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EE113DW Status Report 4
Gesture Control for Home Devices Project - (solo project)
https://github.com/Ehanlion/HGR_project

Main Intention:
This week was slower than the last set of weeks. Development slowed down with midterms that occupied both this week and next week. Luckily, my original development plan accounted for this, allocating multiple weeks for the next steps of the project. As a result, this week saw little actual code development undertaken and was, instead, largely filled with research in my spare time. I looked at possible boards to support my transfer of my laptop-code environment over to a solitary device. Numerous ones, amidst the lineups of Arduino and Raspberry PI Boards, stood out to me. I also contemplated using the original, Nucleo H7 board as well. While seemingly innocuous, this was actually an efficient usage of what little time I had this week. The research was minimal but effective and contributed greatly to my next goal: integrating my code onto a separate device. Since the ultimate goal of this project is to build a standalone, networked, and robust system, knowing the pros and cons of various market-offered boards is integral to understanding the future of the project's development.

Conceptual Development:
This week's research was much more involved than last week's efforts. I searched the webs for various boards that I could use to build my project with. It is worth noting that, in prior weeks, I had examined the Raspberry PI 5 board as the likely candidate for this project. However, I came to that conclusion quickly and from limited resources so I reckoned that re-examining my research would be a good, logical step in project development.

The main stand-out options come from Arduino and Raspberry PI. My initial thoughts were that Arduino did not produce any boards that could compete with the compute power of the RPI 5. This was incorrect. Some of the higher-end boards produced by Arduino actually use the same quad-core ARM processors that the Raspberry PI boards do. My other main concern with Arduino was that (to my knowledge), they did not have any good networked options for their boards. This is crucial to my project because my code relies on over-the-network communication to talk to the home devices it intends to control. However, I found that Arduino has lines of boards with the surname 'WIFI,' which indicates network capabilities.

This was good news -- Arduino boards were every bit as capable as RPI boards. However, there was an elephant in the room: I already coded my project in python. To my dismay, I learned that the Arduino language, seemingly a subsidiary of C, is incompatible with the code I already developed. Furthermore, while MediaPipe (the gesture-recognition package from Google that I am using for this project) does support Cpp integration, the package could not integrate on an Arduino. Sadly, I only thought to check compatibility *after* researching the boards themselves. This same issue stops me from using the Nucleo H7 Board.

In conclusion, my initial guess of using the RPI5 board as my chosen platform for the project was correct; I can rest assured that I am using the best building block for my design now.

Implementation and Development:
This week saw no actual code development. My code progress remains the same as last week. With the pressure of midterms, I foresaw this coming and allotted multiple weeks for shifting my code over to a board.

Resources:
I continued to use online resources from both OpenCV and MediaPipe to advise me on the project. However, this week I spent a lot of time just changing the code structure in my existing program, removing excess processing, and building in subtle new features.

Individual Contribution:
This project is an individual project and as such, all development was undertaken by me.

References:

1. https://github.com/googlesamples/mediapipe/blob/main/examples/gesture_recognizer/python/gesture_recognizer.ipynb - Website for MediaPipe with an installation guide as well as a python example.
2. https://docs.python.org/3/library/asyncio.html - Website for Asyncio library
3. https://developers.google.com/mediapipe/solutions/vision/gesture_recognizer/python#live-stream - Website for MediaPipe with a python implementation of a hand tracking overlay.
4. https://docs.opencv.org/3.4/dd/d43/tutorial_py_video_display.html - Website for OpenCV's example on getting as video feed functioning
5. https://store-usa.arduino.cc/collections/iot-cloud-compatible?selectedStore=us - Website for Arduino's cloud computing boards
6. https://www.raspberrypi.com/news/introducing-raspberry-pi-5/ - Website for Raspberry Pi's introduction of the RPI5