

EE/CprE/SE 492 BIWEEKLY REPORT 6

Nov 8th, 2023 – Nov 22nd, 2023

Group number: sdddec23-19

Project title: Bluetooth-Enabled Ingestible Capsule to Monitor Gut Activity

Client &/Advisor: Santosh Pandey

Team Members/Role: Chase Thompson, Cutler Thayer, Tucker Thomas, Robert Zukowski

○ Weekly Summary

Worked further on the prototype and came up with a plan to create a mock up version to connect to the UI should the prototype not work as expected. The user interface was completed and work has been started on connecting the user interface to an algorithm to analyze the photos. We discussed different methods for this that we have been working on previously and have decided to first try using the python scripts to send image data to OpenCV using file transfer. If that does not work we will explore sending the data through the UI to Amazon's Machine Learning kit or we will try using an OpenCV package for C#.

○ Past week accomplishments

- **Chase Thompson:** Finished the user interface application using C#. There are currently two active options within the application, the live-view from the endoscope which will send images to process at a rate that the user can decide and the photo selection which allows the user to simply select photos already on the harddrive to send to the Python script. The other option for connecting a bluetooth device is currently disabled as we are unable to connect to the capsule but a mock up for this functionality is being discussed for the end of the semester.
- **Robert Zukowski:** Finished assembling and testing the PCB connections. Began writing a library from scratch for the MT9M114 image sensor using arduino. After laying out the groundwork and making significant progress, it came to my attention that the parallel output being used to send pixel data is still transmitting at 96MHz despite my best efforts to not use the full multi-frame/sec options within the chosen IC. Unfortunately at this point in the semester, following this project is a dead end- to successfully interface with this image sensor, it is almost certainly required to implement an on-board FPGA, design said board to significantly stricter signal integrity layout principles, and write a complicated buffer/shift register "program" onto the FPGA that can only then actually interface with a device capable of displaying the images.
- **Cutler Thayer:** Looked into Amazon's Rekognition software for Computer Vision and machine learning. Sorted out which data should be for testing and training in the software, so I can determine the accuracy of the model after it is trained. Looking into

how to integrate this with a camera directly as well.

- **Tucker Thomas:**

○ **Individual contributions**

<u>NAME</u>	<u>Individual Contributions</u>	<u>Hours past 2 weeks</u>	<u>HOURS cumulative</u>
Chase Thompson	Completed the user interface by finishing the live-view and photo selection options for the user to choose from. The live-view window consists of the camera view, a camera selection dropdown, a sampling rate option, and a window for flagged photos to be listed.	8	24
Robert Zukowski	Assembled boards and a package with everything I initially thought would be enough for it to work. Then I spent a significant amount of time writing code that ended up being completely unusable due to the reasons mentioned in the section above. The silver lining is that I now actually have an understanding of designing with an image sensor, and we did order a backup plan in case this happened.	8	28
Cutler Thayer	Working with Amazon's Rekognition machine learning software to get a base machine learning model to compare our rapid reading to.	5	14
Tucker Thomas			7

○ **Plans for the upcoming weeks**

- Chase Thompson: These following weeks I will begin working on testing the different ways of connecting the UI application to the Rapid Reading algorithms. I will also be shifting some of my focus to the poster for our project.
- Robert Zukowski: Shifting focus to alternate image sensor with built-in interface. It is significantly bigger than the sensor chosen earlier, and will eventually have to be completely replaced if this project is to be continued, but it will allow our group to continue with our goal of sending image data over bluetooth to

interface with the previously mentioned rapid reading program.

- Cutler Thayer: Train Amazon Rekognition's machine learning model so that we have something to base our images from the hardware on. In addition I will also try to figure out how to connect this model to a software application as well.
- Tucker Thomas: