Morph Optic Data Acquisition and Control,
Proof of Concept Statement of Work
April 15, 2019

This document outlines the Morph Optic Data Acquisition and Control (MODAC), Proof of Concept (PoC) Statement of Work (SoW) for Maui Institute of Art and Technology (MIOAT).

MODAC PoC is a small linux based computer, with additional Windows 10 PC software, to read and control a glass slumping kiln. The PoC Parts List, with URL links to vendor pages, is attached/referenced. This PoC system will be integrated with an existing kiln and additional sensors provided by MorphOptic (and their client).

MIOAT will acquire the equipment in the PoC Parts List and integrate it into a custom case, develop software to read, control, save to file and graphically display values from the sensors/relays. The primary software will run on a small linux based computer, with communication to display/control software running on a Windows 10 PC. Communication with PC may be by USB/Serial or private Ethernet hub. The software system will be primarily written in Python, although some (mostly) 3rd party library code may be written in other langauges. Use of Open Source tools will be prioritized over proprietary tools where possible. MIOAT will document the design and use of the system.

The basic system provides a number of IO devices and interfaces and will be expandable to larger numbersin future developments.

- Display screen on MODAC (and PC) with graphical buttons and graphs
- SD card & regular PC recording of data files,
- 16 channels of single ended A/D converters (I2C interface, w 6 possible addresses= 96 possible channels)
- 8 thermocouple amplifiers for 4-20mA, +/-10V, Compensated Thermocouple inputs (MO to supply 3 K-Type thermocouples plus other analog items below)
- 8 opto-isolated relays capable of switching 3 12vDC and 2 110AC low amperage lines (include 12vdc supply voltage) (uses 8 GPIO lines)
- external relay controlled 110VAC plug (uses 1 GPIO line)
- interface via BlueTooth with a MO provided Leica D1 laser distance center
- interface with MO Supplied Optris Optical Pyrometer (uses one Thermocouple amplifier & A/D channel)
- interface with MO supplied displacement sensor via 4-20mA/10V a/d channel
- 4+ additional uncommitted GPIO lines

Phase 1: Unit Tests

- Demonstrate function of each IO device individually
- Demonstrate basic UI running on MODAC display and PC.
- Demonstrate saving sensor data streams to PC and MODAC text CSV files

Phase 2: Integration with Kiln

- Integrate MODAC with kiln devices and client PC
- Conduct preliminary calibration
- Implement simple PID controller using temperature inputs and relay control of kiln heaters
    - to be based on 3rd party Python PID libraries

    - example code to show how Python script can be written to enhance control loop
- Demonstrate kiln control on the MO client kiln
- Revise basic UI and PID based on feedback from MO and MO client.

PoC Wrapup: documentation and future planning

- Provide soft and hard copy documentation for use and design of MODAC PoC
- Deliver all hardware & software for MODAC
- Outline how additional features, sensors and controls can be added