Design Review 4 Presentation
3/6/2022

Introduction

Delta P - Gas Reactor Sensing System

Remove Carbon 14 from atmospheric samples using vacuum pressure and heat. Create embedded system to perform all necessary functions.

Team Members:
Gabriel Bixler
Cameron Divine
Qian “Matteo” Zhang
Benjamin Shugrue

Ben Shugrue

Client and Objective

Delta P - Client/Sponsor : Chris Ebert

Researcher at NAU that is studying carbon samples. These samples are put into a vacuum chamber where they are heated up and a chemical reaction occurs between the carbon and a small piece of iron.

Delta P - Objective

The current device has pressure sensors that our starting to fail. Our team has been tasked to design a device that uses new sensors. The device is expected to function similarly to the old device.

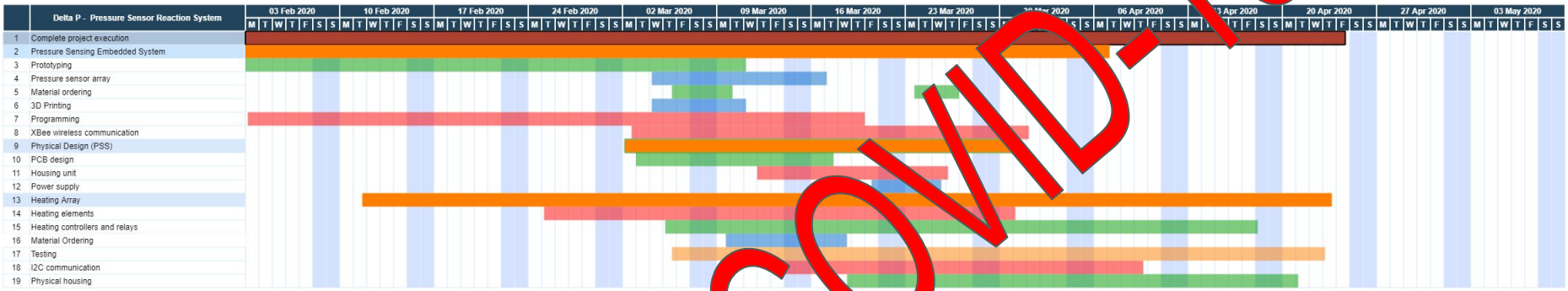
Ben Shugrue

Overview of Main Goals

- Subsystem 1 - Sensor Array
- Subsystem 2 - Physical Controls
- Subsystem 3 - Programming for Embedded System
- Subsystem 4 - Housing Unit
- Subsystem 5 - Wireless Communication

Cameron Divine

Overview of Schedule



COVID-19

Gabriel Bixler

Individual Timelines

Gabriel Bixler -

- **October 2021**, meeting with sponsor, project research and testing of pressure sensors
- **November/December 2021**, prototyping and coding of sensor array
- **January 2022**, implementation of button controls and LCD screen, prototyping
- **February 2022**, parts ordering and PCB design
- **March/April 2022**, final assembly of pressure sensor system

