

EE / CprE / SE 492 – sdddec19-19

Printed Miniature Nutrient Sensors

Bi-Weekly Report 4

10/12/19 - 10/25/19

Client : Dr. Liang Dong

Faculty Advisor : Dr. Liang Dong

Team Members

Jonathan Hugen - Manufacturing and Testing
Samuel Keely - Software and App Development
Jeremy-Min-Yih Chee - Software and App Development
Clayton Flynn - Manufacturing and Testing
Ritika Chakravarty - Circuit Design

Weekly Summary of Advisor Meeting 10/3/19 and 10/10/19

We discussed possible methods to reduce battery consumption by the sensor box. We also discussed the ideal number of data transmissions per day to achieve the same. We decided to have the number of data collections be based on the change in data. Higher frequency responses in data will cause higher data collection and transmission frequencies.

Weekly Summary of Group Meeting 10/3/19 and 10/10/19

We discussed the details of using sleep to save power on the sensor. We also discussed the advantages of using the cellular module to do the adc conversion for the sensor. The process of how we will test the different functionalities was also discussed. The field data will be used to help test and calibrate our project. We also discussed a new timeline for testing and a procedure to test the sleep mode function on our microcontroller.

Past Two Weeks Accomplishments

Jonathan Hugen:

- Started a tracking system for progress with ISM application
- Applied 11 patterns to a test wafer and got a good testing procedure
- Communicated with the TA that will help us with surface topography measurements
- Attended weekly meetings

Samuel Keely:

- Application Optimization
- Server design work
- Database design and interface specification
- Verification of code used for Arduino system

Jeremy-Min-Yih Chee:

- Attended weekly group meetings to discuss current project status, and timelines.
- Successfully set up remote server.
- Recalibrate server to support Zapier
- Ran test on remote server to ensure that data connection is successful.

Clayton Flynn:

- Attended weekly meetings
- Deposited material on the dot array and identified pattern variables
- Got wafer separated into different sections to avoid damaging entire wafer
- Set up table to record data and parameters

Ritika Chakravarty:

- Met with group for weekly meeting.
- Ordered parts for battery sensor meter.
- Studied raw data from previous field tests of the sensors.

Pending Issues

The ISM dries extremely quickly. We need to come up with a way to speed up and automate the programming of new patterns so the applicator tip does not clog between applications. The Cellular Module has to be able to go into deep sleep mode which it can according to the data sheet. We still have yet to get it to work. We are also considering eliminating the entire arduino module in favor of using the microcontroller on the cellular module to do the functions of the arduino. The server also has not been established yet and we have yet to get reliable communication to it.

Individual Contributions

Member	Projects	Hours	Total Hours
Jonathan Hugen	<ul style="list-style-type: none"> - Practice dispensing ISM on PCB test wafer - Learn how to scale and rotate programs - Write subroutines - Diced wafers and prepared ISM for dispensing - setup progress tracking spreadsheet for ISM patterns - 3D printed a camera lens cap to reduce reflectivity 	18	44
Samuel Keely	<ul style="list-style-type: none"> - Develop Server prototypes - Create Server side interface for database - Implement Database design - Discussed questions to ask Dr. Dong 	3	15
Jeremy-Min-Yih Chee	<ul style="list-style-type: none"> - Recalibrate the server as Zapier does not support the latest version of mySQL. - Set up remote server, so that we can test the data transmission of the cellular module to the database. - Research on potential method of connecting the cellular module to the current MCU being used. - In the end, we decided to import the entire source code of the current MCU into the MCU of the cellular module to reduce communication complexity. 	7	47
Clayton Flynn	<ul style="list-style-type: none"> - Attended weekly meetings - Deposited material on the dot array and identified pattern variables 	18	43

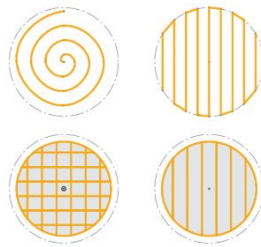
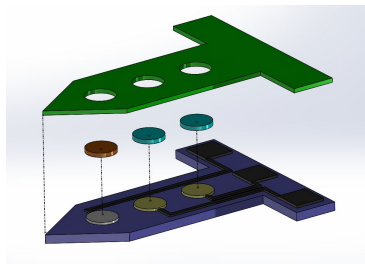
	<ul style="list-style-type: none"> - Got wafer separated into different sections to avoid damaging entire wafer - Set up table to record data and parameters 		
Ritika Chakravarty	<ul style="list-style-type: none"> - Met with group for weekly meeting. - Ordered parts for battery sensor meter. - Studied raw data from previous field tests of the sensors. 	3	23

The total hours in the above table includes the hour from CprE/EE/SE 491.

Plans For Upcoming Week

Jonathan Huguen

- Write a program for the fluid dispensing robot to coat the top of the silicon sensor with epoxy (shown in green) and the gold pads with ISM (shown as light blue dots).
- Incorporate sub-routines to make pattern application a more automated process. I'm still having trouble with long setup times. We need a faster method for dispensing.
- Find a way to purge the applicator tip more quickly.
- Get trained/introduced to the atomic force microscope.
- Reduce reflectivity problem with camera to eliminate the blind spot in the middle of the camera.



Samuel Keely

- Server SQL foundation
- Arduino code check
- Application design

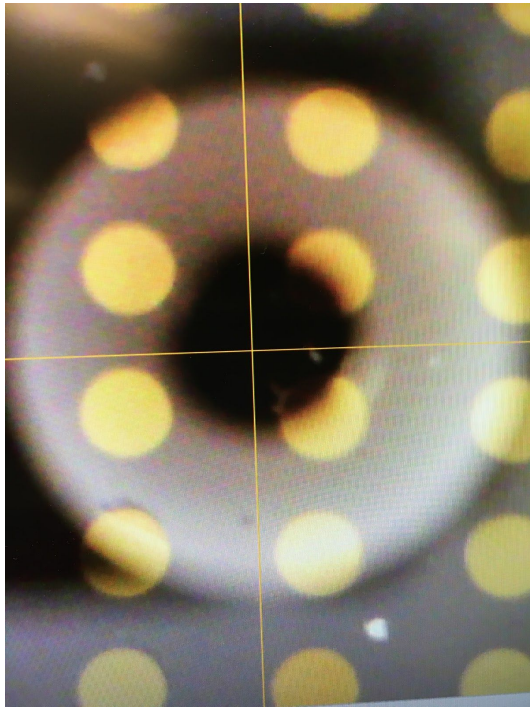
Jeremy-Min-Yih Chee

- Continue working on getting the cellular module to successfully transfer data to the database and stores it in there.
 - Assemble the entire data transfer system online (Cellular module, Database, and App)
- Work on migrating the source code of the current MCU into the MCU of the cellular module to reduce the complexity of the system.

Clayton Flynn

- Work on improving dispensing pattern
- Measure profiles of the with AFM to help find the best performing patterns
- Work on being faster to avoid material evaporating

- work on reducing the reflection of the camera on the wafer



Ritika Chakravarty

- Test battery sensor meter output.

-Re-caliberate sensor box with current data and test output curve.

Future Plans

We work on implementing the sleep function on the cellular module. The cellular module will use the adc pin instead of the arduino to make things simpler. The sleep function will adjust to send more data when the nitrate levels are changing. The sensor material will be measured and the future patterns will be adjusted according to the results. The battery sensor will be arriving soon and will be implemented into the box and app.