EE / CprE / SE 492 – sddec19-19
Printed Miniature Nutrient Sensors
Bi-Weekly Report 5
10/26/19 - 11/8/19
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 10/31/19 and 11/7/19
We discussed the methods to make the dispensing more reliable. We also discussed that the arduino is unnecessary and the cellular model can replace the functionality. The interface between the cell module and the sensor will need to be updated. The app needs to be updated to have a graph displayed.

Weekly Summary of Group Meeting 10/31/19 and 11/7/19
We discussed the details of using sleep to save power on the sensor. We also discussed replacing the arduino with the cellular module. The process will be tested using the sensor box with a function generator. The field data will be used to help test and calibrate our project. We also discussed testing the interfAce between the sensorbox and the database.

Past Two Weeks Accomplishments
Jonathan Hugen:
- Deposited ISM on over 150 sensor pads
- Perfected the pattern and setup the robot for faster pattern application
- Got trained on the Stereo Microscope and collected images for analyzing
- Got trained on the Phase Contrast Microscope and collected images for analyzing
- Prepared for analyzing the test wafers on the Atomic Force Microscope
- Developed a cleaning operation for the dispensing tip
- 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 and advisor meetings to discuss current project status, and timelines.
- Work on presentation slides.
- Successfully set up the data transmission aspect of the project, where the cellular module will be able to transmit the data to the cloud and store it in a database (Losant)
- Modify a portion of the source code so that it will work accordingly with the cellular module.

Clayton Flynn:
- Attended weekly meetings
- Deposited material on the dot array and identified pattern variables
- Put focus on spiral patterns because they were giving the best results
- Viewed deposits under contrast microscope
- The profiles appeared flat by observation
- Found solution to clean dispensing tip between dots to improve consistency

Ritika Chakravarty:
- Met with group for weekly meeting.
- Contributed to slides for PIRM.
- Studied raw data from previous field tests of the sensors.
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Pending Issues
The database needs to be interfaced with the app. The arduino is being removed from the box, so the cell module will need to be setup to replace the arduino's functionality. The semester is getting closer to the end, so time may begin to be a constraint. The ism profiles need to be measured with the ism, so we will need to get access to the device.

Individual Contributions

| Member	Projects	Hours	Total Hours
Jonathan Hugen	- Practice dispensing ISM on PCB test wafer - Learn how to scale and rotate programs - Get trained on the Atomic Force Microscope - Deposit epoxy coating around ISM deposits - Inspect the epoxy coatings and get them approved by Dr. Dong	21	65
Samuel Keely	- Develop Server prototypes - Create Server side interface for database - Implement Database design - Discussed questions to ask Dr. Dong	3	15
Jeremy-Min-Yih Chee	- Work on presentation slides for upcoming PIRM. - Successfully implemented the data transmission from cellular module to the Losant's database. - Instead of using mySQL and Zapier, Losant's IoT platform is used as it provides functionalities like a visual workflow engine and real-time visualization of our data. - Modify a portion of the source code so that it can be integrated smoothly into the cellular module.	20	67
Clayton Flynn	- Attended weekly meetings	15	58

	- Deposited material on the dot array and identified pattern variables - Put focus on spiral patterns because they were giving the best results - Viewed deposits under contrast microscope - The profiles appeared flat by observation - Found solution to clean dispensing tip between dots to improve consistency		
Ritika Chakravarty	- Met with group for weekly meeting. - Contributed to slides for PIRM. - Studied raw data from previous field tests of the sensors.	3	30

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

Plans For Upcoming Week
Jonathan Hugen
- 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 subroutines and step and repeat to make pattern application a more automated process.
- Find the right variables for depositing epoxy on the ISM
- Get trained/introduced to the atomic force microscope.
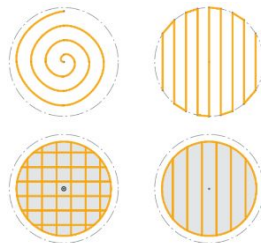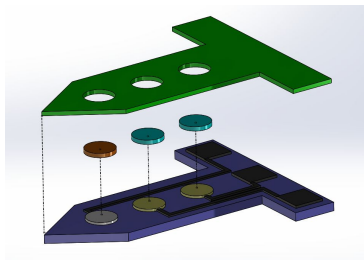
Samuel Keely
- Server SQL foundation
-Arduino code check
-Application design

 Jeremy-Min-Yih Chee
- Continue working on migrating the source code of the current MCU into the MCU of the cellular module to reduce the complexity of the system.
- Work on removing the bluetooth module since the data transmission with cellular network has been deployed.
 - Test the power consumption of the cellular module when data are being transmitted.

Clayton Flynn

-Work on improving dispensing pattern

- Measure profiles of the with AFM to help find the best performing patterns

- Start sealing the edges of the dots with the epoxy

- See if the line spacing played affects the profile on the AFM

Ritika Chakravarty

- Perform function generator test on Cellular module.

- Perform function generator test on battery sensor.

Future Plans

The profile of the ISM is relatively flat, so the focus will be switched to the epoxy to seal the edge. The cell module will be used instead of the arduino, so the pins will need to be programed and switched to the module. We will map out the power consumption of the messages and reading so we have a better idea of what the power consumption is at. The app needs to be connected to the database. The app will also continue to be worked on.