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
Yogesh Chander	| Software/Hardware Integration
Jacob Lyons	| Component/System Design
Sergio Perez-Valentin	| Software Lead

Weekly Summary:

In the last two weeks, the group made significant progress towards creating a functioning prototype. We were able to download almost all of the necessary libraries onto the Raspberry Pi, including Pycharm, Numpy, Opencv, PCA9685, and I2C. Unfortunately, we don't have enough storage on the Pi SD card to download the real sense library which is needed actually to manipulate the D455i data. We ordered an SD card with vastly more storage capacity so we can download all required libraries onto our Raspberry Pi. Additionally, we crafted a homemade sleeve which we embedded the haptic motors into it and assessed its usability and comfort on the user's skin through testing. After talking as a team, we decided to use a compression sleeve, which we then ordered. New Adafruit pieces were soldered together and are ready to use once the new SD card arrives. The team has also ordered a vest equipped with storage compartments, which we will test to determine its suitability as a housing unit for the Raspberry Pi and power bank and to evaluate its user experience. All ordered parts will arrive within the next few days.

Past Week Accomplishments:
- Extended all needed motors as well as 2 reserve motors and prepared the motors for mounting to the sleeve via attaching beads. - Alexander
- Sliced all necessary wire pairs for the motor array to length. - Jacob L
- Learned libraries/software necessary for working with the final camera (as opposed to the Kinect). - Jacob L
- Reflashed Raspberry Pi SD card so we could download more Python libraries onto the SD card. - Yogi, Jacob B
- Downloaded ada Fruit python libraries (PCA9685 and I2C) onto Raspberry Pi. - Team
- Wrote python script which tested haptic motors using Raspberry Pi GPIO pins. - Yogi, Sergio
- Tested new haptic motor script. - Jacob B

- Placed an order for the Raspberry Pi case as well as the heatsinks. - Jacob B
- Refactored code base to work with new technologies recently bought. - Sergio
- Optimized code, specifically cv2 depth algorithms and differential depth matching that target specific locations on an array grid to determine vibration pulses.

Individual Contributions:

Name	Individual Contributions	Weekly Hours	Total Hours
Sami Bensellam	Worked on getting Realsense camera drivers downloaded, ordered different parts needed for the project	10	19
Alexander Black	Worked on Motors and Sleeve	7	21
Jacob Burns	Worked on installing the necessary libraries on Raspberry pi. Helped test haptic motors. Ordered a Raspberry Pi case and heatsink.	7	19
Yogesh Chander	Reflashed pi SD card, downloaded Adafruit libraries, wrote a script that controls the haptic motors	7	19
Jacob Lyons	Sliced all wire pairs for the motors, handled peer review, and learned how to interface with the camera software-wise.	7	20
Sergio Perez-Valentin	Updated existing software classes from last semester to allow input from realsense camera. Configured Raspberry Pi with libraries and firmware. Created new compression functions to reduce data fidelity from the cameras that were causing the Raspberry Pi to overwork.	8	20

Pending Issues:
1. The motors have to be connected to the female terminals and sewn into the sleeve to begin usability testing.
2. Raspberry Pi SD card does not have enough storage for all required Python libraries, so a new SD card with more storage has been ordered.
3. A possible change of OS might be required due to issues with ARM warnings with realsense libraries.
4. Different location zones for where the motors can be placed are still being discussed.

Plans for Coming Weeks:
- Alexander Black:
  - Connect the motors to female terminals and sew them onto the compression sleeve once they arrive.
  - Begin testing with the sleeve.
- Jacob Lyons:
  - Mount the camera to the headgear when it arrives.
  - Test different head-mounting configurations
  - Help Alex with the sleeve.
- Yogi Chander:
  - Download the necessary libraries onto the new SD card once it arrives.
  - Write a script that utilizes the AdaFruit hat and controls up to 16 haptic motors.
  - Test Raspberry Pi while being powered by the MIADY power bank
- Sami Bensellam:
  - Finishing setting up the Adafruit hat.
  - Get the Intel realsense camera working with the Raspberry Pi.
  - Receiving the hat and finding a way to connect it to the hat.
- Jacob Burns:
  - Secure the Raspberry Pi and AdaFruit hat into the case.
  - Help download libraries onto the new SD card.
  - Test the camera with the Raspberry Pi.
  - Help integrate 16 motors with AdaFruit hat.
- Sergio:
  - Finish installing libraries on Raspberry Pi.
  - Test latency and compression features between realsense camera and Raspberry Pi.
  - Start integrating the Raspberry Pi mount with the arriving harness. Test comfortability and weight, including ease of use mounting and daily living.