E1.05 – H.I.M.

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Revision History Table		Template Date 1/29/2020
Version	Summary of Changes	Date
0.1	Initial draft	09/21/20
0.3	Change to Top-Level Diagram and Executive Summary	9/24/20
0.5	Added figures to Product Features and changes to Executive Summary	9/28/20

Contents

1. EXECUTIVE SUMMARY

The Executive Summary was written by Cameron Muir.

Our product is a handheld device that is designed to record temperature, humidity, time, and location. Our product will be a lightweight, hand-size portable device which will allow user to store and upload data onto a cloud database for analysis. When the data is transferred to the cloud database, it will display a map of the temperature range throughout the region. Furthermore, this will help with visualization by scaling the heat sectors.

The ability to map out the temperature range throughout an urban environment will be beneficial to city production planning. This data provides the basis for how planners can decide on building materials ; and alter current structures, parks, and buildings in order to construct a place for people to cool down. For example, by providing a fountain in a park, this allows the concrete to cool down and not emit much heat, improving the quality of life in those areas. Additionally, it helps cities understand where heat relief efforts need to be focused (Detroit Heat Watch, n.d). Many solutions use PVC pipe parts that mount to a car or bike to help take measurements (Detroit Heat Watch, n.d.). However, our device aims to improve that by allowing it to fit in your hand comfortably and be light enough to carry.

Our development process will start with researching and picking parts that will be adequate to complete the project described above. Our team will then prototype, build, and test the device sensors, and on board storage, making revisions if necessary. An enclosure will be made for this device to make carrying it easy for the user. Furthermore, our team will then integrate our board with cloud and mapping services so all that data can be accessible at any location. The team composed of Jose Silva (Display Panel), Cameron Muir (Mapping), Gabriel Montero-Sierra (Cloud), and Andrew Flores (Power and Sensors), will work remotely to design and build the device. All data will be collected in the San Marcos area.

2. Product Features

The top-level block diagram was drawn by Gabriel Montero.

The top-level diagram of our system is shown in Figure 1. This device will receive inputs from multiple sensors that would record data and store them onboard. For the device, a battery will be used as the power source which will have an indicator to display the battery life. In addition, there will be a sensor for every feature such as, temperature sensor, humidity sensor, etc. A GPS will be integrated to the device to record the location the data is being retrieved.

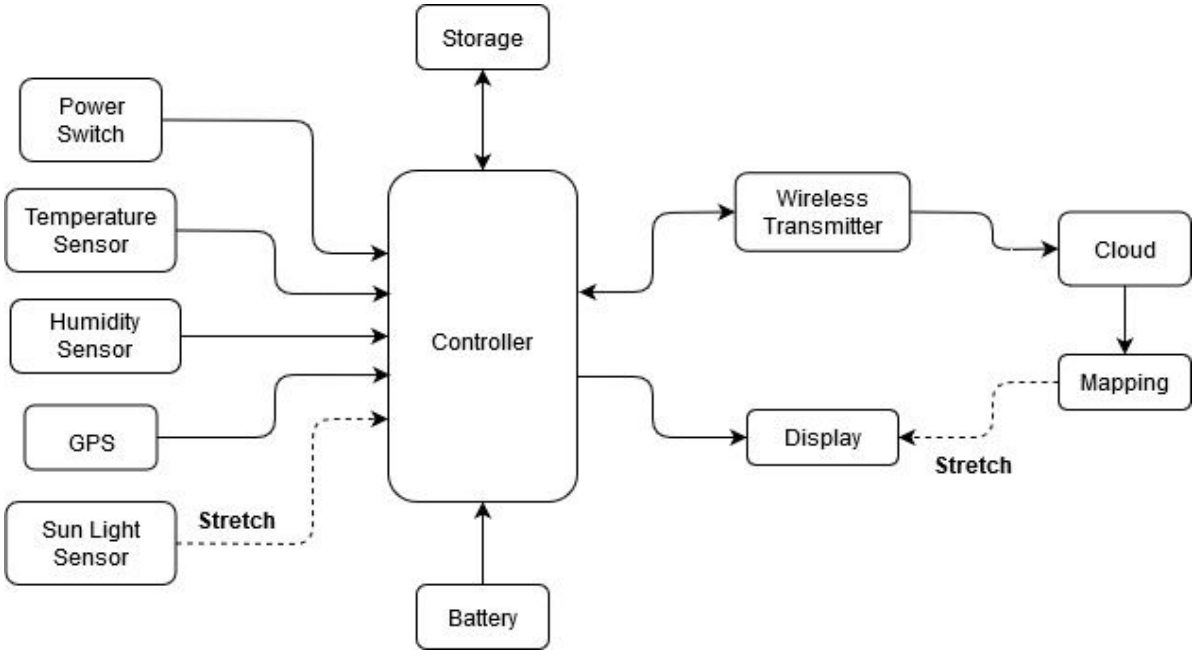

Figure 1: Top-Level Block Diagram

Feature 1: Wireless Transmission of Data

This section was written by Gabriel Montero

A cloud that will store recorded data transmitted from the device. The data will be recorded in a .txt/.csv file type for organization.

