J.Y.M. Gauntlet Prototype

By: Jacob White, Michael Khojastegan, Yousra Merzougui

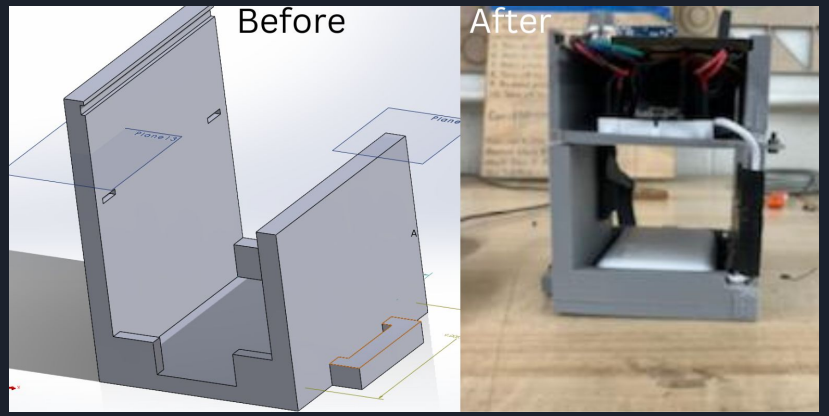
Original vs Evolved Vision of the Gauntlet Prototype

The Vision:

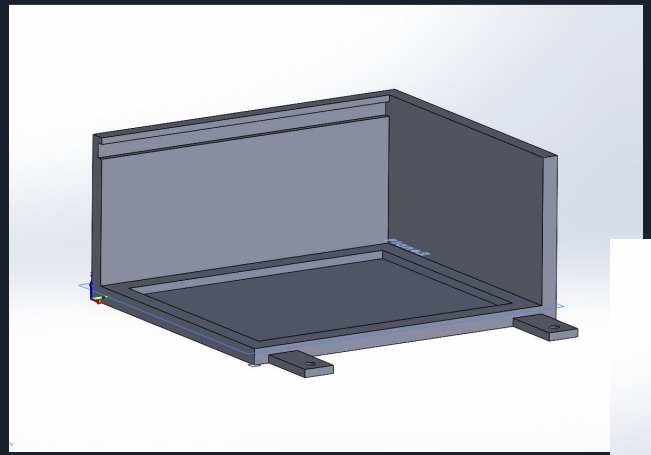
- A simple, modular design that allowed quick interchangeable parts
- Allows for full functionality of hand comfortably without sacrificing performance

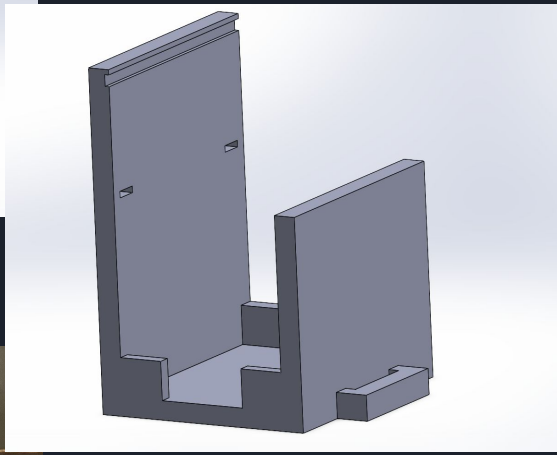
Evolution:

- Stayed true to simple, modular design, and original sizing
- Drifted away from the idea of the top half being all 3D printed in exchange for a slide wood board.
- The wood board allows for different layouts or sensors and is easy to quickly reproduce if damaged
- Creating a bevel under the breadboard allowed for a precise fit and cable management.



