**8 Memo**

To: Professor Pisano

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Team: NoiseHub Team 8

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Subject: First Prototype Test Report

1. **Equipment and Setup**

**Hardware:**

* Raspberry Pi 4B
* Thermistor
* Garmin LIDAR-Lite v4 x2
* Raspberry Pi Case
* Adafruit USB Microphone
* 12W USB C Power Adapter (RPI)
* Laptop (Pi SSH)
* Mobile Device (App observation)

**Software:**

* Python Scripts:
  + Lidar, mic, thermistor data sourcing and transmission
* Amazon Web Services (Backend)
  + AWS Cognito
  + AWS DynamoDB
  + AWS Amplify
  + AWS AppSync
  + AWS TimeStream
* React Native Mobile Application

**2.0 Test Setup**

The Raspberry Pi will be turned on and connected to BU’s network. Next, the team will ensure the Lidar and thermistor are properly wired. Then, the team will SSH into both Pi’s to display real-time data and observe changes in room conditions.

**3.0 Test Procedure**

1. SSH into both Pi’s on team member’s laptops
2. Run microphone script on encased Pi at team bench
3. Observe changes in noise level (low, medium, high) as team members talk closer and further away from the mic
4. Run Lidar and thermistor script on Pi at the lab door entrance
5. Observe changes in temperature as the thermistor is wrapped in a team members hand
6. Walk in and out of the door in following groupings to observe headcount change:
   1. Two people exit
   2. One person enters
   3. One person enters, one person immediately exits
   4. One person exits
   5. Two people enter
   6. Three people exit
   7. Three people enter

**Lidar Results (75% Accuracy Acceptable)**

| Data set # | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Expected Headcount | 0 | -2 | -1 | -1 | -2 | 0 | -3 | 0 |
| Received Headcount | 0 | -2 | 0 | -1 | -2 | 2 | –1 | 3 |

**Thermistor Results**

| Data set # | 1 | 2 | 3\* | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Thermistor Data | 70.8 | 70.8 | 70.9 | 80.1 | 80.4 | 80.7 | 80.9 | 81.2 | 81.5 | 81.7 |

\*Thermistor wrapped in hand after this sample

**Microphone Results**

| Data set # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Microphone State | 1 | 1 | 0 | 1 | 2 | 2 | 1 | 1 | 0 | 1 |

0 = Low

1 = Medium

2 = High

**3.0 Conclusions**

From the measurements taken, we can confirm that the Microphone state system is working extremely well and accurately reporting the current volume of the room. In a real application it will be dependent on the client to calibrate it accurately, but it’s now shown that it is effective if set up properly. Similarly, the thermistor is performing well as in the first prototype test, even though it’s now integrated into the Lidar circuit. The Lidar was performing extremely well leading up to the testing, with 80-90% accuracy. However, upon the testing it was extremely inaccurate, typically double counting entrances while exits remained the same. This may have been due to last minute adjusting of the angle for the entrance lidar, or it may have been the adjusted angles of entry due to the testers standing near the door frame. Regardless, it shows that there is still a lot of work to be done in accuracy and reliability for the lidar system.