Senior Design Bi-Weekly Status Report; Spring 2024
January 27 - February 10, 2024

Group: 27
Project Title: Machine to Human Vision
Client: Sami Bensallam

Team Members:

Sami Bensellam	| Project Lead
Alexander Black	| Hardware Lead
Jacob Burns	| Software Development
Yogi Chander	| Software/Hardware Integration
Jacob Lyons	| Component/System Design
Sergio Perez-Valentin	| Software Lead

Weekly Summary:

In the last two weeks we received the necessary MicroSD card and downloaded all the required libraries onto the pi including Ubuntu OS, Realsense2, Pycharm, and the Adafruit libraries. We wrote a python script that powers the haptic motors via the Adafruit Hat. However, when testing this script, we found that the amperage output was not sufficient to power the haptic motors to max capacity. We need to increase the amount of amperage coming out of the Adafruit Hat output ports by at least three times. After consulting with EE professors we have decided to use buffer amplifiers to triple the amperage. A small sample sleeve was also prepared to test the haptic motors, but as mentioned previously, the vibration of the motors is too weak to use for navigation. We were also able to run the realsense script on the raspberry pi and we were able to see the depth images from the D455i camera.

The haptic motors were all connected to female wires, however we found that the hot glue was not a sufficiently strong adhesive to connect the beads and the motors, as when sewing the motors onto the compression sleeves the beads break off quite easily. We have switched instead to an acrylic adhesive, and have found the connection to be significantly stronger.

Past Week Accomplishments:

- Connected motors to female terminals, prepared small example sleeve, began reapplying beads with acrylic, performed power testing, ordered a number of necessary materials - Alexander
- Installed Ubuntu OS and necessary libraries on Raspberry Pi - Yogi, Jacob B, Sami
- Wrote a script that tested haptic motor vibration output using the Adafruit hat. Found the need to increase amperage output. - Yogi, Jacob B, Sami
- Was able to run D455i script on Raspberry Pi - Yogi, Jacob B, Sami
- Consulted with electrical engineering professor on how to increase the amperage output of the Adafruit Hat - Yogi, Sami

- Created a visual system that showed depth map and color map from D455i camera - Sergio
- Further implemented and fixed issues with preexisting depth algorithm - Sergio

Individual Contributions:

Name	Individual Contributions	Weekly Hours	Total Hours
Sami Bensellam	Installed ubuntu OS and realsense library onto raspberry pi. Helped with writing the Adafruit script for controlling the haptic motors. Tested the voltage and amperage outputs of the raspberry pi GPIO ports and the Adafruit output ports. Researched PMOS and NMOS transistors as a viable way to control amperage output of Adafruit ports. Talked to EE professor about amperage output issues	10	29
Alexander Black	Worked on motors and sleeves	6	27
Jacob Burns	Installed necessary libraries on new sd card. Tested haptic motor vibration output on adafruit hat.	8	27
Yogi Chander	Wrote a script that powers the haptic motors using the adafruit hat. Measured the voltage and amperage output of the Raspberry Pi GPIO port output and the Adafruit port outputs. Reached out to EE professor to brainstorm ideas on how to increase amperage output from Adafruit hat. Researched into buffer amplifiers for controlling Adafruit output amperage.	10	29
Jacob Lyons	Worked on configuring a transistor or op amp configuration to amplify the current received by the motors, played with alternative mounting options for the haptics	6	26
Sergio	Fully integrated the stereoptical camera with	12	32

Perez-Valentin	preexisting code base. Fixed issue in the depth sensing algorithm due to the difference in depth detection done by the intel camera. Create a visual system that displayed both the depth map and camera map captured by the camera. Displayed visual cues for the cells and objects being detected by the algorithm for testing purposes.		

Pending Issues:
1. Finish reapplying beads using acrylic and expand the sleeve to include 8 motors
2. Raspberry Pi does not output sufficient current to drive all 16 motors, we need to find a way to increase the current output. A possible solution is by connecting a buffer amplifier to each output port on the Adafruit
3. Low frames per second on the realsense script when it's run on the raspberry pi.

Plans for Coming Weeks:
- Alexander Black:
    - Apply beads using acrylic
    - Expand the sleeve to include 8 motors
    - Ensure connectivity throughout the motors
    - Begin testing with the sleeve
- Jacob Lyons:
    - Increase the current received by the motors to get a clearer signal
    - Finalize the connections between all the parts
- Yogi Chander:
    - Calculate the voltage and amperage input to the buffer amplifier needed to attain an amplifier gain of 5x in order to supply sufficient amperage to the haptic motors.
    - Try to increase the FPS of the camera display from the Raspberry Pi
- Sami Bensellam:
    - Figure out how to increase the frames per second when running the realsense script on the raspberry pi
    - Help with buffer amplifier output optimization
- Jacob Burns:
    - Increase amp output on Adafruit hat
    - Test stereo camera code on Raspberry Pi
    - Run 16 haptic motors off of Adafruit Hat
- Sergio:
    - Research different versions of object detection
    - Implement these new versions and test for optimal performance

- Fix bounding box display on visual window for easier testing
- Run new software on raspberry pi for frame testing