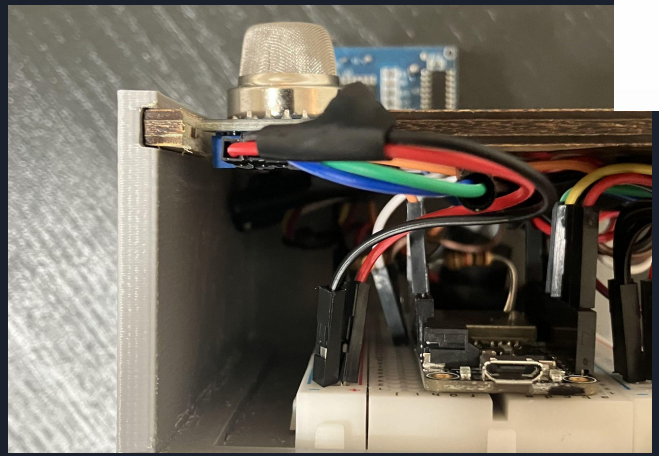
CAD Iterations and Fitment



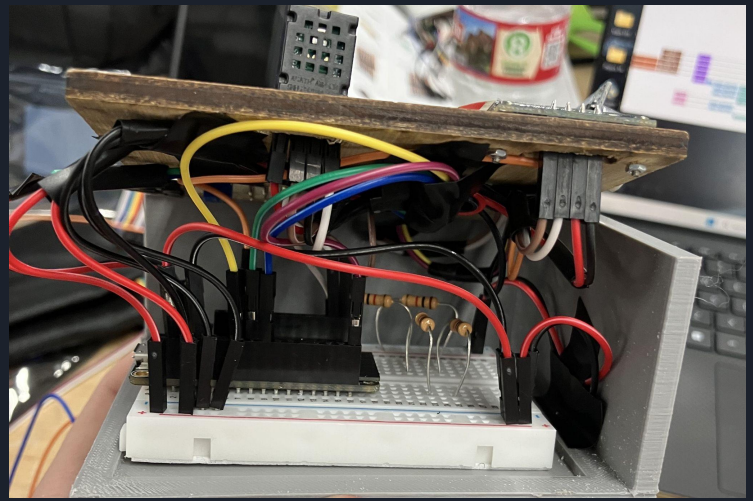


Improvements:

- Our interlocking joints were designed to print slightly bigger than their holes/grooves
- While this did cost time to file off the excess plastic, it made up for it by holding everything together without fasteners
- Over time these joints will wear down so we decided to include two bolts that are inserted after connecting the top half
- Between the bolts, fitment, and tensioning velcro straps the gauntlet is able to complete any task without risk of falling apart



Wiring and Cable Management



Nothing is worse than a jungle of unorganized cables, to fix any further headaches we:

- Set up a clear color pattern for wires
- Taped wires together and routed along wood top
- Used as many M-F wires as possible to cut our circuit down to just one breadboard

General
Power (3.3V)
Ground
SCL
SDA
Power (5V)

Gas Sensor I/O
D0 to A4
A0 to A3

Distance Sensor I/O
Trig to 21
Echo to A2

Challenges faced while coding and our solution process

Goal:

- Break the program down into smaller programs
- Merge these smaller programs into a larger one

Challenges:

- Merged code would not function properly (circuits, new pins, mutual exclusivity with WiFi)
- Circuit design would change repeatedly

Solutions:

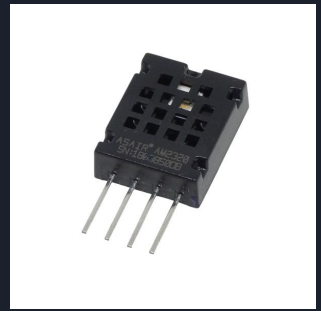
- Iterate through different code processes in the smaller programs, then merge those
- Research the circuit diagram, code libraries, and consult experts

Show your code and explain the challenges you faced and how you overcame it or learned from it:

```
// ---Humidity and temperature---
float humidity = am2320.readHumidity();
delay(500);
float temperature = am2320.readTemperature();
Serial.print("Temperature: ");
Serial.print(temperature);
Serial.println(" C");
Serial.print("Humidity: ");
Serial.print(humidity);
Serial.println(" %");

// -------Gas sensor--------
int gasSensorValue = analogRead(gasSensorAnalog); // Get gas sensor value
Serial.print("Gas: ");
Serial.println(gasSensorValue);

// ------Ultrasonic sensor-----
// Clears the trigPin
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
```



Challenges faced while building the website and our solution process

Goals:

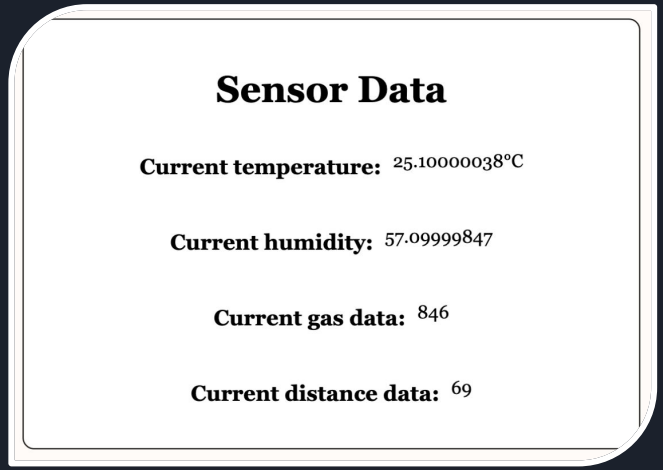
- Create a website that could represent our project and display sensor data in real time
- Implement UI/UX design techniques to make the website user-friendly and aesthetically pleasing

Challenges:

- Styling issues: some components (images, text, box feature) did not appear on the website as intended

Solutions:

- Built a wireframe for each website page to organize each feature and the code associated with it
- Tested the website after each coding iteration



The Official J.Y.M. Website

https://j-y-m.w3spaces.com

Testing and Iteration Process

Explanation of what happened when you test your prototype and the iterations you made. Please include the variables you tweaked and measurable tweaks you made (when applicable).

