

# EE / CprE / SE 491 – sdddec19-19

## Printed Miniature Nutrient Sensors

### Weekly 4 Report

3/4/19 - 3/8/19

**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 Advisor Meeting 3/7/19

This week we 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 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.

#### Weekly Group Meeting

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:

- Introduction to CAD
- Looked into what files it takes to 3D print
- Researched some various polymers we will be using in the project
- Setup cloud based CAD account and started drafting objects
- Researched bonding methods for polymers

Samuel Keely:

- Attended the weekly meetings and discussed some basic design constraints
- Researched php
- Researched sql
- Looked into ETG database

Jeremy-Min-Yih Chee:

- Completion of understanding python.
- Attended to this week's meeting with the professor to discuss about the design documents of the current sensor.
- Have understanding of the sensors' current testing phase.

- Currently, the sensor is being tested in a controlled environment inside the lab as testing in an open environment is not optimum with the current weather.

Clayton Flynn:

- Attended weekly meetings
- Worked on Design Project
- Looked at LoRaWAN for transmitting data
- LoRaWAN should be able to transmit long distances as we need.

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.

### 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>- Gain familiarity with cloud based CAD software</li> <li>- Research on ultrasonic bonding</li> </ul>	1.5	9.5
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>- Start to find the best possible ways of optimizing the app and network of the sensor.</li> <li>- Set up database through ETG</li> </ul>	2	11
Clayton Flynn	<ul style="list-style-type: none"> <li>- Attended meetings</li> <li>- Discussed questions to ask Dr. Dong</li> <li>- Worked on design document</li> </ul>	2	10
Ritika Chakravarty	<ul style="list-style-type: none"> <li>- Attended meetings.</li> <li>- Summarize data for Project Plan.</li> <li>- Revised circuit design basics.</li> </ul>	2	11

### Plans For Upcoming Week

#### Jonathan Hugen

- Research bonding methods for polymers
  - Long chain vs short chain polymer resins

- Cost of processes
- Ultrasonic bonding
- Research nano printing
- Research printing materials and properties
  - UV stability
  - Heat Sensitive
  - Bonding strength
  - Nitrogen permeability
- Design Document

### **Samuel Keely**

- Design document
- Further elaboration of sensor data and storage methods

### **Jeremy-Min-Yih Chee**

- Have a meeting with one of the PhD student to obtain the design documents for the app.
  - Have full understanding of the design documents.
  - Design optimization process of the app accordingly and additional functionality as discussed with the professor.
    - Additional Functionality includes:
      - Sensor tracking capabilities
      - Data Cloud Storage
- Research on LoRa (digital wireless data communication).
  - Learn how to calibrate LoRa to work with the present system via online resources.

### **Clayton Flynn**

- Work on design document
- Research 3d printing for the sensor
- Research bonding for polymers
- Learn CAD for printing and circuit box space management

### **Ritika Chakravarty**

- Organize and summarize list of questions to ask Dr. Dong during our weekly meetings.
- Analyze circuit diagram for nutrient sensor.
- Update design plan 2.

### **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.