

## **EE/CprE/SE 492 BIWEEKLY REPORT #3**

**Sept 28th 2022 – Oct 11th 2022**

**Group number: SDDEC22-12**

**Project title: Creating DNA from scratch for DNA-based data storage**

**Client &/Advisor: Meng Lu**

**Team Members/Role: Connor Larson/Software Engineer , Kyle Riggs/Software Engineer , Brandon Stark/Electrical Engineer , Nathan Armstrong/Electrical Engineer , & Lucas Heimer/Electrical Engineer**

### ○ **Weekly Summary**

Finished modeling and printing the LCD holder. Worked with the Arduino Nano to send a signal to the LED microcontroller. Tested the power output of the light through the LCD screen using the power meter. Testing of the microfluidic system was conducted and adjustments are continuing to be made for improvements to the overall efficiency.

### ○ **Past week accomplishments**

- Team Member 1 (Connor): Spent time with the Arduino Nano. Was able to get code properly uploaded to it. Also researched potential reasons why I cannot import the Fluigen Library.
- Team Member 2 (Kyle): Made multiple matrices to simulate DNA sequences that can be printed. Started work on having a timer dynamically display them sequentially.
- Team Member 3 (Brandon): Modeled and printed extended LCD holder in order to reduce the heat towards the LCD screen. Troubleshoot Arduino Nano.
- Team Member 4 (Nathan): Used the power meter to determine the power going through the LCD screen. Used the measurements to find the energy, then related that to the energy at the lower light wavelength.
- Team Member 5 (Lucas): Conducted testing of the microfluidic system to try to prevent blockages in the narrow tubing. Tested subcomponents that will be used to house the DNA samples in a smaller volume tubing.

### ○ **Pending issues**

- Team Member 1 (Connor): Importing the Fluigen library to my C++ project.
- Team Member 2 (Kyle): Code issues getting the timer to work dynamically updating matrices. Also need to get the dimensions of the display correct.
- Team Member 3 (Brandon): We might have to use a different LCD screen so that enough power from the UV light can get through the LCD screen. The new LCD extension might be too far away from the LED.

- Team Member 4 (Nathan): The power the LCD screen allows through is not enough for the breakdown of the DNA. We need to figure out a solution to allow more power through the LCD in order to have a single cycle go fast enough to avoid damaging the LCD screen.
- Team Member 5 (Lucas): Implementation of a flow unit will allow us to control the exact volume being pushed through the system. This could help us improve the efficiency, especially when considering the limited supply of nucleotide samples we have.

○ **Individual contributions**

<b><u>NAME</u></b>	<b><u>Individual Contributions</u></b>	<b><u>Hours this week</u></b>	<b><u>HOURS cumulative</u></b>
Member 1 (Connor)	Researched ways to get Fluigen library properly installed. Got Arduino Nano configured.	12	30
Member 2 (Kyle)	Matrices set to model DNA sequence and timer implementation.	12	30
Member 3 (Brandon)	3D modeled and printed LCD extension. Troubleshoot Arduino Nano.	12	30
Member 4 (Nathan)	Measured the power of the system. Researched alternatives to the LCD screen we currently have.	12	30
Member 5 (Lucas)	Continued testing of the microfluidic system and adjustments made to improve performance. Continual brainstorming of new ways to increase efficiency.	12	30

○ **Plans for the upcoming week**

- Team Member 1 (Connor): Link C++ code to Arduino script. Continue to troubleshoot Fluigen Library import & hopefully get some code written.
- Team Member 2 (Kyle): Hopefully finish the timer to dynamically update the matrices and set the dimensions correctly.
- Team Member 3 (Brandon): Create housing for the Arduino and create housing for the flow cells so that they can fit on the LCD screen without moving.
- Team Member 4 (Nathan): Finish the measurements and math for the exposure time using the power density meter. Figure out alternatives to the LCD screen that would allow more light energy through it.
- Team Member 5 (Lucas): I will begin laying out the final code for our procedures in order to gauge the time period which will be required to run each step of the process. I will also continue researching the potential implementation of the flow unit and how it can assist

with improving the overall system.

- **Summary of weekly advisor meeting**

Dr. Lu and the rest of the team discussed what we did the weeks before. We also discussed plans for moving forward on each part of the project. The hardware team needs to install and configure the Arduino Nano, as well as potential housing for the Arduino Nano. The microfluidic team needs to continue to run tests in preparation for trials with the actual biological molecules. Testing in coordination with the user interface will be conducted in the upcoming weeks. The software team received a DNA sequence from Dr. Lu that can be a specific sequence for our initial testing. We also need to figure out the timing between when we show each matrix for the most efficient printing time.