

EE/CprE/SE 491 Weekly Status Report 8

Dates: 3/19/18 – 3/23/18

Group #: 5

Project: Micro-Electro-Mechanical Systems (MEMS) Based Sensing System for Soil Conditions Monitoring

Client: Dr. Halil Ceylan

Advisor(s): Shuo Yang and Dr. Yang Zhang

Team Members:

Nathan Coonrod (Report Manager)

Kyle Kehoe (Communications Manager)

Jacob Verheyen (Meeting Facilitator)

David Severson (Web Master)

Sok-Yan Poon (Timeline Manager)

Weekly Summary

Our objective for the week was to make technical progress at the hardware and software level of our project. In addition, we discussed our approach for recreating the MEMS temperature and capacitance sensors. Our project team split up into two different groups to tackle both hardware and software tasks. On the hardware side of things, work was done on tackling the capacitance measurement circuitry and troubleshooting a temperature measurement channel that wasn't working properly. The temperature channel was successfully troubleshooted, and SPICE simulation is currently ongoing to better choose circuit component values and get desired circuit behavior for the capacitance measurement circuit. On the software side of things, we wrote Arduino code that allowed us to record and log data for one of our temperature measurement channels. The accuracy of the temperature readings still need to be tested, and the code we wrote can be modified to include the second temperature measurement channel.

Past Week Accomplishments

- Kyle: Wrote Arduino code to implement data-logging for a temperature measurement channel.
- Nathan: SPICE capacitance measurement simulation, continued breadboarding analog front end.
- Jacob: Troubleshoot and fixed resistance measurement circuitry on prototype.
- David: Worked on capacitance measurement simulations in Multisim. Continued working on capacitance measurement circuitry.
- Sok-Yan: Worked on Arduino code to implement data-logging for temperature measurement; talked to Professor Tuttle about sensor wafer recreation.

Pending Issues

We are still in the process of implementing a capacitance measurement circuit for the moisture measurement channels in the data acquisition system. PSpice simulations are being done to better understand circuit behavior and choose appropriate component values for the circuit. In addition, the MEMS sensors still need to be recreated at the Microelectronics Research Center at Iowa State. We have received the photolithographic masks and are coordinating with appropriate faculty to take the necessary steps to have the sensors recreated (fabricated) on a wafer.

Individual Contributions

Name	Contribution	Hours This Week	Hours Cumulative
Kyle	Wrote Arduino code to implement data-logging for a temperature measurement channel.	3	31
Nathan	Analog front end prototyping and SPICE simulation.	3	31
Jacob	Troubleshoot and fixed resistance measurement circuitry on prototype.	4	28
David	Worked on capacitance measurement simulations in Multisim. Continued working on capacitance measurement circuitry.	4	31
Sok-Yan	Worked on Arduino code to implement data-logging for temperature measurement, talked to Professor Tuttle about sensor wafer recreation.	4	31

Plan for Coming Week (3/26/18 – 3/30/18)

We will spend more time making technical progress on the capacitance measurement circuit for the data acquisition system and start writing code that can datalog these measurements. Also, we will continue coordinating with appropriate faculty to have the MEMS sensors fabricated as soon as possible since it will take approximately one week for the fabrication process to be completed.