Carnegie Mellon University

16-681

MRSD Project 1

Individual Lab Report 7
Team C - COBORG

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Sponsor:
Biorobotics Lab

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1. Individual Progress

For this time period, I primarily focused on creating the 3D parts from the CAD designs of the upgraded COBORG housing. This includes the Nvidia Jetson Xavier Brackets, The battery housing, the Intel Realsense D435i bracket, the 3D printed camera assembly housing, and the speaker mount. Each of these parts were iterated on to fix minor issues such as hole size tolerances, hole alignment, and peculiar issues such as the Nvidia Jetson bracket, pictured below in *Figure 1.*, which would press the reset button on the computer on accident in the original design.

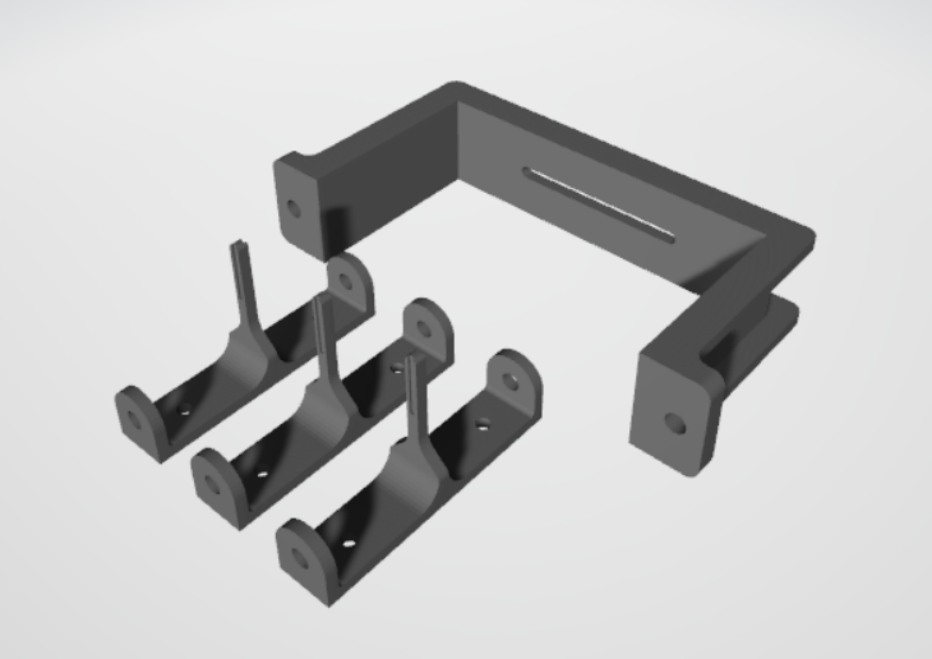

Figure 1. Intel D435i Brackets + Nvidia Jetson Xavier Bracket

2. Challenges

A challenge that we are facing is that the parts we had ordered on 9/13/2021 have yet to arrive. We expected to have some hardware integration completed by this week, however our plans have been delayed until everything we ordered arrives. If the parts do not arrive by next week, we must move on to mitigate further risk.

The plan is to use the MRSD inventory to update the frame, as many of the components we require are already available. We wanted the frame to be all black, but all that is available in the inventory is the default silver metallic color. We may have to order the last few parts from Amazon, however, items ordered from Amazon arrive within a week of when they are ordered.

3. Teamwork

Below I detail the progress of the team as the project progresses:

- Jonathan Lord-Fonda:

  Created a program to check the mechanical work space of the arm against the required task space with Feng. He then updated the task space requirements based on the program. Then he created a cpp node to check the mechanical task space much faster than the previous Python implementation.

  He then worked with Yuqing to develop vision task space plans and requirements. To validate, he created a program to check the visual work space against the required task space.

- Gerry D'Ascoli:

  Implemented Octomap with Jason for voxel-based object detection using the already existing point cloud library. He then built up the framework for the resolved rate node with Jason to serve as goal pose stabilization in the smart manipulation state machine.

- Feng Xiang:

  Did hands-on testing with mock robot arm designs out of cardboard to observe dynamics of different designs. He then ran mechanical task space simulations on different robot arm designs and collected data. Finally he built a trade study between different robot arms to determine optimal design choice, and prototyped a new 4 DOF arm based on the existing hardware.

- Yuqing Qin

  Focused her work on the Vision node. This included iterating through the vision task space with Jonathan, doing a trade study on the vision upgrade, and preparing YOLO tiny v4 and YOLO tiny v3 as alternate higher speed options to the current YOLO full v3.

4. Plans

For the next ILR, my plan is to finish the hardware integration, as this is the top priority. Once we have that complete, I will work on the updated E-stop design. This includes a pull cord mechanism instead of the current push button, and a relay that kills power to the motor on the "Stop Stop Stop" voice command. The final task planned for the next sprint is to convert the main node from an open loop state machine to a closed loop state machine. This will require feedback from the other nodes into the "/*state_input"* ROS topic.