InFrame: Revised SOW

Introduction

Given the recent COVID-19 outbreak, the InFrame team has been forced to make some adjustments and refocusing decisions in order to complete the work remotely. After discussing with the course staff, the main areas of refocus mainly revolve around the integration of InFrame's subcomponents. The main goals moving forward are to complete the independent subcomponents to the highest extent possible. The idea would be to show their functionality as a set of complete APIs, in such a way that it is evident that a different subcomponent could be called to complete its work and return a certain expected output. Nevertheless, the following changes were made to the individual subcomponents:

System Control

System Control will, as an isolated subsystem, likely have the fewest alterations due to the ongoing COVID-19 pandemic. Since the team's Jetson Nano cannot be reached by any working member, the CSM will need to run instead on a team member's computer. As a result, in the locations where GPIO signals would be output, corresponding commands will be output through STDOUT and their validity tested accordingly. The remote controlling iOS interface can still be developed as expected; however, its Bluetooth communication would occur with the new central processing device, Ike's Macbook, as opposed to the previously intended Jetson Nano. If Ike is able to order an additional Jetson, Comms module, and tools for installing the device, then System Control as an independently operating subsystem can be developed as expected, with limitations on integrating it with the hardware in the team's original design.

Perception

The Perception subsystem has always been intended to work independently from the rest of InFrame's system. As such, both the object detection and object tracking can and will be developed and tested with any type of video feed found online. The development of this pipeline can continue as normal by assuming that said video feed is equivalent to the frames passed in from the System Controller. The good news is that Diego was able to get a Jetson Nano for personal use that he can use to continue to develop the perception pipeline under the constraints and limitations of an SBC instead of a much more powerful Macbook. As such, by using a video feed pulled from online with our intended 60 FPS instead of feeding straight from a camera, a proof-of-concept pipeline will be developed to track an object from a video saved locally and output to STDOUT where the system would have to instruct the motors to turn to show that pipeline functions end to end.

Hardware

We have received all of the ordered components. We have our own 3D printer that we will be using to prototype this project. We have also borrowed a Solidworks capable PC from SCS. We also have a multimeter and a very basic oscilloscope that should allow us to complete the hardware development. With all of this it is expected that a full hardware system is built and ready to integrate with the Jetson and Camera system. This prototype will be able to pan and tilt

the camera using the chosen power tool battery. Motor speed can still be tested by providing a dummy load of the same weight as the camera. We will also be able to test motor granularity, load capacity and response time. True battery life testing is not possible without another Jetson nano and camera. To simulate a Jetson's power consumption, a 10W dummy load will be put into the system. By doing all of this we can prove that this project would be successful if we were all together and able to integrate our respective parts.

Integration

Although the subsystems can mostly be developed independently by the distributed team members, the integration of these parts becomes a rising issue. On the software end, integration is not greatly affected with the Perception work still able to be called by the System Control; however, problems arise when integrating with hardware. Since only one member on the team has access to the physical hardware systems and the integration work is expected to be the most difficult portion of the project, the only way to integrate all subsystems would be to overload that one member, Thor Mercier, with all integration work. This sole solution would not be feasible. As a result, this team intends on developing all subsystems independently and spending additional time modeling subsystem interactions as if they could be easily integrated together by any group working in the same physical space.