CESU
Centralized Environmental Sensor Unit

Minas Berberian
David Karapetyan
Rafi Keshishian
Objective

- Create a central system to support an array of sensors that collect and send sensor data.
- Collect, display, and send sensor data
- Implement data into graphs and tables to identify trends in data
- LCD Display that shows current sensor readings
- Design code/core to be able to accept more sensors for the future
- Create web interface to access and observe data
Requirements

1. Shall collect temperature data
2. Shall collect humidity data
3. Shall collect barometer data
4. Shall collect GPS data
5. Shall check for rain using the rain detection sensor
6. Shall check for fire using the gas and flame sensors
7. Shall display collected data on LCD screen
8. Shall send data through WIFI Module
9. Shall store data on MicroSD
10. Shall allow for < 6 sensors
11. Shall allow for additional ports for simple future scaling
getData()
- getTemp()
- getHum()
- getAP()
- getGPS()
- getLPG()
- getCO()
- getSmoke()
- getRain()
- getFire()

displayData()
- displayTemp()
- displayHum()
- displayAP()
- displayGPS()
- displayLPG()
- displayCO()
- displaySmoke()
- displayRain()
- displayFire()
Physical Wiring Schematic

- Black wires - ground
- Red wires - 5V power
- Pink wires - 3.3V power
- Blue wires - analog pins
- Yellow wires - digital pins
- White wires - connect sections
- Orange wires - TX and RX
Electrical Wiring Schematic
# Pin Breakdown

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Pins</th>
<th>GND</th>
<th>VCC</th>
<th>AO</th>
<th>DO</th>
<th>SCL</th>
<th>SDA</th>
<th>TX</th>
<th>RX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flame</td>
<td>4</td>
<td>X</td>
<td>5V</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td>4</td>
<td>X</td>
<td>5V</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humiture</td>
<td>3</td>
<td>X</td>
<td>5V</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raindrop</td>
<td>4</td>
<td>X</td>
<td>3.3V</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barometer</td>
<td>4</td>
<td>X</td>
<td>3.3V</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCD</td>
<td>4</td>
<td>X</td>
<td>5V</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data/LOG</td>
<td>3</td>
<td>X</td>
<td>5V</td>
<td></td>
<td></td>
<td>XXX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPS</td>
<td>2</td>
<td>X</td>
<td>5V</td>
<td></td>
<td></td>
<td>XX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thing</td>
<td>4</td>
<td>X</td>
<td>3.3V</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL**

- Analog Pins: 6
- Digital Pins: 5
- TX/RX Pins: 1
- SDA/SCL Pins: 2
- 5V power Pins: 6
- 3.3V power Pins: 3
## Power Analysis

<table>
<thead>
<tr>
<th>MODULE</th>
<th>VOLTAGE (V)</th>
<th>CURRENT (mA)</th>
<th>POWER (mW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUMITURE</td>
<td>5</td>
<td>.3</td>
<td>1.5</td>
</tr>
<tr>
<td>LCD</td>
<td>5</td>
<td>150</td>
<td>750</td>
</tr>
<tr>
<td>GAS</td>
<td>5</td>
<td>160</td>
<td>800</td>
</tr>
<tr>
<td>FLAME</td>
<td>5</td>
<td>20</td>
<td>66</td>
</tr>
<tr>
<td>BAROMETER</td>
<td>3.3</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>GPS</td>
<td>5</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>THING</td>
<td>5</td>
<td>500</td>
<td>2,500</td>
</tr>
<tr>
<td>RAINDROP</td>
<td>3.3</td>
<td>15</td>
<td>49.5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>34.9</strong></td>
<td><strong>866.3</strong></td>
<td><strong>4,270.3</strong></td>
</tr>
</tbody>
</table>
Link to Code

https://github.com/davidk6736/cesu
Hardware

Arduino Uno
Humiture
Flame
Barometer
Gas
Raindrop
LCD
GPS Shield
Thing
Antenna
MicroSD
<table>
<thead>
<tr>
<th>Parts</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barometer sensor</td>
<td>$8.99 (In-Stock)</td>
</tr>
<tr>
<td>Humiture sensor</td>
<td>$9.99 (In-Stock)</td>
</tr>
<tr>
<td>Flame sensor</td>
<td>$9.99 (In-Stock)</td>
</tr>
<tr>
<td>Gas sensor</td>
<td>$10.99 (In-Stock)</td>
</tr>
<tr>
<td>Raindrop sensor</td>
<td>$9.99 (In-Stock)</td>
</tr>
<tr>
<td>Thing</td>
<td>$15.99</td>
</tr>
<tr>
<td>GPS Shield</td>
<td>$44.95 (In-Stock)</td>
</tr>
<tr>
<td>MicroSD chip (8GB)</td>
<td>$5.99</td>
</tr>
<tr>
<td>LCD screen</td>
<td>$9.99 (In-Stock)</td>
</tr>
<tr>
<td>RF Adapter Cable</td>
<td>$3.95</td>
</tr>
<tr>
<td>Antenna</td>
<td>$12.95</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$150.76</strong></td>
</tr>
</tbody>
</table>
Team Members

David Karapetyan:
- Testing individual sensors/PDU

Minas Berberian:
- Creating Main Code/PDU

Rafi Keshishian
- GPS + Data Logging Shield and code
Test Plan

- Write code for individual sensors
- Wire sensors individually to test code
- Write code to encompass all sensors and GPS + Data Logging shield
- Wire sensors/shield all together to test code
- Write code for Thing Dev ESP8266
- Connect Arduino with Thing and test
- Connect all sensors/shield/thing and test if data is going through
- Store data on MicroSD and .txt file
- Program stored data using MatLab to plot charts to show trends in data
- Program continuous live data using Matlab to plot charts
Issues/Concerns

Data storage: where to store data (MySQL?) ✓ SD Card/Text File

Data graphing: Program to graph live/old data (Python?, Matlab?)

Web interface: creating website/server (javascript?, html?)
Questions?