meant to allow anyone to easily use the program so that the application can be effortlessly shared between the patient and their family and so that it can act more as an accessible educational tool. A mock design in basic drawings is included below.


Welcome, today you'll be experiencing A Virtual reality creation to walk you through your upcoming treatments. Please begin by selecting your preferred language by moving the cursor using the right remote:
English
French


Please select a Treatment video:
Breast Screening
CT scan
HET
Prostate


Video will begin shortly. Feel free to look around and familiarize yourself with the surroundings. However, when the video for the treatment begins please follow the instructions of the doctor and remain as still as possible.

Conclusions and Recommendations

Considering our top priority is creating a fully functional, modular program, ideas to present the program generally follow a similar outline. Patient is directed to select a language, then select the treatment you will receive, and then the video corresponding to a specific part of the treatment. This order of operations can be agreed upon but the part that is in contention is how to make the menu in a way that will relax the patient so they do not panic before the upcoming treatment. In order to create that relaxing experience we chose to use the outlined method of selecting the treatments. Another reason for our choice is we thought to take into account that many patients may not be experienced with technology since some may be on the older side. As we want the program to be inclusive for all patients, it was important for us to make a simple design. All that said, we're choosing to continue the development of the first concept. As a group we decided that it would be the least convoluted, least domineering, and most relaxing options for our estimated wide range of patients. While presenting the idea to the client, it was received well but we hope to make it more than satisfactory for them.

References

GNG 1103 Project Guidelines