Testing:

Code:

- Add circuit sensors one by one
- Work on the “small” programs for each sensor, then merge

CAD:

- Uncertain measurements led to planning for larger expected uncertainty
- Make parts and form into an assembly to reprint in shorter time frames

Iteration:

Code:

- If some sensors didn’t work, iterate with different code or set up a new circuit

CAD:

- When parts were not perfect, we would iterate by filing off the expected excess material
- Filing paths for wires and power cable for a cleaner look

Next Steps & How we would re-approach our design

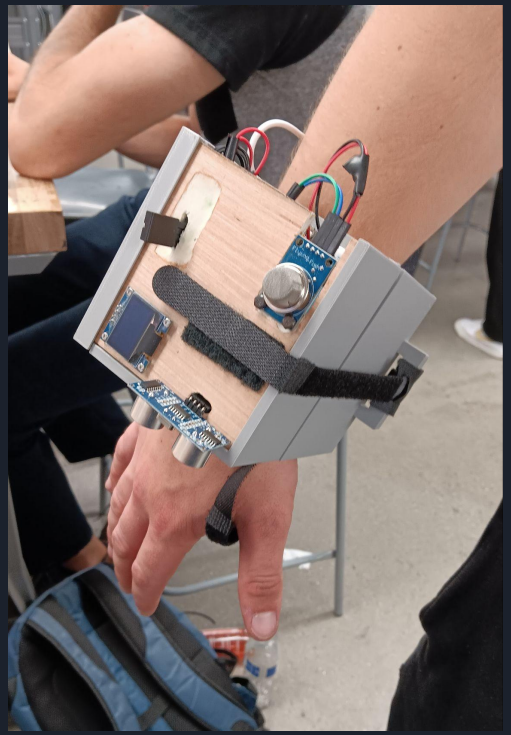
What would be the next steps – future design work and/or how you would approach this differently if you were able to start over.

Future:

- Review the design process, code, and circuits
- Find more collaboration projects (UCLA clubs, internships, hackathons)

What would we have done differently?

- Better communication channels
- Worked off of Github directly
- Take mental breaks

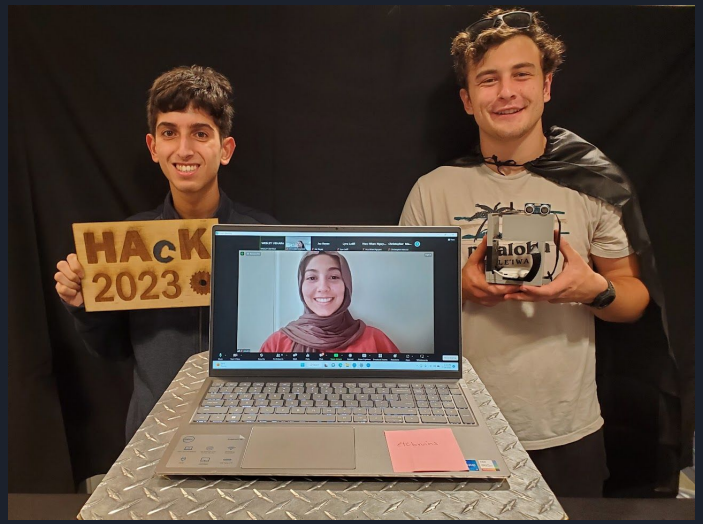


Reflection

“Participating in HAcK allowed me the opportunity to work with a team on a project in a short amount of time, which I haven’t done before. This helped me hone my time management and communication skills, improve my engineering mindset, and was a new experience that has definitely prepared me more for the real-life situations I’m likely to experience as an engineer in the future” - Yousra

“This experience boosted my engineering mindset in ways that I was unable to with my classes; by working together on a team over multiple days, I found out the tools and skill sets needed to succeed with large projects. Additionally, since I’m a computer science major, I applied my coding knowledge to actual hardware which will be a critical skill needed in my future path. Also, it was a really fun experience!” - Michael

“Through basic training and HAcK I have been able to apply what I have learned in classes and get hands on experience. It is hard to jump into teaching yourself complex skills that take time and experience to learn like Solidworks. Now with many new skills and experiences under my belt, I am excited to apply them to my own personal projects in the near future.” - Jacob



Thank you!