EE/CprE/SE 492 BIWEEKLY REPORT #2

Sept 17th 2022 – Sept 27th 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 LED/LCD housing model. Ordered an Arduino Nano to control the LED. Figured out how to control the Arduino Nano once implemented into the system. Further testing was performed on the microfluidic system in an attempt to increase pressure and flow rate. Different components were also tested for housing the smaller volume test tubes which will contain the DNA reagents in future trials.

- **Past week accomplishments**

    • Team Member 1 (Connor): Wrote pseudo code for Arduino and Fluigen systems. Also learned how to setup an Arduino in C#. We will be able to call these functions (LED on/off) from our main code. Looked into the Fluigen library and tried to install that into my project for testing.

    • Team Member 2 (Kyle): Implemented custom DNA matrices so we can use that to begin printing when it is ready and also started working on a random matrix generator so we can do larger tests with that when it is done.

    • Team Member 3 (Brandon): Printed out first version of the LED/LCD housing. Made several changes to the housing model and printed out a 2nd better working version. Began working with the Arduino Nano component.

    • Team Member 4 (Nathan): Printed first version of housing. Also began working on measuring the power of the UV light using a power density meter.

    • Team Member 5 (Lucas): Performed troubleshooting on the microfluidic system in order to find causes for a limited pressure supply. Found ways to seal any potential leakages and improved the overall pressure by more than three times the previous amount. This helped to improve the overall flow rate. Also began looking into the procedure that will be used in the final process and the necessary commands to be used for this part of the project.

- **Pending issues**

    • Team Member 1 (Connor): I'm unable to install the Fluigen library into my C# project. This is stopping me from being able to test the functionality of this library on our

project.

• Team Member 2 (Kyle): Getting the random values to dynamically update the matrix is tricky

• Team Member 3 (Brandon): At this point I am trying to figure out how the Arduino Nano gets configured into the LED board. The few examples I have seen have been older versions of the LED. The Arduino Nano is supposed to control the LED by when it can turn on and off.

• Team Member 4 (Nathan): No pending issues.

• Team Member 5 (Lucas): Some flow rate improvements are still required to prevent blockages and further enhance the overall efficiency of the process.

o **Individual contributions**

NAME	**Individual Contributions**	**Hours this week**	**HOURS cumulative**
Member 1 (Connor)	Research and pseudocode for Fluigen and Arduino libraries	12	18
Member 2 (Kyle)	Matrices for testing and random DNA sequence generator began	12	18
Member 3 (Brandon)	LED/LCD housing, 3D modeling/printing, and Arduino Nano configuring	12	18
Member 4 (Nathan)	Housing, power density meter, Arduino Nano	12	18
Member 5 (Lucas)	Troubleshooting of the microfluidic system, tested individual components that contain different volumes of fluid, began writing the process procedure commands.	12	18

o **Plans for the upcoming week**

• Team Member 1 (Connor): Hopefully solve the Fluigen library issue. I want to test the basic functions on the physical machine. I'd also like to get the Ardunio setup once it arrives.

• Team Member 2 (Kyle): This upcoming week I plan on getting more work done on the matrix generation and possibly start testing.

• Team Member 3 (Brandon): This upcoming week I plan to get the Arduino Nano configured into the LED/LCD housing. I also plan to make slight changes to the housing structure.

• Team Member 4 (Nathan): Finish the measurements and math for the exposure time using the power density meter. Continue working with the Arduino Nano to function with the other components.

• Team Member 5 (Lucas): Continue to do testing on the different components throughout

the system. I will begin shortening some of the lengths of tubing for the reagents to flow through in hopes to decrease the overall time.

- o **<u>Summary of weekly advisor meeting</u>**

  Dr. Lu and the rest of the team went over the biology behind the microfluidic part of the system and how we are going to be building single strand DNA within our process. We also discussed plans for moving forward on each part of the project. The hardware team needs to install and configure 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 discussed getting a DNA sequence from the advisor that can be a specific sequence for our initial testing. We need to figure out the timing as well between when we show each matrix for the most efficient printing time.