Parameter	Min	Max	Comments:
Transmission Distance	n/a	50m	Without obstructions
Transmission Data	n/a	6 values	Date, Time, Temperature, Humidity, Longitude, Latitude

Table 1: Wireless Transmission Parameters

Feature 2: Power System

This section was written by *Andrew Flores*

The device will run from a single rechargeable battery that will be housed in the main casing of the device. The battery will allow for the device to operate for an optimal amount of time to provide thorough measurements of data. Using a rechargeable battery will allow for the device to be handheld and portable.

Parameter	Min	Max	Comments:
Battery Life	4 hr	n/a	At least 4 hour battery life
Recharge time	2 hr	n/a	Dependent on battery capacity

Table 2: Power System Parameters

Feature 3: Temperature and Humidity Sensing and Logging

This section was written by *Andrew Flores*

The device will use a sensor to record the humidity percentage in the air, as well as the temperature. The sensor will provide data that will be used in unison with the gps to provide the temperature at different locations.

Parameter	Min	Max	Comments:
Temperature Range	-5℉	120℉	Sensor operation range
Humidity Range	0%	100%	Sensor operation range
GPS	n/a	n/a	GPS will provide coordinates for the location of the device

Table 3: Temperature and Humidity Sensing and Logging Parameters

Feature 4: Display Panel

This section was written by Jose Silva

The display panel on the device will display the current time, battery life, and temperature and humidity of the surrounding area. The display panel will be visible in bright sunlight with black text.

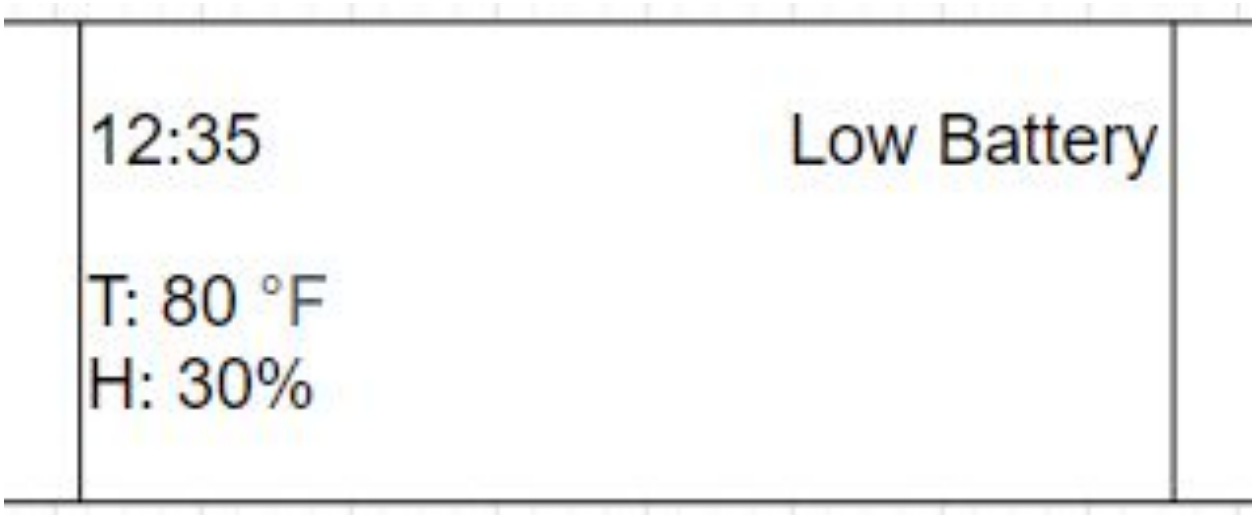

Figure 2: Display Panel Concept Sketch

Parameter	Min	Max	Comments:
Refresh rate	n/a	1m	Time between recorded data and displaying that on the display

Table 4: Display Panel Parameters

Feature 5: Map Overlay

This section was written by Cameron Muir

The Map Overlay is a feature that will be constructed from the data collected by the device, allowing for a visual representation of where hot spots are in urban areas. A preliminary concept UI can be seen in Figure 3.

Parameter	Min	Max	Comments:
File Format	n/a	n/a	Using .txt/.csv to import data to a mapping service
Temperature Input	-5℉	120℉	Imported from cloud service, reading taken on device

Humidity Input	0%	100%	Imported from cloud service, reading taken on device
Location Input	n/a	n/a	Using Latitude and Longitude values from GPS subsystem
Date and Time	n/a	n/a	Imported from cloud service, reading taken on device

Table 5: Map Overlay Parameters

Figure 3: Map Overlay Concept

Feature 6: Data Storage

This section was written by Gabriel Montero

The device will have a nonvolatile storage. No password will be required to access data.

