DNA-Based Data Storage

SDDEC23 – 05

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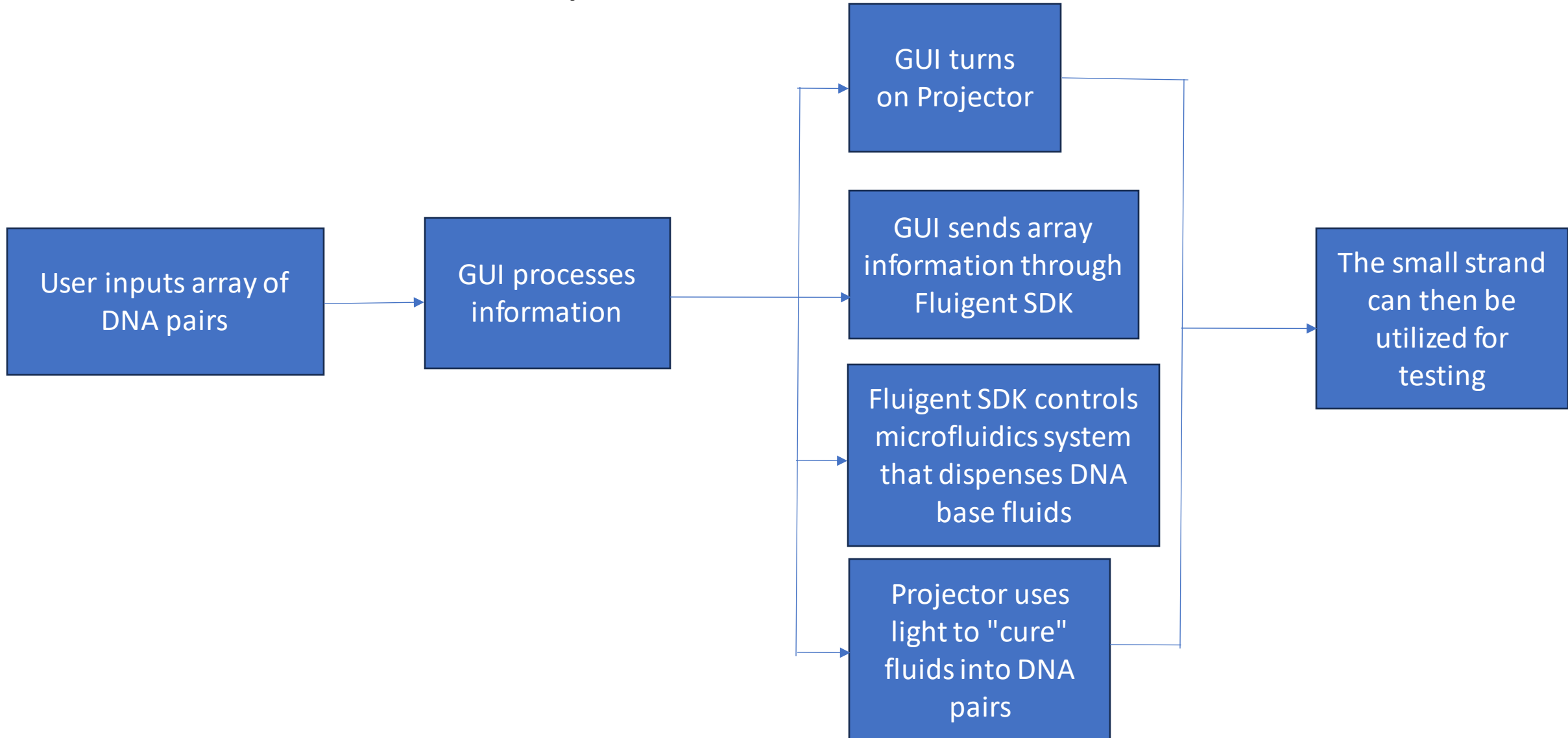
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Overview of Our Project

End Goal: Be able to print, store, and extract information from DNA with relative ease

Issue: While reading DNA is easy and inexpensive, extracting information from DNA using modern techniques destroys the DNA making it unusable again

The goal of **this project** is to create a user-friendly system that when given a string or array of DNA pairs from a user, will print a short strand of DNA that can be used for testing new techniques of extraction. Our job is to develop the system to print the short DNA strands for research and tests.

How Does Our System Work?

