Team Hololens Health Showcase

Chase Mulder

Lucas Seeterlin

Liam Mazure

Mohammad Selah

Supervised by: Hunter Bridwell

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Overview

The goal of this project is to create an educational app on the hololens that will show different overlays like internal organs, muscles, and skeleton and show descriptions of each. The app for the hololens will be built in Unity with C# scripting. The 3D Models of the internal organs will be constructed in Blender. The end result will be a working demo for the GVSU innovation showcase where users can put on the hololens and see the internal organs of their friends overlaid on top of them in mixed reality.

Languages

C# will be the scripting language used in the program Unity. The C# scripts will be edited in the program Visual Studio Code. Blender will create the 3D models. The Unity assets store will be used for downloading already created assets and models. For testing purposes, the GVSU Atomic Object Showcase has a hololens that can be used to test. Testing the software at home looks slightly different without hololens access. Unity allows for the use of a computer's camera to project 2D images allowing for at home testing.

Libraries, SDKs, and APIs:

Unity

We will be using Unity as the main platform for our project. Unity is a great software when it comes to working with 3D models, as well as augmented reality.

Unity Assets Store

Models and UI elements that we do not create will be retrieved from the Unity Asset store, which contains free products that others have created.

Visual Studio Code

VSCode will be used to alter the C# scripts we are working with. It will also be used as a debugging tool.

Blender

We will be using Blender to create the anatomical 3D models, which will be imported into our Unity project and displayed in the Hololens.

Code Repository Organization:

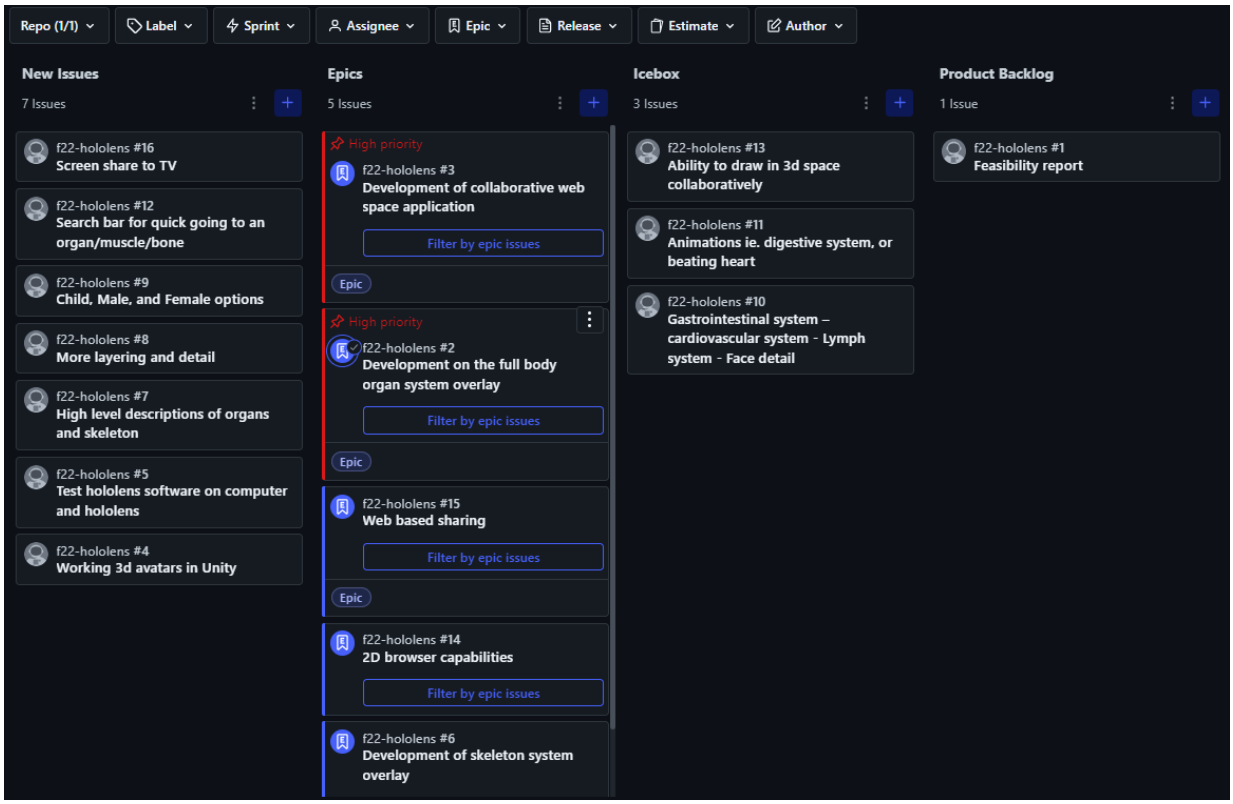
Branching

Due to our project's prior existence, the structure of the repository is also present. At the time of writing this feasibility report, we have not been granted access to the repository to view its contents and structure. However, it can be assumed that there will be a master branch that contains the most updated, functioning code. To avoid any merge issues, it is also a safe idea to create a child beta branch from master that new code changes will go into, where we can run tests to make sure that everything is working as expected before pushing the code into the master branch. Since 4 of us will be working on this project at the same time, it is best practice for each of us to create our own branch to work in, cloned from the beta branch. Finally, there will be a branch on documentation as well as a tutorial on how to access and use the project through the Hololens.

