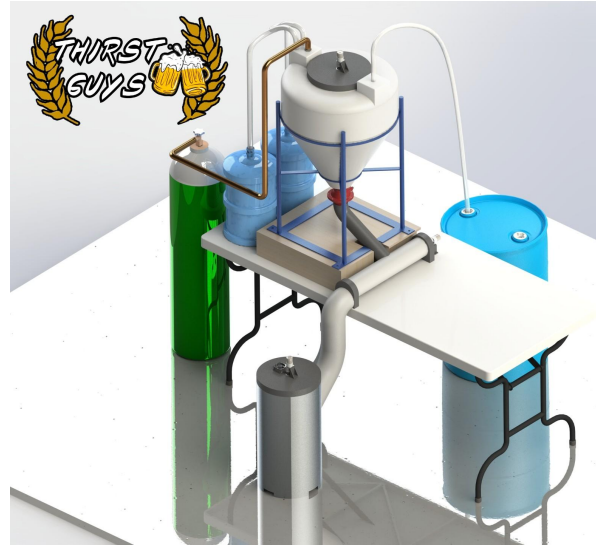


Mechatronics Final Project - Developing the Multiple-Paged UI for Dynamic Task Handling for Senior MCE Capstone Design Project



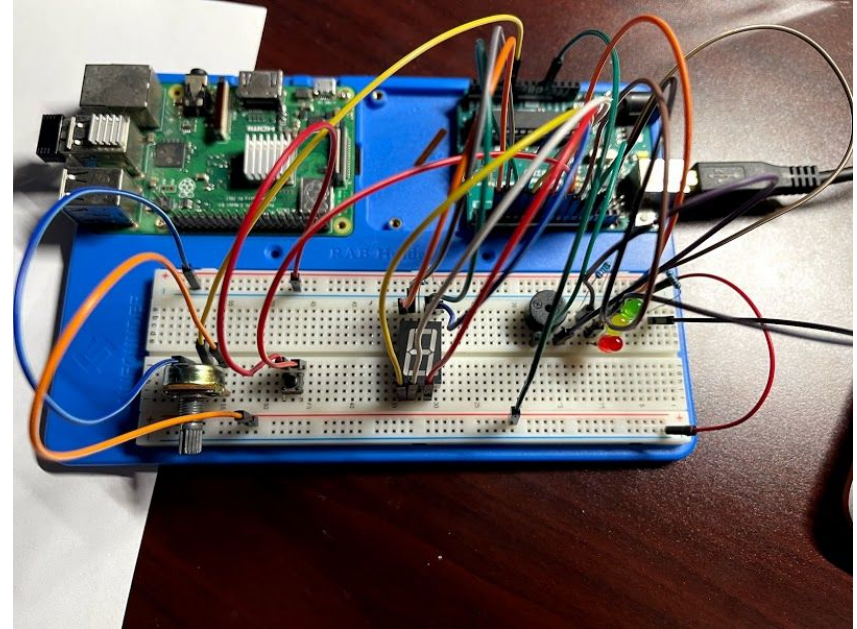
By: Raymond Turrisi

18 December 2020



Outline

- Overview
- Instruction to Implementation
- State Transition Structure
- Electrical Diagram
- User Interface
- Recorded Demo
- Live demo and Questions



Overview (1)

