Bi-Weekly Report

28 November 2014

Team Information

This document contains a summary of all that has been achieved over the last two weeks by team 19 on the CTSNet Robotics project as a part of the module Systems Engineering I of the University College London Computer Science course. Team 19 is formed of three students, Edward Collins (team leader), Kirthi Muralikrishnan (website and documentation lead) and Tom Page (research and programming lead).

Client Information

Team 19 has three clients:

- Dr Shabnam Parkar, a paediatric surgeon at Great Ormond Street Hospital.
- Dr Joel Dunning, cardiothoracic surgeon at James Cook University Hospital.
- Dr Lourdes Agapito, computer graphics and vision expert at UCL and primary supervisor.

Summary of Progress

The last two weeks have revolved around finalising User Interface designs and beginning research into programming the Kinect 2.0 sensor. In addition the team website has been created which will contain all project related information, including a video summary of the project by the 12 December 2014.

The User Interface was designed over a period of three weeks. This began with each team member designing a separate user interface design for the system. The team then met to compare the three different UI designs, and subsequently combined them to create a final design. This design was then assessed by both the team and teaching assistants to identify and rectify issues.

Furthermore, the team has identified all targets that need to be met by 12 December 2014, which includes creation of a prototype of the system using the Kinect 2.0. This prototype is concerned with the basic functionality that underlies the entire project - creating a basic depth sensing program. Ideally, this program would be able to tell the user how far objects in the camera's view are in numeric form. This should be able to identify foreground from background, similar to how a surgeon's tool would be identified in the body. In order to create this program, research has been conducted into the Kinect 2.0 sensor by the team over the previous two weeks.

Summary of Team Meetings

Date	Topics Discussed	Time
18 November 2014	Final User Interface design and work assignment.	1 hour
21 November 2014	Lab session discussing programming Kinect with PhD Student Aron Monszpart.	2 hours
28 November 2014	Discussion of research, work assignment and first attempts at programming prototype.	2 hours

Difficulties Encountered

In order to write programs that make use of the Kinect 2.0 sensor, the programmer must be using the Windows 8 operating system. Two team members own Macintosh laptops and are having difficulty in getting the Kinect sensors to run on their laptops. It is not possible to use software such as Parallels Desktop or VMWare to run the Kinect sensor on a

Mac, as they do not meet the graphics requirements of the sensor. The last option left to us is to use Bootcamp which will completely install Windows rather than running it as a virtual machine.

Progress Target

There are now two weeks left until 12 December 2014, which is the end of term and the due date for work related to the first half of Systems Engineering. By then the team has several goals to achieve.

- The first of these is to get the prototype working that will be able to look at an object and inform the user how far away it is in numeric form. If this is achieved then the team will work on identifying foreground from background.
- The second goal is to have all documentation relating to work during the first term on our team website. This includes User Interface designs, project descriptions, pictures of the re-wiring process of the Kinect, research sources and so on.
- Finally the team needs to create a 10 minute video describing the project which will be uploaded to YouTube and then referenced on the team website.

Individual Description of Tasks

Ed Collins

The past two weeks have been focused on User Interface design and team management. I combined the team's three separate designs into a single document that represented our final UI design. This combined three different concepts of depth feedback: audio, visual and haptic. Our ideal system would use a combination of these three feedback methods, all using depth information obtained from a camera - the Kinect camera as a prototype and hopefully from a specialised endoscopic camera after this.

In addition I created a work assignment document in order to keep the team on track with the remaining work so that the this first part of the project is fully completed by Friday 12 December. Finally I have conducted some preliminary research into the Kinect, focusing on using Microsoft Visual Studio and learning the C# programming language.

Tom Page

Over the last two weeks I have begun to create programs for the Kinect. I first began by playing around and reading the code of some of the example projects which come with the Kinect SDK. This inspired be to be able to write three programs, which I hope to be able to link together and create the basis of our prototype. The first program was using the Kinect's infrared sensor to create a depth image, with the further away the object in the image, the lighter the colour. This program was a success. The next program was not involving the Kinect, but involved simple computer graphic manipulation. This program took in a bitmap image and removed any red from the image and outputted a greyscale image of the non-red objects. This will relate to the project as it may be necessary to distinguish between the body and the instrument, therefore removing red would be the simplest way to do this. The final program created a monochrome image from the kinect's camera. This will be adapted to link the first two programs together. The aim for the next week is to adapt the second and third program so that the red can be removed from the image taken by the Kinect's camera. The next task after that is to then incorporate this with the depth map and find the closest distance between the foreground and the background.

Kirthi Muralikrishnan

I have worked on creating the website for our project. This would be the website that would be presented at the end of term. Basic HTML and CSS was used to construct the website. I used a new application called Adobe Dreamweaver that helped me see the changes that I had made to my website dynamically. We also met up as a team and decided on the structure of the website. We also made our individual prototypes, which was later combined to form our project prototype by Ed. The next step for me would be to complete the website and get it as efficient and simple to use as possible. Later on, I would like to use the Kinect and help our team come up with the prototype by the end of this term. Tom has managed to work on a part of the group prototype that would help us move forward with creating the prototype.