Zenhub

To stay organized and avoid stepping on any toes, our group will be using the built-in ZenHub plugin. More specifically, our group will be documenting any issue that arises through the New Issues pipeline that alerts other members of the repository. If one team member has a relative idea on how to fix the issue, the work size of the issue can be measured out. In addition to documenting issues, we will be using ZenHub to keep track of completed work during each 2 week sprint. This will allow us to measure how much work is being completed during each sprint and give us the ability to predict how much work can be completed in upcoming sprints.

Zenhub Dashboard



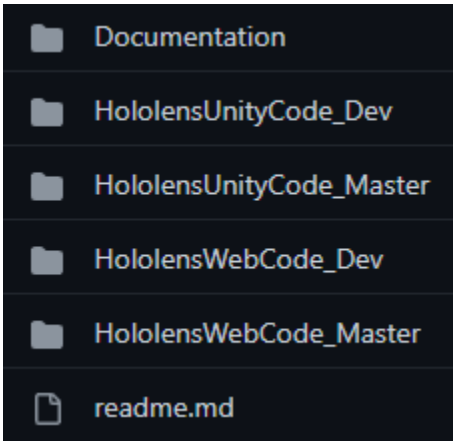
System Organization

All of the functionality of our project will be run through Unity's augmented reality environment and displayed through the eyes of the Hololens. Due to this, users will be interacting with the user interface that was previously created through Unity. Since our application will be locally contained and private on our own computers, we do not have to worry about login information. To access our application on the Hololens, a user would wear the headset and launch the application through the built-in Hololens menu. After the application has launched, the user will be greeted with the UI designed by us. This UI allows the user to change various settings and anatomy layers, serving as the main point of interaction.

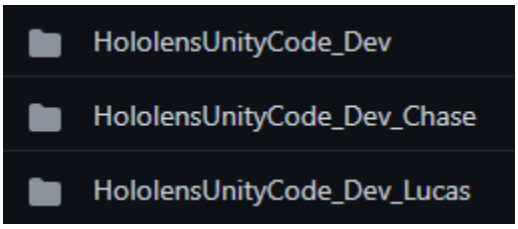
Development

Our project is split into two core parts: development of the educational application and development of the collaborative web space application. The educational application code is going to be stored in the HololensUnityCode_Master branch. The web space application is going to be stored in the HololensWebCode_Master branch. There's also a UnityCode_Dev branch and a WebCode_Dev branch. These Dev branches are where the latest developed code is going to be. Each developer will have their own sub branch in the Dev branches. Finally, there's a documentation branch which contains the outline of the project and how to run the project.

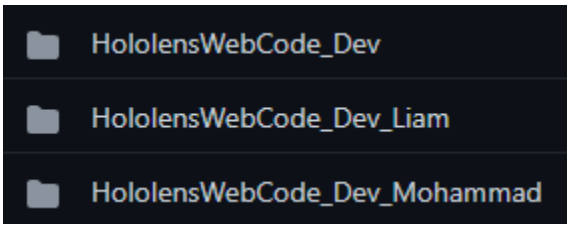
Hololens Main Directory



Unity Code Directory



Web Code Directory



Main Requirements Educational application

The first major requirement is to develop the full body organ system overlay. What's been developed already is the organ system for the chest and abdomen region. In demonstrations, someone puts on the Hololens and is able to see with anatomical accuracy in 3D space a projection of the organ system overlaid on whoever the Hololens is looking at.

The second major requirement is that everything is anatomically correct and is able to scale right to the patient. What's already been created is anatomical reference points in 3D space used to scale the 3D projection. Patients want to know where their fracture is, so it's a priority that everything is anatomically correct and is able to scale right to the patient. Anatomically correct location and size of organs will also help the patient understand their own body to help point out where the pain is coming from

The third major requirement is to add an educational aspect to the application. Our group envisions future students using this application to learn anatomy etc. in mixed reality. The goal is to make the learning experience better than learning from a textbook. This can be achieved through adding additional features that add to the user experience.

Stretch Requirements Educational application

- Search bar for quick going to an organ/muscle/bone
- Gastrointestinal system – cardiovascular system - Lymph system - Face detail
- Animations ie. digestive system, or beating heart
- More layering and detail
- Anatomical correctness down to the millimeter
- Child, Male, and Female options
- Full body systems of the other overlays ie. bones, muscles, fat, skin…
- High level descriptions of each organ

