EE/CprE/SE 491 WEEKLY REPORT 8
March 28, 2022 – April 3, 2022

Group number: 12

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

Client &/Advisor: *Iowa State University / 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**

  On the software side we were able to build off of the simple matrix application. We started to add user input for the desired matrix size, cell size, and distance between cells. The assembly of the microfluidic system began this week and a majority of the components have been finished. Some missing components are being delivered this week which were inhibiting the progression of the build. A model for the flow cell was designed on Solidworks and will be used for fabrication once finalized.

- **Past week accomplishments**

  • Team Member 1 (Connor): Worked on adding user input to the user interface. Added the ability for a user to insert the amount of rows/columns, their size, and the distance between them. To do this, in our PWF application we had to create bindings.

  • Team Member 2 (Kyle): Worked more on the user interface of the project. Created a top section that allows users to enter matrix specifications and this will dynamically update the matrix below, which will be a preview of what will be sent over HDMI to the printer. Also, making the code very Generic. So, as the codebase gets more and more complicated it will be much cleaner and easier to implement new features.

  • Team Member 3 (Brandon): Determined how to fix the LCD screen resolution and worked with Nathan on installing and testing out new LCD screen.

  • Team Member 4 (Nathan): Continued working with the new LCD to try and implement it in our new system. I also worked with Lucas for a bit in designing the flow cell for the initial draft.

  • Team Member 5 (Lucas): Worked on designing a 3D model of the flow cell and now have an initial draft ready. Also worked on assembling the microfluidic system. Most of the system is assembled, but some components are missing so some solutions need to be designed to resolve the issues.

o **Pending issues**

• Team Member 1 (Connor): Figure out how to project the application on a specific connected display. Also, figure out how to have the application update on a button press.

• Team Member 2 (Kyle): Make a Cell object that will allow each cell to be modified depending on a DNA sequence file that will be selected by the user. Also, find a way to make the new popup window that will be the actual matrix for printing be sent over HDMI alone without sending the rest of the application.

• Team Member 3 (Brandon): We may have to modify our new LCD screen or strip the reflective backing off of it on order for more UV light to pass through.

• Team Member 4 (Nathan): The new LCD screen is still incompatible with the HDMI adapter and UV light. We will need to figure out how to remove the reflective backing from the LCD screen, or find a different LCD screen that will function how we want.

• Team Member 5 (Lucas): Need to determine a sufficient solution to allow the test tubes to become pressurized. Specialized caps are manufactured by Fluigent, but an alternative will be experimented with. Drilling holes in the top of the test tube to fit the size of the hoses for the air and switch connection may be used and sealed with glue.

o **Individual contributions**

NAME	Individual Contributions *(Quick list of contributions. This should be short.)*	Hours this week	HOURS cumulative
Member 1 (Connor)	Worked on the UI application. Helped add a user input feature.	6	48
Member 2 (Kyle)	Worked on UI design and user input functionality. Cleaned the code to be generic and meet best practices specifications.	6	48
Member 3 (Brandon)	Worked with LCD screen and its testing within our system.	6	48
Member 4 (Nathan)	Worked with the LCD screen. Helped out with the original draft of the flow cell	6	48
Member 5 (Lucas)	Worked on assembling the microfluidic system and designing the flow cell on Solidworks	6	48

- **Plans for the upcoming week**
  - • Team Member 1 (Connor): Continue to work on the application. Want to continue building off what we have. Want to add the "update" button that will send the rendered matrix to the device.
  - • Team Member 2 (Kyle): Add more objects to allow the code to be highly modifiable and clean. Have the dynamically updating preview matrix working top notch. Possibly start working on getting the real popup matrix to be sent over HDMI.
  - • Team Member 3 (Brandon): Determine if we can modify our new LCD screen or purchase a new one. Potentially create a new housing for our system.
  - • Team Member 4 (Nathan): Troubleshoot our LCD compatibility issues, as well as take the reflective back side off of the screen to see if that solves our problem. Help with finalizing the flow cell design and hopefully send it to get it fabricated.
  - • Team Member 5 (Lucas): One of the final components will be delivered early next week so the microfluidic system will be able to be completed besides the addition of the pressurized test tubes. The flow cell design will also be finalized and fabrication can potentially begin.

- **Summary of weekly advisor meeting**
  - For the software side we showed our advisor the current state of the UI. He liked how it is looking so far as well as our plans for the future. He mentioned that in the application we will have sample DNA sequences that a user can choose. These sequences will have different orders of nucleotides that will update each individual cell of the matrix for each type (ACTG). So, we need to start brainstorming ways to deal with this and I feel like we have a pretty good idea on how this will be handled.
  - The power of the UV light being passed through the LCD was discussed after some initial testing. It seems that the current LCD screen has a reflective backing causing a smaller amount of power than expected to pass through. Further testing is expected to be done to verify what can be done to account for this discrepancy.