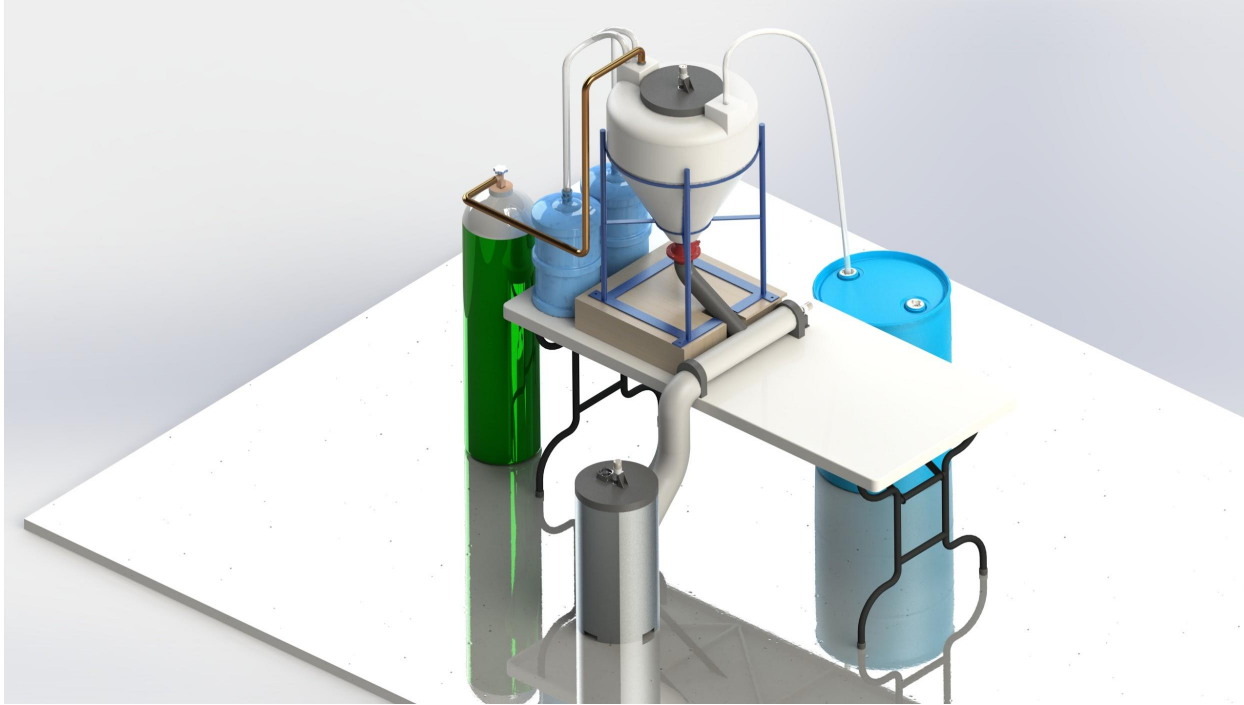


Fig. 1: Rendering of Team 20H's Capstone Design Projects Proof of Concept.

Overview (2)