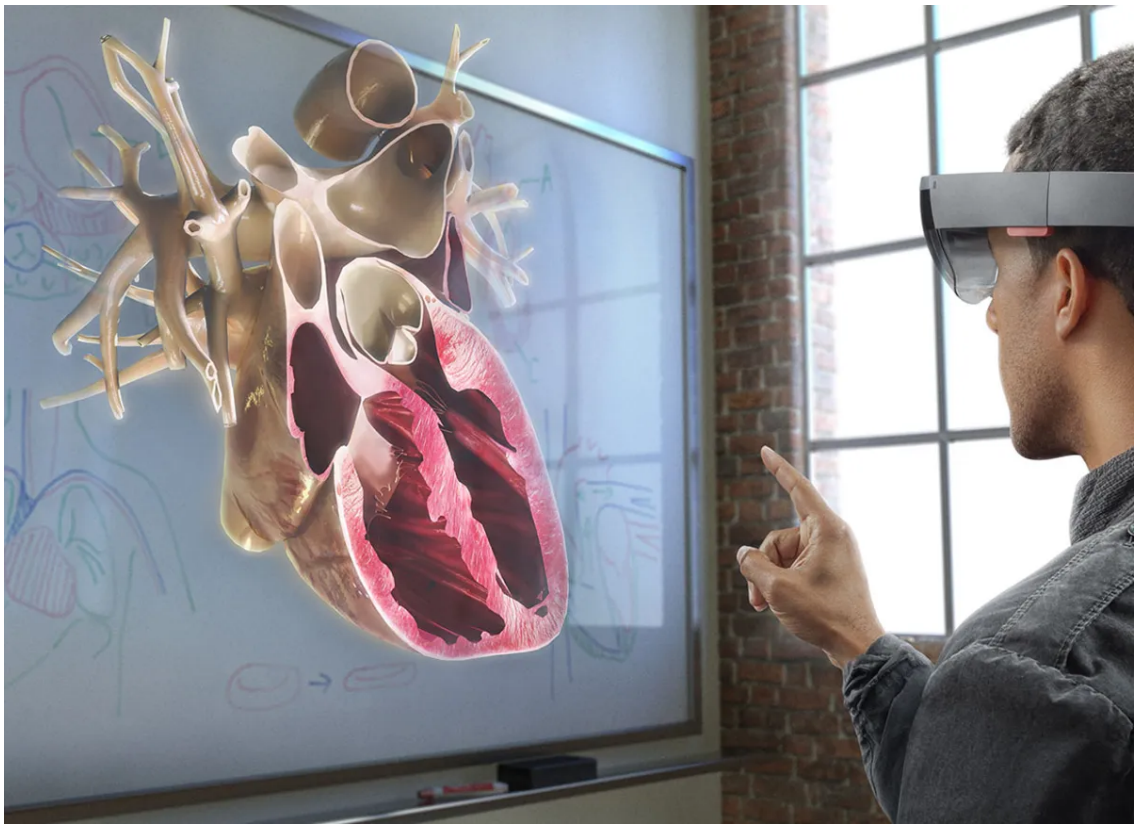
Main Requirements Web application

The first major requirement is to develop a collaborative web space where doctors can all view a patient's CT scan projected in 3D space. Our group is still waiting for files on the Hololens application. Our basic understanding of the files we're getting is it's an application for the Hololens and for a gaming computer. The gaming computer and the Hololens run the application at the same time. The Hololens gives an IP address and the gaming computer puts in the IP address. The gaming computer has to have a good graphics card because the application streams a patient's CT scan file to the Hololens. Then on the Hololens you can see the 3D CT scan image and drag a hollow box object over the 3D image to see the internal scan.

Stretch Requirements Web application

- Ability to draw in 3d space collaboratively
- Ability to pinpoint/mark areas where there are problems ie. fractures
- Screenshot ability that saves to a patient screenshot folder
- 2D browser capabilities
- Talk to others while image is superimposed on patient in 3D space
- Web based sharing
- Screen share to TV

Mock Ups



Work Policies

Our policy is to ensure open communication between teammates. We will communicate if we do not know how to do something, or ask for clarification. If there is something a teammate does not understand, there might be another teammate that does understand. There are some teammates that have worked with hololens and some teammates that have web application experience, so it will be divided and conquered. Now we will start developing the full body organ system overlay, specifically the abdomen region, afterwards we will make sure everything is anatomically correct and seized to each patient. Then we will make it for educational use. Now regarding each specific task will be discussed amongst the group, and if something is too difficult or unforeseen circumstance said teammate will have 72 hours notify the team so we can accommodate.

Testing

To test our product, we will be constantly visiting the technology showcase room located in the Grand Valley State University library. There, we can use the Hololens to test our software thoroughly. When we want to test our work at home and on the fly, Unity has the ability to test augmented reality projects through the lens of a camera. If any errors or bugs are found, they will be entered into ZenHub as a new issue and the difficulty of the fix will be weighed accordingly.

Deliverance and Milestones

Sprint 1

- Start development on the full body organ system overlay
- Start development of collaborative web space application
- Working 3d avatars in Unity
- Test hololens software on computer and hololens

Sprint 2

- Start developing skeleton system overlay
- High level descriptions of organs and skeleton
- Research and development of collaborative web space application

Sprint 3

- Development of full body system overlays
- Development of collaborative web space application

Sprint 4

- Work on potential stretch goals
- Polish user interface
- bugs

Sprint 5

- Documentation / Finishing touches

Sprint 6

- Prepare for presentation and submission