User inputs array of DNA pairs → GUI processes information →

- GUI turns on Projector
- GUI sends array information through Fluigent SDK
- Fluigent SDK controls microfluidics system that dispenses DNA base fluids
- Projector uses light to "cure" fluids into DNA pairs

→ The small strand can then be utilized for testing

Example of GUI:
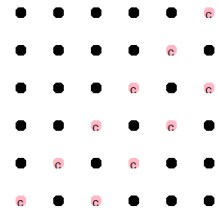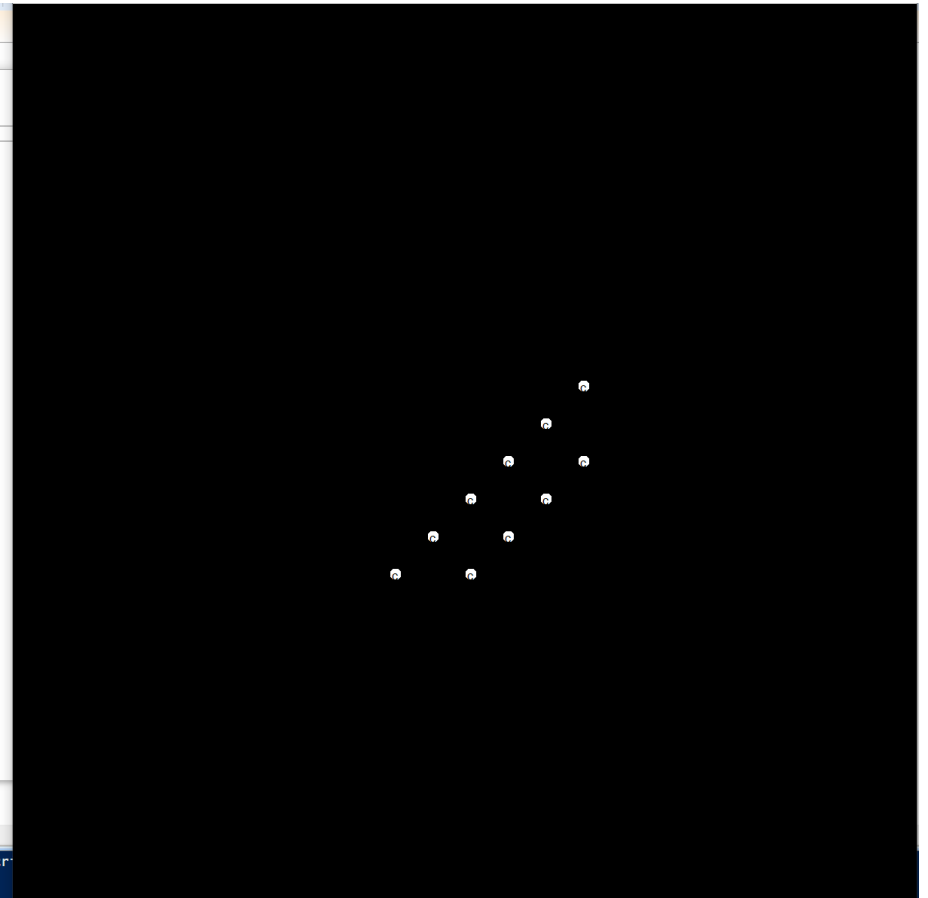
Details of Our Team and System Breakdown

- GUI Team – Evan, Colin, and Rachel
    - Language: C#
    - Platform: Powershell ISE

- Hardware – Caden
    - Projector

- Microfluidics (OxyGEN and Fluigent SDK) - Astha and Anna
    - Language: C#
    - Platforms:
        - Visual Studio Code: Fluigent Software Development Kit
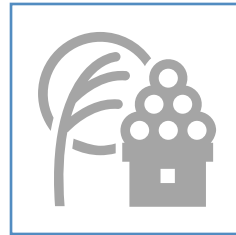   - OxyGEN: Interface with physical system

Timeline Check-in
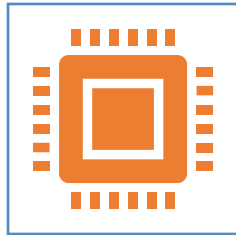
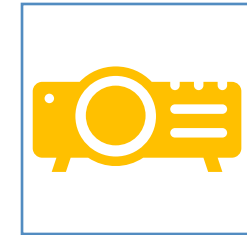
GUI

9/20/23: Finish **functionality for ease of use**

11/20/23: Integration tests with whole system

OxyGEN

9/15/23: Begin **SDK customization**

10/23/23: Integration **testing with fluidic system**

Projector

9/30/23: Evaluate **new projector**

10/16/23: Integration **and framing testing with GUI**

Goals

GUI Team:
- String shifting of DNA strand
- Integrate with OxyGEN
- Allow user to manually input the array spacing

Hardware Team:
- Rebuild housing to integrate new projector
- Find resolution of current projector
- Integrate with GUI into the printer itself

Microfluidics Team:
- Begin testing basic codes including basic valve pressure, switching between liquids, etc
- Integrate and test with OxyGEN
- Integrate with GUI and projector

Technical Challenges

GUI Team:
- Ensuring string shifting works to get **unique** over-lap in DNA strand
- Auto capture of the printing screen by the projector

Hardware Team:
- Finding the current projector resolution, adding/changing the lens to fit into the printer
- Screen mirroring to projector: currently c annot identify projector as separate display

Microfluidics Team:
- Fluigent SDK needs a specific package manager to connect to Fluigent network and resources
- Pairing and integrating the Fluigent SDK with the OxyGEN software which controls the physical components