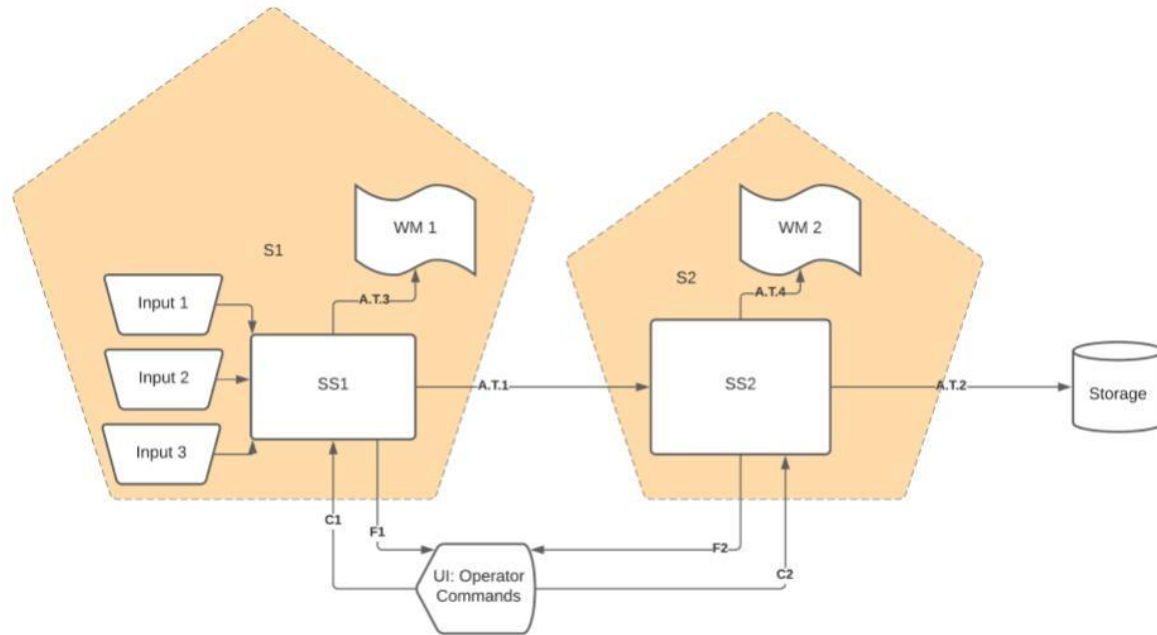


Fig. 2: Systems Diagram for the Automated Malting System.

Overview (3)

- Motivation?

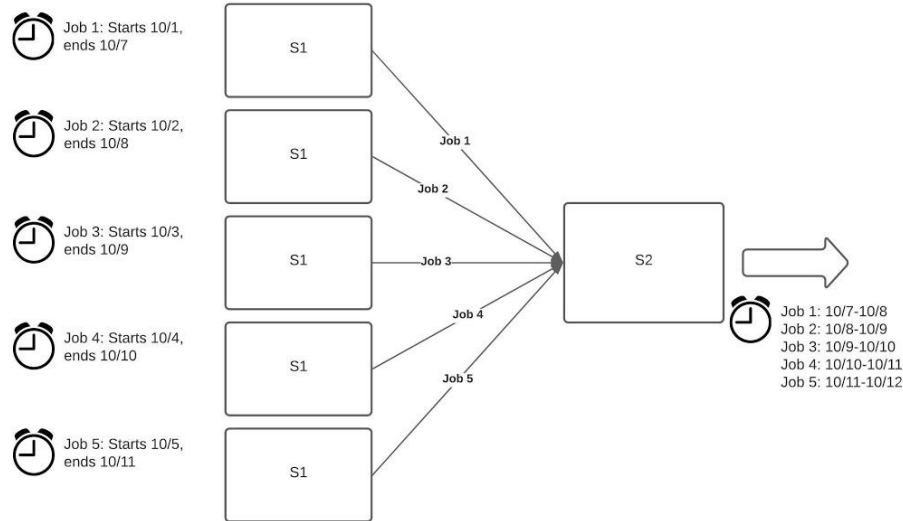


Fig. 3: Distributed task diagram depicting the use of queues and dynamic task handling.



Instructions to Implementation (1)

1. The use of a microcontroller and PC platforms to implement the code processing for the project.
2. The use of state transition diagrams to design the control software for the project. The code operation should not be trivial. Use the requirements for the Tank Control Extension as suggestions for features to include in your project.
3. The project operation should include at least 3 of the following operations: A/D conversion, PWM actuation or D/A conversion, timing, and digital input/digital output.
 - a. **A/D conversion:** Potentiometer input which controls the rate of heating within the temperature simulator
 - b. **PWM actuation:** This is implemented within the glowing red LED whoms luminosity is proportional to the error between the actual and desired temperatures. It doesn't glow when there is a small error.
 - c. **Timing:** Timing is used extensively for the simulation, the states for the LEDs, and the states for the buzzer.
 - d. **Digital Input:** This is used in the button which pops the current job from the queue.
 - e. **Digital Output:** This is found in the Seven Segment Display



Instructions to Implementation (2)

4. Your project should include at least three different electronic components such as transistors, diodes, logic gates, LEDs buzzers, or other circuit elements such as switches or relays.

