# Furnace Controller

1. 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.

2. 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 develop a custom macOS application written in Swift to control one of our furnaces. For this project, the team will build off of last year's SwiftIO project to write a custom Swift Package to for our mass flow controller using either a SwiftIO board or similar microcontroller and a custom Swift Package to control the temperature of our furnace.
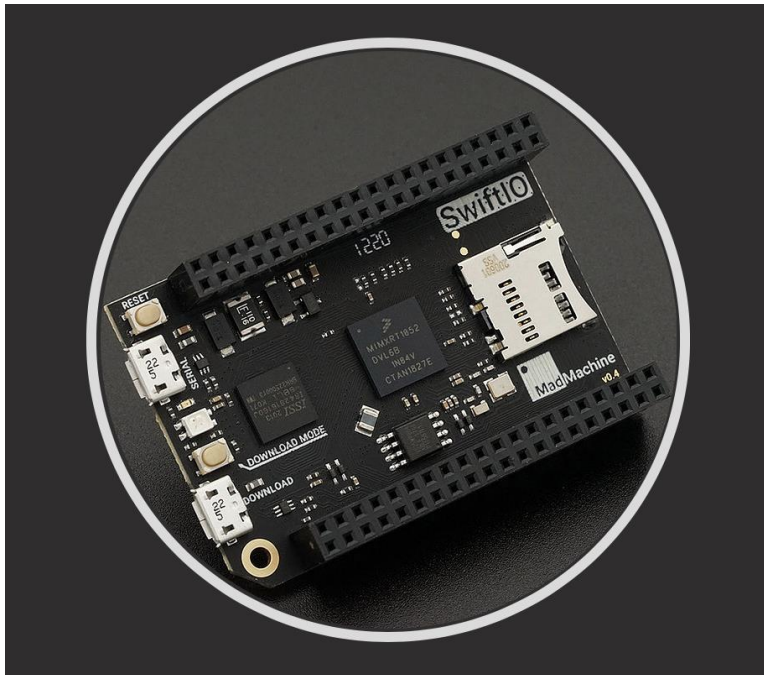
Required features:

- Develop a VISA-compliant driver running on a SwiftIO board that will read in string commands, parse the string to VISA commands, convert these VISA commands to the native SwiftIO board commands, and then execute the SwiftIO commands.
- Connect the SwiftIO board to the computer using UART (digital) to either USB or Bluetooth
- Connect the SwiftIO board to a mass flow controller using I2C to Analog Out (analog) protocols to set the flow rate and an Analog In to read the flow rate
    - Set the flow rate
    - Read the flow rate
- Write a Swift Package to communicate with the furnace (string comments)
    - set the temperature
    - read the temperature
    - turn the vacuum pump on or off

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

2.1 *Deliverables*

1. Final design report (mandatory for all teams)
2. Working drivers that includes the feature upgrades listed above
3. Clearly documented and marked up code that also leverages jazzy to create the API documentation

2.2 *Summary*

Develop an application to control the mass flow controllers and furnace

3. 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.

4. Preferred Team Size

3-5 students

5. Internship Opportunity

Lab research opportunities continuing application within Hildreth's lab.

6. Location for Work

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