Team 12 - Requirements, Constraints, and Engineering Standards Assignment

Connor Larson, Kyle Riggs, Brandon Stark, Lucas Heimer, & Nathan Armstrong

1.1 Problem Statement

Being able to successfully perform DNA synthesis with the use of a modified Photon Mono 3D printer that will satisfy a new medium of digital storage to keep up with increasing demand at an affordable price.

1.2 Requirements & Constraints

Requirements:

- Requires the use of a Photon Mono 3D Printer's LCD
- Requires the use of a Raspberry PI to control the LCD
- Requires Nucleotide fluid to create the micro arrays
- Design a microfluidic system for the DNA synthesis

Constraints:

- Accurately create multiple micro arrays.
- Use a Raspberry PI to control a Photon Mono 3D printer's LCD.
- Make a bug free, user-friendly User Interface to print the desired micro arrays.
- Use affordable parts to fulfill this expensive task

1.3 Engineering Standards

- IEEE 802.11 - Wireless Networking "WiFi": This standard will be applied to our project because we will be using wireless networking to communicate between our computer application, the software controller (raspberry pi), and the 3D printer itself.

- IEEE 260.1 - Standard Letter Symbols for Units of Measurement: This standard applies because we are working with a microfluidic system to make a DNA microarray. This means we will be working with very miniscule amounts of liquid pushed through holes that may just be a few millimeters wide.

- IEEE 830 - Software Requirements Specifications: We apply this standard because our project has certain parameters that we must abide by, so we have certain software requirements we must follow to develop our software to meet our specifications.

- IEEE 1588 - Precision Time Protocol: This standard is applied through our use of a 3D printer. The fluid must be applied to create the microarray at specific intervals to avoid mistakes and actually create an accurate end product.

- IEEE 802.6 - Standards for information exchange between systems: This standard is applied to our project because we will use a Raspberry PI to transfer data to a LCD and a nucleotide fluid dispenser.

- IEEE 1074 - Software Development Life Cycle: We apply this standard to our project because we will need to create a UI and a program to control the LCD and nucleotide fluid dispensation system. This code we create for this task will need togo through the Software Development Life Cycle.

- IEEE 1471 - Software Architecture / System Architecture: We apply this standard through the development of our application that the user will be interacting with as well as the system that communicates between the 3D printer and software controller. Good architecture will help immensely in the runtime of our application and how easy it will be to implement.

1.4 Intended Users and Uses

Users

- Geneticists care that it exists because it is a cheaper way to synthesize DNA that will end up saving them money and time in the end.
- Since this is a new and cheap idea that will save time and money, investors will want to invest in it.

Uses

- In regards to the LCD screen: they will upload a microarray using the user interface that we have made.
- Synthesized DNA will be used for Digital Data Storage
- The altered 3D printer will be used for DNA Synthesis Sequencing
- Synthesized Gene DNA can be used for disease research
- An individual will use our easy-to-navigate Graphical User Interface to use the printer