

# EE / CprE / SE 491 – sddec19-19

## Printed Miniature Nutrient Sensors

### Weekly 5 Report

3/11/19 - 3/15/19

**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 Advisor Meeting 3/14/19

This week we once again discussed the design document for the project. We discussed working with one of the grad students to get a better understanding of the current state of the app and network. We also discussed the the process of using the nano printer for the project. The sensor will need to be waterproofed around the edges and the coating of the sensor will need adjustment to have a level surface. The current sensor was being tested in the lab looking at the long term function. We accumulated a list of questions for Dr. Dong that needed to be answered for us to complete the design document.

#### Weekly Group Meeting 3/13/19

This week we discussed the design document for the project. We covered how the readout circuit will be implemented in the sensor. We will not be meeting over break as most members will be gone. We will begin work on the project for next week. We will be contacting the Grad students for help on the project and understanding the current state. We further discussed how we will divide the work of the project and the roles are listed above.

#### Past Week Accomplishments

Jonathan Hugen:

- Met with Yun cung who is my advising TA
  - Toured the lab
  - Discussed basic safety procedures
  - Learned how to operate the micro-fluid dispenser
  - Got detailed explanations of problems associated with micro-fluid dispensing process
- Looked into what files it takes to 3D print
  - Found computers on campus that support correct software
  - Practiced drafting and file conversion for machine use
- Researched some various polymers we will be using in the project

Samuel Keely:

- Enumerated proposed features for the application
- Began designing interfaces for application
- Started work on database design and information storage requirements

Jeremy-Min-Yih Chee:

- Attended to this week's meeting with the professor to discuss about the fabrication of the sensor.
- Have basic understanding of LoRaWAN
- Research on required Standards for networking protocol and app development.

Clayton Flynn:

- Attended weekly meetings
- Worked on Design Project
- Met with advising TA Yuncung
- Toured the lab
- Received instruction for operating the micro-fluid dispenser

Ritika Chakravarty:

- Attended weekly meetings.
- Discussed and compiled a list of questions to ask Dr. Dong during our weekly meetings.
- Contacted post grad. student working on the nutrient sensor project with Dr.Dong, regarding circuit diagrams for the sensor.
- Studied the materials used in the circuit and their relevance to the circuit.

### Pending Issues

We currently have no access to market surveys regarding the sensors. Therefore, we are not completely sure how well this product was received and how it can be improved from the perspective of the customer. We are still waiting to gain access to the greenhouses North of the ISU campus. Our sensors will be tested in the greenhouse. We are also waiting to meet with the graduate students who will be assisting us with the project including a chemistry student, a software engineer, and an electrical engineer.

### Individual Contributions

Member	Projects	Hours	Total Hours
Jonathan Hugen	<ul style="list-style-type: none"><li>- Research CAD systems</li><li>- Contact grad students for project details</li><li>- Practised dispensing fluid on silicon wafers</li><li>- Leaned calibration methods for dispensing machine</li><li>- Learned some simple programming for dispensing machine</li></ul>	3.5	13
Samuel Keely	<ul style="list-style-type: none"><li>- Set up database through ETG</li><li>- Discussed questions to ask Dr. Dong</li></ul>	2	10
Jeremy-Min-Yih Chee	<ul style="list-style-type: none"><li>- Attended weekly meetings with Dr. Dong and team meetings.</li><li>- Continue research on potential optimizing techniques for both the sensors and app.</li><li>- Worked on Design Document</li></ul>	2	13
Clayton Flynn	<ul style="list-style-type: none"><li>- Attended meetings</li><li>- Worked on design document</li><li>- Learned how to calibrate the dispensing machine</li></ul>	2	10

	- Learned the basics of dispensing with the program		
Ritika Chakravarty	<ul style="list-style-type: none"> <li>- Attended weekly meetings.</li> <li>- Discussed and compiled a list of questions to ask Dr. Dong during our weekly meetings.</li> <li>- Contacted post grad. student working on the nutrient sensor project with Dr.Dong, regarding circuit diagrams for the sensor.</li> <li>- Studied the materials used in the circuit and their relevance to the circuit.</li> </ul>	3	14

### Plans For Upcoming Week

#### Jonathan Hugen

- Schedule times to meet with TA to start writing programs for micro-fluid dispensing machine
  - Read through instruction and setup manual
  - Practice calibration and simple programming
- Research bonding methods for polymers
  - Long chain vs short chain polymer resins
  - Cost of processes
  - Ultrasonic bonding
- Research printing materials and properties
  - UV stability
  - Heat Sensitive
  - Bonding strength
  - Nitrogen permeability
  - Mechanical/ thermal stability
- Design Document

#### Samuel Keely

- Design document
- Obtain and break down previous application versions
- Further elaboration of sensor data and storage methods

#### Jeremy-Min-Yih Chee

- Waiting for post graduate student reply to schedule a meeting to obtain the design documents for the app.
  - Design optimization process of the app accordingly and additional functionality as discussed with the professor.
    - Additional Functionality includes:
      - Sensor tracking capabilities
      - Data Cloud Storage
- Work on design documents
  - Draw and design an interface diagram for the app and server interfaces.
  - Work on Introduction section of the design documents

#### Clayton Flynn

- Work on design document

- Research 3d printing for the sensor
- Research bonding for polymers
- Research how viscosity will affect distribution on the silicon wafers
- Learn the programming for the printer

### **Ritika Chakravarty**

- Organize and summarize list of questions to ask Dr. Dong during our weekly meetings.
- Analyze circuit diagram for nutrient sensor.
- Continue to research methods to reduce power consumption of circuit by making minor modifications to the circuit.

### **Future Plans**

Next week we hope to have our Design Document nearly complete by early next week if our schedules permit. We also would like to meet the graduate students we will be working with. Lastly, we would like to obtain portions of the slideshow presentation that he has put together during the grant approval process for this project. His slideshow should have most of the information we need to understand more of the scope of the project. We are compiling any remaining questions about the project to send to Dr. Dong in an email so we can communicate over next week. We will soon be gaining access to the lab and greenhouse and be meeting the graduate students we will be working with.