EE / CprE / SE 491

Project title: Small-Form-Factor Solar-Powered Self-Sustainable IoT Sensors with

   Long-Range Wireless Communication

October 14 - October 28

Group number: 7

Client &/Advisor: Dr. Cheng Huang and Dr. Meng Lu

Team Members and roles:

Calvin Condo - LoRa Module

Qin Xia - Sensors

Chuxin Chen - Arduino / Sensors

Lun Zhang - LoRa Wireless module/Arduino

Yuchen Zhao - LoRa Wireless module/Arduino

Luke Healy- Arduino/Sensors

Previous Week

In our previous weekly report, we discussed how we researched and ordered components for our project. Specifically, we ordered the light sensor, the combined humidity and temperature sensor, and the LoRa modules. We also finished writing test plans which included learning the fine details of the device, creating schematics, and writing code.

Weekly Summary

- LoRa Module

  For the LoRa module, we decided to go with the HC-12 wireless module for its long range communication, low power consumption, and compatibility with the Arduino Uno. After placing the order, we began to study the device in more detail. Specifically, we studied the data sheet to get an understanding of the device and started writing code as well as utilizing online resources. Our testing has been delayed since we have not yet received the HC-12 module in the mail.

  The code we wrote for testing will send data from the transmitter every minute. During the time the HC-12 is not transmitting it will enter a sleep mode to conserve power. The

clock is set up by delaying the code (every loop we delay one second). This method does not account for code execution time, so if it proves to be too inaccurate during testing we will have to modify this method. To test data being transmitted, we plan to connect a potentiometer to the transmitter and an LED to the receiver. By adjusting the potentiometer, the LED on the receiver side should change in brightness. The receiver is coded to receive data whenever data is available. This will confirm that data is being transmitted and we can move on to implementing the project sensors.

- Sensors

  In the previous week, we researched and prepared plans for both the sensors. For the combined humidity and temperature sensor, we prepared a code that will take measurements every two seconds. The only wiring required was connecting power, ground, and the data pin. Once the code was running, we tested the sensor by breathing on it and seeing the change in the readings. We realized there is some delay in the readings, but this should not be a problem in our project as there is not quick changes in sensing.

  For the light sensor, we had the same plan layed out as for the humidity/temperature sensor. The light sensor came on a board without connection pins, so we soldered pins to the board in order to test using a breadboard. So far, we have successfully done coding on reading the output for a single light sensor. Our final design will incorporate four light sensors/photo diodes, a temperature sensor, and a humidity sensor. We have begun writing code and planning a schematic for a complete sensor layout.

Pending Issues

We have not received the LoRa module, so our testing for the component has been delayed. Once we are able to test the LoRa module, we will be able to move on to integrating it with our sensors. We also need to start designing our PCB. We expect this to be challenging since our group has little to no experience designing PCBs. We have reached out to ETG who will lend us a guiding hand during the PCB design process.

Team Contributions

Team Member	Contribution	Hours this Period
Calvin Condo	LoRa module research and design.	24
Chuxin Chen	Sensors and Arduino research, coding, and testing.	23
Qin Xia	Research and rewrite the Arduino code.	20
Yuchen Zhao	LoRa module and Arduino research and testing	21
Lun Zhang	Sensor testing and Lora module research	20
Luke Healy	Sensor testing, Arduino research, Light sensor module configuration research	20

Upcoming Week

We plan to begin LoRa module testing and PCB design. We have a few tests planned for the LoRa module including basic communication and adjusting an LED brightness. Once the testing for LoRa module is complete, we will put it together with our sensors for testing and adjustments. While this is happening we will begin our PCB design with the help of ETG and other resources. The PCB design will be in two parts: the light sensors and the rest of the electronics. They will be connected via ribbon cable. We will also begin preparing for the design review due dead week.