Company Background

Dr. Owen Hildreth is an Assistant Professor in the Department of Mechanical Engineering at the Colorado School of Mines. His primary research is on nanometer to centimeter-scale additive manufacturing technologies. He has written numerous MacOS applications for custom data-collection and visualization as part of his research.

Project Description

My group develops a lot of custom software to control our instruments, often with the help of CSM computer science students. The objective of this project is to add much needed functionality to a macOS application written in Swift to control our nano-inkjet printer Fifi (see screen shot below). For this project, the team will primarily write a custom Swift Package to control two syringe pumps via ethernet to enable multi-material printing and the incorporate this new Swift Package into Fifi by writing a new "Operation" to print gradient materials by controlling the flow rate of the two syringe pumps.

Required features:

- Connect two syringe pumps via ethernet to FiFi, the Swift app that controls the nano-inkjet printer.
- Add the ability to manually control the syringe pumps with independent control over start/stop and dispense rate. Add and edit operations to take advantage syringe pump connectivity.
- Add Operation that varies dispense rate of syringe pumps in relation to dispense time to print functionally graded materials.
- Add additional operations to improve functionality.
    - Loop to clean up operation queue.
    - Print continuous line as a snake.
    - Print advanced patterns from uploaded image.

This project is an excellent opportunity for students to get experience with Swift, driver design, microcontrollers, and application design.

Deliverables

- Final design report (mandatory for all teams)
- Working drivers that includes the feature upgrades listed above
- Clearly documented and marked up code that also leverages Swift's DocC markup

Summary

Develop a Swift Package to control Syringe Pumps and then integrate this Swift Package into our existing Nano-inkjet Printer application to print functionally gradient materials.

Desired Skill Set

Curious, self-motivated, students interested in making useful applications. Experience writing applications for macOS, iOS, or the Swift programming language is a plus.

Preferred Team Size

3-5 students

Internship Opportunity

Lab research opportunities continuing application within Hildreth's lab.

Location for Work

Off-site and on-site at Colorado School of Mines.