sdmay18-38: Smart Wireless Ag Sensors for Measurement of Soil Water Contents

Week 6 Report
October 26 - November 2

Team Members

Colin Cox — *Software*
Wage Miller — *Hardware - Control box*
Jarrod Droll — *Hardware - Sensors*
Rachel Hoke — *Hardware - Sensors*
Scott Rowekamp — *Software*
Tyler Thumma — *Hardware - Control Box*

Summary of Progress this Report

A) Sensors:
This week we began fabricating our sensors in lab. In our first attempt we applied FeCl3 onto the electrodes for the recommended 15 seconds in order for the chemical reaction of Ag to AgCl to occur. From what we could tell this process occurred exactly as expected. Next, we soldered the two wire leads onto the sensor and tested the conductivity. The sensor had good conductivity and we proceeded to apply the PDMS membrane. After applying the PDMS membrane our conductivity was good, but we noticed a discrepancy with our sensors and the correctly completed sensor given to us. After further investigation and consulting from our faculty advisor we found that the chemical reaction of Ag to AgCl did not occur correctly. After attempting to correct this issue by adding more FeCl3 we found that the PDMS prevents the chemical reaction from re-occurring.

B) Application/Software:
Setup 3d printer to use to make a new enclosure for the product. Then we made a few test objects to iron out the issues with the printing process and assess the build quality of the prints. Researched ergonomic designs for the control box.

C) Control Box:
This week for the control box we met and start to redesign and optimize the circuit design to be on both sides. We were able to optimize the PCB by placing Op-Amps on both sides of the board. We also placed our resistors and capacitors on both sides as before to ensure complete optimization. This helped reduce the circuit size by ½.

Pending Issues

Sensor:
The issue we found is that 15 seconds may not be long enough for the chemical reaction to occur. After 15 seconds the color should change from brighter silver to a darker gray, the color in our sensor stayed consistently silver.

App:
Still no requirements for what the apps functionality. We need to acquire some Isopropyl Alcohol to use with the 3D printer.

Control Box:
At this time, we are looking on also implementing our Voltage Booster to our PCB to reduce the size as well. We are currently trying to find the exact circuit diagram to implement this onto our PCB. This in turn will help us

with reducing the overall size of our control box.

Plans for Upcoming Reporting Period

Sensors:
We plan on repeating the fabrication process on another sensor and we plan to allow the FeCl3 more time to complete the chemical reaction.

App:
Develop prototype app that connects to mesh network and displays status of the sensors

Ctrl Bx:
We plan on designing the circuit further with the voltage booster on the board.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Colin Cox	Continued research on mesh network capable devices	3	23
Wage Miller	Created new design for new circuit design to optimize both sides of the board.	3	22.5
Jarrod Droll	Began fabrication of sensors. Documented errors found during the fabrication processes. Develop possible alternatives to correct this problem.	3	23
Rachel Hoke	Began fabrication of sensors. Documented errors found during the fabrication processes. Develop possible alternatives to correct this problem.	3	23.5
Scott Rowekamp	Continued research on mesh network capable devices	3	21.5
Tyler Thumma	Created new design for new circuit design to optimize both sides of the board.	3	19