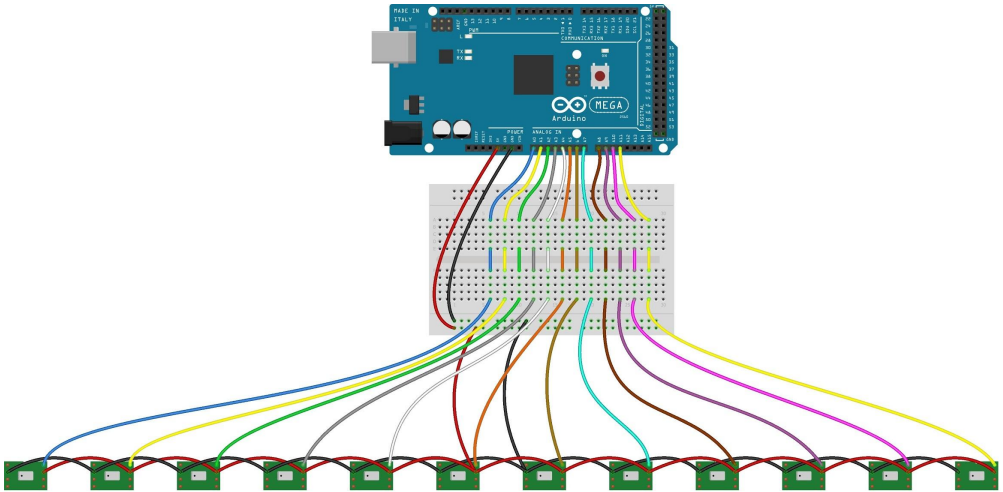
Gabriel Bixler

Website

Qian Zhang

Sensor Array

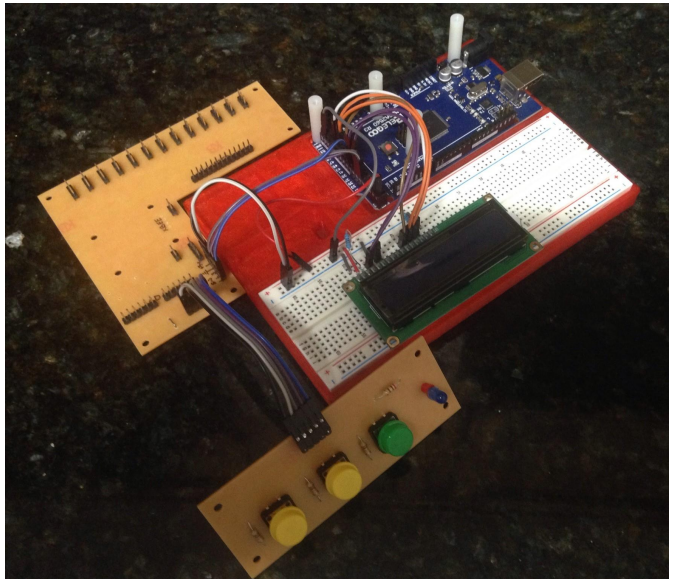
- AMS5812 pressure sensor



Prototyping

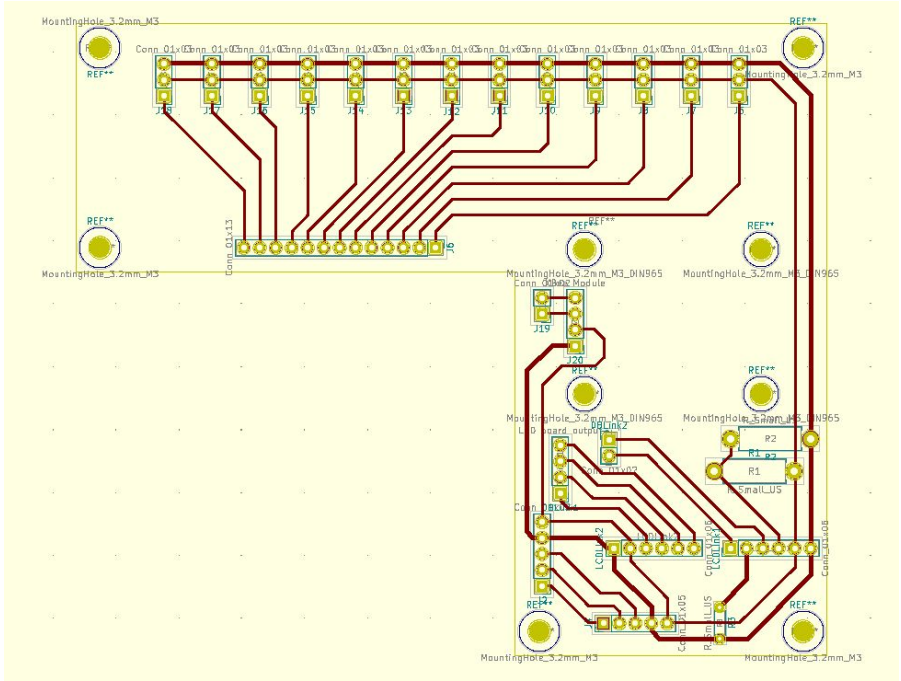
- Arduino Mega
- Breadboard
- AMS5812 sensors