- a. 1 x Arduino
- b. 3 x LEDs
- c. 1 x Buzzer
- d. 1 x Button
- e. 1 x Seven Segment Display
- f. 1 x potentiometer switch
- g. 2 x resistors

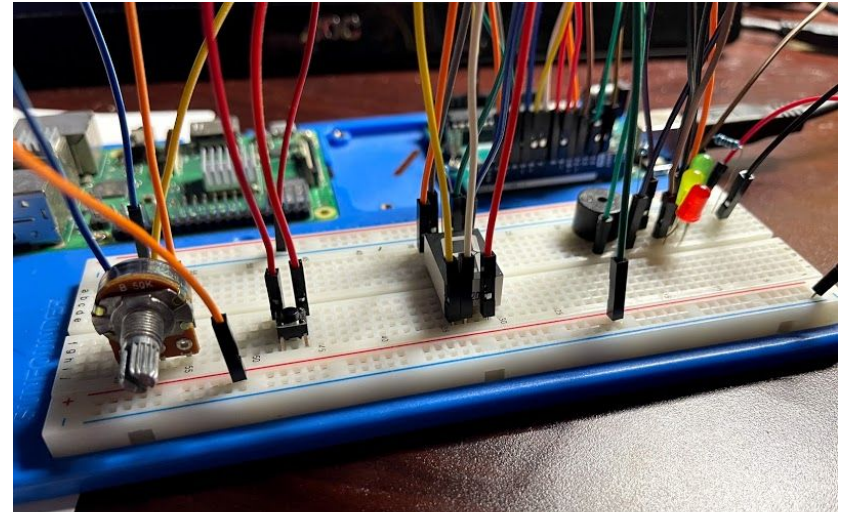


Fig. 4: Electrical Hardware



Instructions to Implementation (3)

5. Use of serial interfacing to communicate between the PC and the microcontroller.
 - a. Implemented as full duplex serial communication with mutual parsing within both programs.
6. Add a plot to dynamically show your controlled variable or control action during the last 60 seconds
 - b. This is completed under the *View Log* tab.

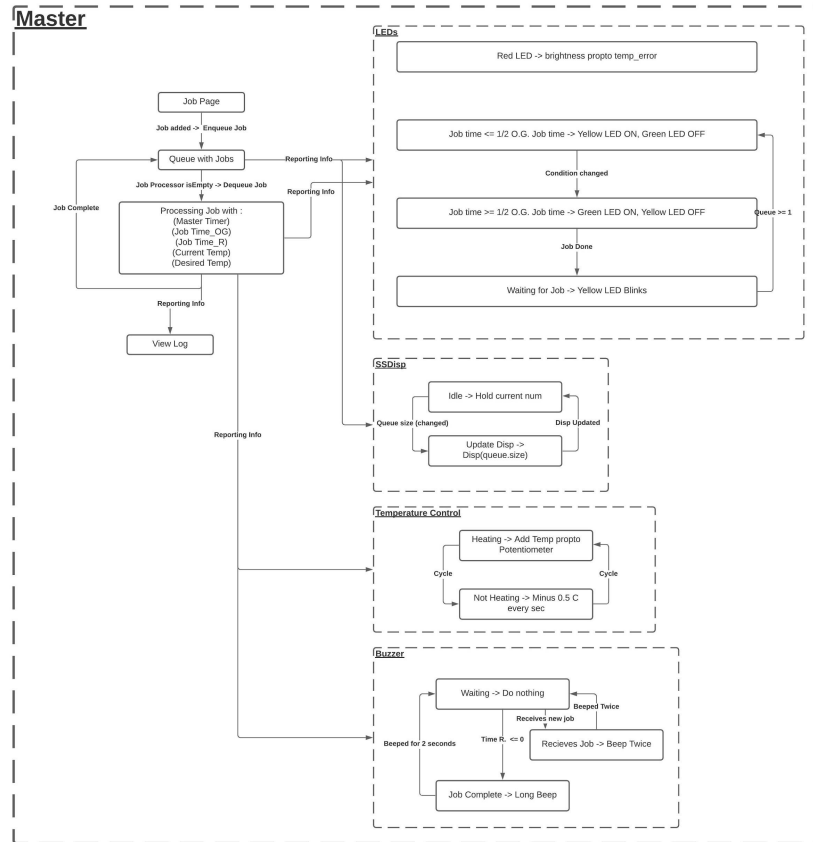
Additional Comments:

