UCL Peach Group 39: Reality
Bi-weekly Report #8

Timur Kuzhagaliyev
Fraser Savage
Laura Foody

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1 Overview of the last 2 weeks

Over the last 2 weeks we held several meetings, had a chance to present our project to multiple renal surgeons and have also made contact with the first year team. You can see the details below.

- We had a chance to present our project on a renal surgeon meeting. Generally, our idea was met with enthusiasm but it was obvious that the learning curve associated with using our application is quite steep at the moment and feedback we got clearly indicated that we should simplify the interface and add more descriptive annotations to make using our application more straightforward. Due to some technical difficulties we encountered we were not able to ask for extensive feedback, but having our actual end users try our system was very beneficial for our project in general.

- Lorenz Berger has provided us with a Docker container of a simplified version of the neural network he's developing, so now we can begin integrating it into our system. At the moment, the capabilities of the simplified neural network are quite limited but they should suffice for a proof of concept implementation of our application. We've also had a chance to meet Eoin Hyde, Lorenz's colleague, who kindly provided us with some scripts for DICOM file parsing and described how they are envisioning the webapp. We've discussed the parts we could reuse and potential collaboration with their team in the future.

- During the last 2 weeks we've also made contact with Dr. Shabnam Parkar about her opinion on collaboration between our teams. She confirmed that she thinks it is indeed a good idea and now we're discussing intellectual property ownership. Once this is out of the way, we can begin full-fledged collaboration. To give the first year team a chance to prepare for the project, we've been relaying some of the requirements and mockups for our webapp, as well as information about the technology stack we're using.

- Although, as the feedback from renal surgeon meeting has shown, we still have to make some improvements to user experience in our HoloLens application, we've already made some decent progress by adding features like progress bars, button tooltips and improved loading times. We still have some issues with the visuals, but there are some workarounds we have in mind so they should be fixed relatively soon.

- We're steadily adding more endpoints to our API server, exposing more operations available to the webapp. We've also setup a complete continuous integration pipeline with automatic deployment and unit testing, so the project will be easier to maintain for the next team of developers working on it.

- Finally, we've been working on producing more specifications for our application. Such specifications has already proved useful as we could give them to the first year team to speed up their development process and and make it easier to understand the logic behind some of the decisions we made.

2 Tasks completed

- Participated in a renal surgeon meeting, received useful feedback and suggestion from actual end users of our system

- Made contact with Dr. Parkar to discuss collaboration and received her initial agreement

- Setup a complete continuous integration pipeline for the API server

- Expanded the test suite for the API server and implemented API endpoints for user operations

- Received source code for the neural network and DICOM parser from Lorenz Berger and his colleagues

- Met with the first year team, provided them with the initial requirements for the webapp as well as existing mockups

- Made improvements to user experience and visuals in the HoloLens application

- Coordinated further plan of action with the first year team

- Expanded existing prototype of the webapp

The last couple of weeks were reasonably slow due to the amount of work we had to complete for other modules, but now we're back on track and should be able to meet our goals by the project deadline.

3 Problems encountered

- Apparently DICOM files can often be populated by data which is not only irrelevant to 3D model generation, but can actually compromise the accuracy of the model produced by the neural network we got from Lorenz. If possible, we should think of a way to filter out such "noise" from DICOM files and only plug relevant data into the neural network.

- From the renal surgeon meeting we've attended it became clear that our application is extremely ambiguous for users who have not had any experience with HoloLens before, which we will try to remedy by changing the way some parts of our application are presented, as well as producing short video tutorials on basic usage of the application.

- In additions to problems we've experiencing with making models look photorealistic, we now have some issues with accurate transparency representation due to some basic shader limitations. At the moment, veins and arteries can sometimes be rendered on top of the kidney, which is not desirable and can confuse the user by providing false perspective. We're trying to solve this issue by coming up with our own shaders and by implementing various other solutions.

4 Plans for the next 2 weeks

- Continue work on specifications for various parts of the application, including those that will be useful for the first year team

- Begin collaborating closely with the first year team to produce a feature-complete webapp prototype

- Improve user interface and hence user experience in the HoloLens application using the feedback from renal surgeon meeting

- Produce an Medium article about the recent changes we've made to our application and continue work on the paper about the project

- Continue implementing holographic patient case API endpoints to cater for the needs of the webapp

- Integrate neural networks and scripts provided by Lorenz's team into our API server

5 Individual reports

5.1 Timur Kuzhagaliyev

I've held a several meetings in the last 2 weeks, including those with my teammates, the first year team and Lorenz's colleagues. I've begun relaying webapp requirements and mockups to the first year team so they can make a start on the webapp. I've also been supervising their progress and clarifying aspects of our application as well as general web design process to them. Additionally, I met with Eoin Hyde, Lorenz's colleague, with whom we discussed how we could potentially reuse each other's code. He provided our team with several useful scripts he uses for extraction of useful data from DICOM files which we're going to be integrating into our application. Finally, I've met with my teammates so we could discuss further plan of action, our progress, and feedback we got from the renal surgeon meeting. I had some questions prepared for that but unfortunately due to technical difficulties we overrun by a fair bit and I didn't have the chance to ask them.

I've also been doing more work related to the HoloLens application, by implementing various small features to improve user experience. Some of these features are tooltips that now appear above buttons to make it easier for users to understand the function of each button, progress bars that show how many CT scan slices the user has scrolled through (also used in other modes, e.g. scaling or adjusting opacity), better animations and slightly improved performance. I'm still working on various visual improvements, and I've made contact with Mark Knowles-Lee from Fracture Games to discuss some of the problem we're running into with shaders, which I'll try to fix next.

5.2 Fraser Savage

This sprint has seen the test suite grow substantially, along with the addition of a number of API endpoints relating to User operations. Sprint tasks relating to the Holographic patient case have not been accomplished, with attention instead redirected to implementing and documenting User operation endpoints. The endpoints in place are: User creation, login, deletion and retrieval. There are currently 31 tests which are run against this general scope in the testing branch (which is deployed on the staging server), with further tests in the in-development feature branches.

The core listed sprint goal which has been achieved is continuous deployment of the API to the staging server. Currently the continuous deployment solution waits to receive a webhook from the GitLab CI runner, only redeploying from a successful test stage of the testing branch. Further into development the automation will deploy from master branch tests completing, but it does not yet contain a featured prototype. The testing branch is being deployed so that the other team members are able to work with the API.

Currently in-progress tasks include data-validation for User API operations and Holographic Patient Case operations. Despite claiming that listing of Holographic Patient Cases would be implemented this sprint, it would have taken longer to implement usable operation for the patient cases than for the User representation and so I determined that it would be better to provide usable operations for the other team members.

5.3 Laura Foody

These last two weeks have been spent adding to the web app. The login and sign-up forms now accept tokens however I have yet to import Fraser's APIs so the login functionality is not fully implemented. I used AJAX requests to request the JWTs however the request is not yet made to the right place so the tokens currenlty have null value. Whilst I am figuring that out I started to build further pages and to test them I simply render them on their own in the app.js page. I have built a "My-Account" page which has containers where the models and DICOM images that the user had uploaded would be displayed. I have also started building the homepage which would only be viewable when the user has logged in.