Parameter	Min	Max	Comments:
Data Format	n/a	6 Values	Date, Time, Temperature, Humidity, Longitude, Latitude (.csv)

Table 6: Data storage Parameters

3. Project Plan

This section was written by Jose Silva.

Project Schedule				
Task	DRI	Duration	Start	End
Preliminary selection on power system	Andrew Flores	1w2d	9/23/2020	10/20/2020
Preliminary selection on microprocessor	Cameron Muir	1w2d	9/23/2020	10/20/2020
Preliminary selection on sensors	Andrew Flores	1w2d	9/23/2020	10/20/2020
Preliminary selection on display	Jose Silva	1w2d	9/23/2020	10/20/2020
Research and decide on cloud server	Gabriel Montero-Sierra	2w0d	9/25/2020	10/9/2020

Select mapping path overlay software	Cameron Muir	2w0d	9/25/2020	10/09/2020
Executive Summary (SOW)	Cameron Muir	2w6d	9/10/2020	9/30/2020
Product Features (SOW)	Gabriel Montero-Sierra	2w6d	9/10/2020	9/30/2020
Project Plan (SOW)	Jose Silva	2w6d	9/10/2020	9/30/2020
Sponsor Support Elements (SOW)	Andrew Flores	2w6d	9/10/2020	9/30/2020
Preliminary Project Plan	Jose Silva	2w0d	9/30/2020	10/14/2020
Initial Design Review	Jose Silva	3w5d	10/14/2020	11/09/2020
Preliminary Product Specification	Jose Silva	1m0w0d	10/14/2020	11/11/2020
Order parts	Andrew Flores	3w0d	11/11/2020	12/02/2020
3-D printing of chassis	Cameron Muir	2w0d	11/11/2020	11/25/2020
Cloud Storage Integration	Gabriel Montero-Sierra	2w0d	11/16/2020	11/30/2020
Mapping Overlay Integration	Cameron Muir	2w0d	11/16/2020	11/30/2020
Product Specification	Jose Silva	3w0d	11/11/2020	12/02/2020
Project Plan	Jose Silva	2w0d	11/18/2020	12/02/2020
Senior Design Day D1 (end D1)	Jose Silva	0w1d	12/04/2020	12/04/2020
Prototype Assembly	Jose Silva	2w0d	01/25/2021	02/08/2021
Testing power system	Andrew Flores	1m0w0d	02/08/2021	03/08/2021
Testing sensor accuracy	Andrew Flores	1m0w0d	02/08/2021	03/08/2021
Testing display accuracy	Jose Silva	1m0w0d	02/08/2021	03/08/2021
Testing cloud server	Gabriel Montero-Sierra	1m0w0d	02/08/2021	03/08/2021
Testing mapping display	Cameron Muir	1m0w0d	02/08/2021	03/08/2021
Final System Integration	Jose Silva	2w5d	03/08/2021	03/27/2021
Presentation Peer Reviews	Jose Silva	3w0d	03/27/2021	04/17/2021
Final Report	Jose Silva	2w0d	04/17/2021	05/02/2021
Senior Design Day D2	Jose Silva	0w1d	05/03/2021	05/03/2021

Table 2: Milestone Schedule

4. Sponsor Support Elements

Sponsor Support Elements		
Element	First Needed	Needed Until
Weekly Meeting with sponsor, Professor Hinkle	08/2020	05/2021
$125 for Parts	10/01/2020	05/2021

5. Approvals

The signatures of the people below indicate an understanding in the purpose and content of this document by those signing it. By signing this document, you indicate that you approve of the proposed project outlined in this Statement of Work and that the next steps may be taken to create a Product Specification and proceed with the project.

Approver Name	Title	Signature	Date
Jose Silva	Project Manager		9/28/2020
	D2 Project Manager	Andrew G. Casper	09/28/2020
Semih Aslan	Faculty Advisor		9/29/2020
	Sponsor		9/30/20
	Instructor		

Section	Author	Word Count
1. Executive Summary	Cameron Muir	309
2. Product Feature	Gabriel Montero-Sierra	83
2a. Wireless Transmission of Data	Gabriel Montero-Sierra	44
2b. Power Systems	Andrew Flores	77
2c. Temperature and Humidity	Andrew Flores	118
2d. Display Panel	Jose Silva	87
2e. Map Overlay	Cameron Muir	96
2f. Data Storage	Gabriel Montero-Sierra	31
3. Project Plan	Jose Silva	258
4. Sponsor Support Elements	Andrew Flores	26
5. Approvals	N/A	58

6. References

Detroit Heat Watch. (n.d.). EcoWorks. Retrieved September 28, 2020, from https://www.ecoworksdetroit.org/detroitheatwatch