- Yellow LEDs indicate if the height is above or below the water level mark ☐ Red LED illuminates proportional to the error
- 5 Additional LEDs to indicate tank height ☐ Yellow and Green LEDs illuminate w/rt % of job complete
- Green LED flashing every 1 second when tank is dispensing the fluid ☐ Yellow LED is blinking when there are no jobs in the queue
- Use a buzzer which turns on the first time the tank reaches the desired height in auto mode ☐ buzzes for 4 seconds when job is complete
- Use a buzzer to issue four separate short beeps whenever the tank is in on mode ☐ Beeps twice whenever a new job is loaded into the queue
- Use a potentiometer to control filling rate and display on UI ☐ Potentiometer controls heating rate and is displayed in the notice box on the home screen



State Transition Diagram (1)

Fig. 5: State Transition Diagram.





State Transition Diagram (2)

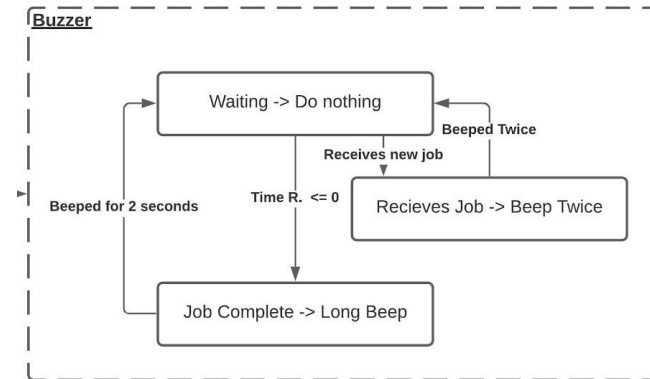
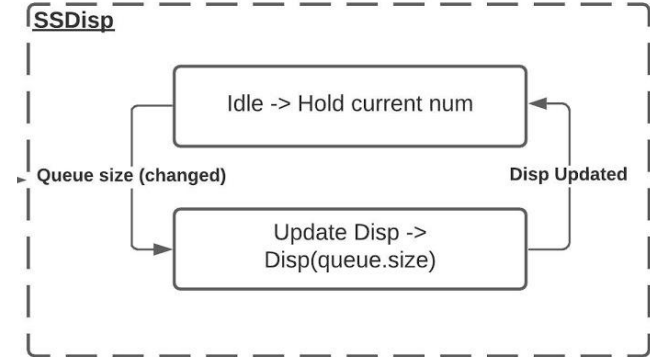
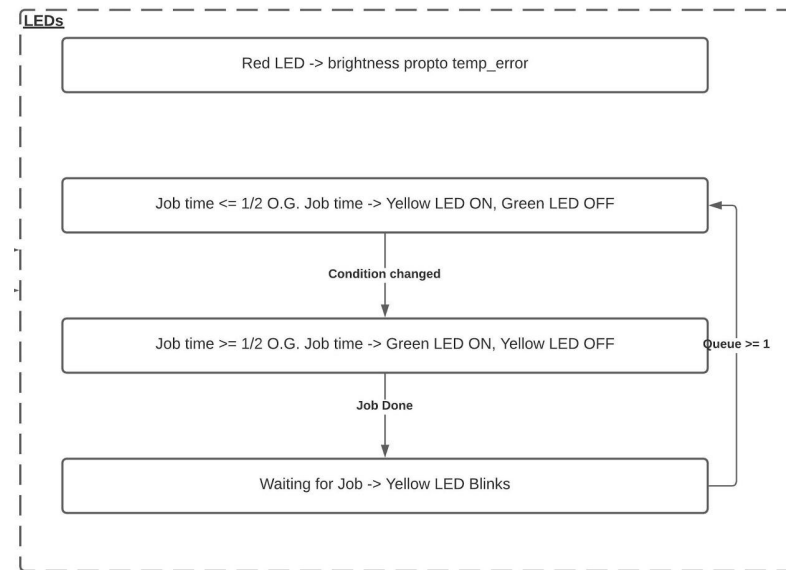


Fig. 6: Isolated state transition diagrams.

