Bi-Weekly Report 2

Date: *30/10/2015*
Project: *ARUK-VRSim*
Project Title: *Video and sensor display on the Google Cardboard*
(Previously: Alzheimer's Experience using the Google Cardboard)
Team Members:
Garrett May (Team Leader)
Hekla Helgadóttir

Overview

Our group has worked very well in the past two weeks, we have successfully managed to work as a team with equal contribution to the project. We have also successfully split the tasks between us, allowing everyone to work on a specific task to contribute to the research. We have made good progress, as we have started creating the app, largely decided on hardware and started researching and trying different types of software to work with. So far, the only problem we have encountered is the task of streaming high quality video from the drone to the base station, which has been resolved by the client accepting lower quality video and not requiring the video to be live.

Meetings

Date: *22/10/2015*
Attendees: *Garrett May*
Hekla Helgadottir
Carla Hyenne
Daniel Eldar
Aron Monszpart

We created a workflow of the drone system, including all parts of the design in a diagram. We discussed different ways of displaying data information on the Google Cardboard, including having the live video feed as a small side view of a larger graph of data, and discussed how to switch between graphs representing various data. We also discussed what needed to be done in the next week and allocated tasks as follows:

Hekla:	Research drone parts and sensors
Garrett:	Research OpenGL and Views to use for creating the application
Carla:	Research OpenCV and start making a website for the project
Daniel:	Research servers and communication between the drone and base station

Date: *29/10/2015*
Attendees: *Garrett May*
Hekla Helgadottir
Carla Hyenne
Daniel Eldar
Aron Monszpart
Usama Inam

We met at client's site to discuss the progress of the project and the expectations for our deliverables. We discussed the live video feed, as we felt it might be difficult to send back a large video file wirelessly. The client confirmed that live video feature was not necessary at this stage, but we should rather focus on capturing data, the video might be delayed or even entirely pre-recorded and then uploaded afterwards. We discussed sensors, and the basic sensors we want to use are: GPS, thermometer, barometer, accelerometer and gas sensor. Furthermore we discussed using a flight controller and a telemetry system to send the data from the drone to our base station. The hardware could be fitted on the already purchased Phantom drone for now but we would have the option to use it as a part of a future custom built drone. Another feature discussed was the use of a rotation gimble for the drone, allowing users to turn the camera and changing the view of a camera on the drone, using head movements with the Google Cardboard. This would however be a part of a later phase in the project. Lastly we discussed a few options of the user interface, including overlaying a terrain with multiple sensor reads or for the user to stand in the middle of a virtual map with relevant data situated all around the user.

<u>Completed Tasks and Project Projection</u>

In the last two weeks, we have come up with ideas for the user interface of the Cardboard app, we have largely decided on which hardware to use, we have made progress on communication between the drone and the base station and we have started creating the website for the project.
We estimate the project to be on time, as we have made a big progress since last week.

<u>Problems to be resolved</u>

At this point, there are no obvious problems that we need to resolve.

Workload - Past two weeks

Garrett:

I began working on creating a basic app for the Google Cardboard. The app would be a base, and have no real content, so that we could build up from there.

The Google Cardboard provides a sample demo, called TreasureHunt, which counts the number of times you find a cube. The cube is rotated and placed in a different position each time it is discovered. The application was coded in OpenGL ES, a variation of OpenGL, which is a graphics library. Considering that our app would be similar in terms of complexity to the TreasureHunt demo, I decided that basing our application of it would be a cogent idea.

However, because our app would be quite basic, using Android's views, such as ImageView, might have been a good idea. Looking through the demo app, I discovered that the application was a combination of views and OpenGL; in short, there were two views (one for each eye), and OpenGL would make function calls to draw a shape on both parts.

Having met up with our client, it was recommended to use OpenGL, as OpenGL would be more portable as well as useful if, later on, we were to make the application more complex, such as making it in 3D. However, we make extend the idea into views in the future. After several errors, I managed to successfully create a base app, which displays a white screen, using the Cardboard SDK and in a new project.

Hekla:

I have been researching hardware options for the project, looking into how to reduce cost and time spent on setting up the hardware, but bearing in mind the quality of sensors. I also had in mind the option of integrating the hardware we will use in a custom built drone later on.

I believe we should purchase a flight controller, which is what interprets the data from the sensors before it's sent back to the base station (or interprets data from a remote control and sends instructions to the drone's motors to make it fly, which we would use if we would later built a drone). The one that would suit our needs is medium priced, called a PixHawk and has a 32-bit ARM Cortex M4 core processor. We also need a transmitter to transmit the data from the sensors to the base station, most drones send and receive their data via a telemetry, which is what I suggest we use. The telemetry uses radio waves to transmit the data back to a telemetry receiver, which can be plugged into the base station (which we are assuming will be a laptop at this point) via USB. We will also need sensors, I found temperature sensors, light and gas sensors compatible with the Pixhawk, but the Pixhawk already has accelerometer, barometer and a magnetometer.

I also researched live video streaming, but found out it would be nearly impossible to accomplish because of the quality of the video we aimed to send (to use a GoPro). Alternative solutions included sending lower resolution video feed to keep it

live. The client later confirmed that live video streaming was not a high priority at this point.

I also looked into various heat cameras, as a heat camera would be able to determine the location and possibly the movement of large crowds. The heat camera will need it's own transmitter and receiver.

Finally I briefly looked into using a rotation device for a camera (a gimble) on the drone, to either capture data in a broader range, or to allow the user to control the camera by turning the head using our Google Cardboard application.

Workload - Next two weeks

Garrett:

I will need to film an area for a video (most likely nearby Malet Place Engineering Building (MPEB)) in order to provide the rest of the team an example video for testing. Videoing the street outside MPEB, both from the ground and from a floor in the building, may be a possibility, as this provides different perspectives that can be used in the development and testing phases.

With the code I have now, I should upload it to GitHub, so that the team can see what work has been done. I also should work on rendering a 3D object; and at some point, a section of a sphere.

Hekla:

In the next two weeks I will finalise our shopping list for hardware for the drone, I will then send the list for confirmation to our project lead, Aron Monszpart, and the project organiser, Dr. Dean Mohamedally before placing an order for the parts.

I will then start researching how to integrate the flight controller with the sensors and whether we need an Arduino board or a Raspberry Pi to connect with the flight controller. I will also research whether we can send live data from the sensors to the base station, and test it if the parts arrive in time.

Garrett and Hekla:

Both of us will help Team 2 finalising the project's website and upload all relevant documentation we have so far.