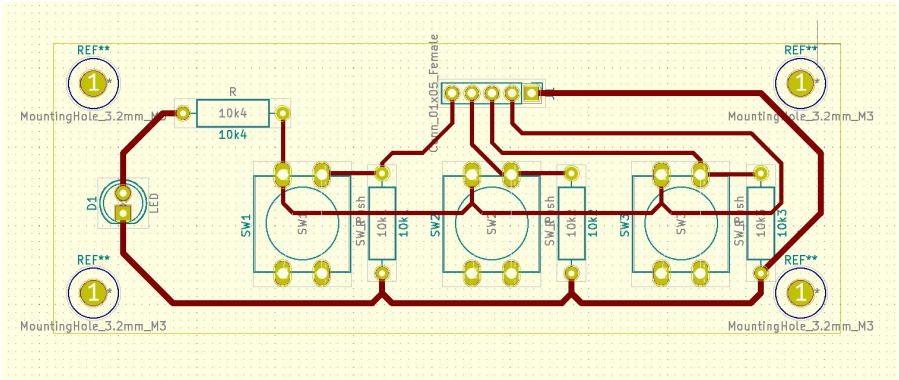
Individual aspects of the project were designed and tested independently before full integration.



PCB Design

- **Bantam Tools CNC Mill** (the Cage)
- **Fritzing** (Basic Design)
- **Eagle CAD** (Intermediate Design)





Gabriel Bixler

Housing

Finished construction of housing for the pressure sensing system

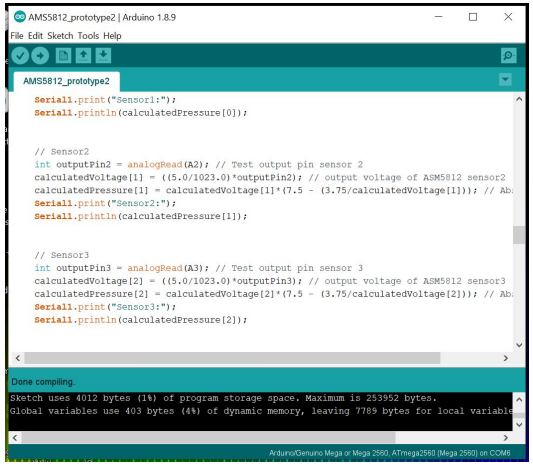
- Aluminum casing
- 4x20 LCD display
- Control Panel

Ben Shugrue

Coding and Documentation

Updated code for our microcontroller and working on 3D part for the project.

- Program allows the user to monitor the pressure system utilizing an LCD display. Two pressure sensors can be selected and displayed.
- Code for the full design is ready
- Assembling user manual for our project
- Communication established through the TX/RX ports



Cameron Divine

Wireless communication

Transmit the data measured by the pressure sensor to the computer through wireless transmission.

- Mega 2560, Xbee*2, XBee Explorer Dongle
- Improve the algorithm so that the value of each sensor is transmitted to PC
- Display on PC

Qian Zhang

Heating Array

Benjamin Shugrue

Budget

We allocated our budget to adequately fund the pressure sensing module and heating array.

Due to unforeseen circumstances, we were not able to develop the heating array and our project came in under budget.

Delta P

Parts List	Link	Cost	Ordered	Order Date	Total Cost	Remaining Budget
Arduino Mega	https://www.amazon	18.99	☑	2/28/2020	221.03	278.97
XBee 2c Module	https://www.amazon	26.95	☑	2/28/2020		
XBee USB Dongle	https://www.sparkfu	26.95	☑	2/28/2020		
XBee Shield	https://www.sparkfu	18.95	☑	2/28/2020		
CW-3 Cable	https://www.digikey.	34.56	☑	2/28/2020		
20x4 LCD for Arduino	https://www.amazon	13.99	☑	3/11/2020		
YaeCCC Aluminum Enclosure Metal	https://www.amazon	24.99	☑	3/11/2020		
Power Supply (pressure sensor)	https://www.amazon	8.99	☑	3/11/2020		
Power supply input	https://www.amazon	7.99	☑	3/11/2020		
Push buttons	https://www.amazon	7.89	☑	3/11/2020		
Crimp Pin Kit and Ribbon Cable	https://www.amazon	12.77	☑	3/11/2020		
XBee Explorer regulated board	https://www.amazon	18.01	☑	3/11/2020		
3 Pin Mini XLR Connector	https://www.amazon	13.49	☐			

Gabriel Bixler

Summary

- Subsystem 1 - Sensor Array
  - Waiting for parts to arrive
- Subsystem 2 - Physical Controls
  - Completed
- Subsystem 3 - Programming for Embedded System
  - Completed
- Subsystem 4 - Housing Unit
  - Completed
- Subsystem 5 - Wireless Communication
  - In progress