Electrical Schematic

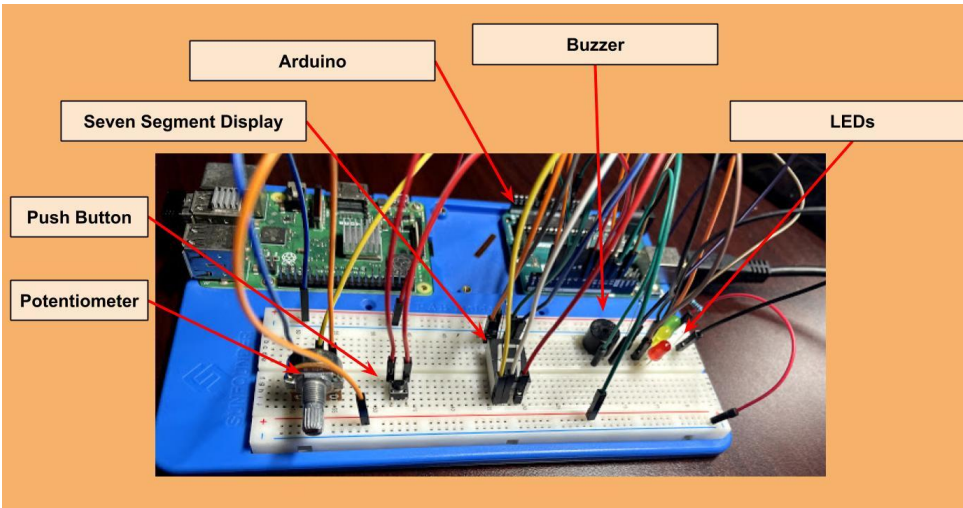
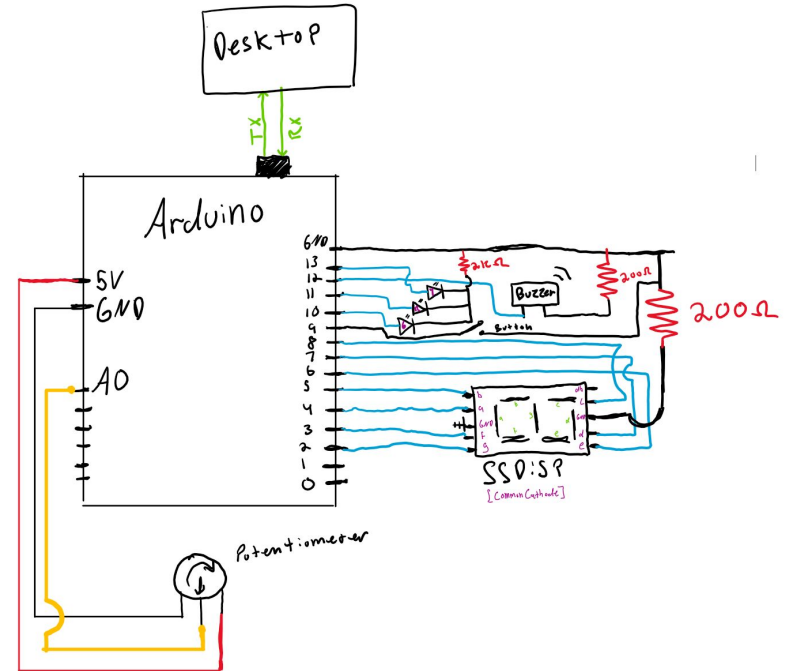


Fig. 7: Labeled photo of breadboard housing electrical components.

Fig. 8: Electronics diagram





User Interface

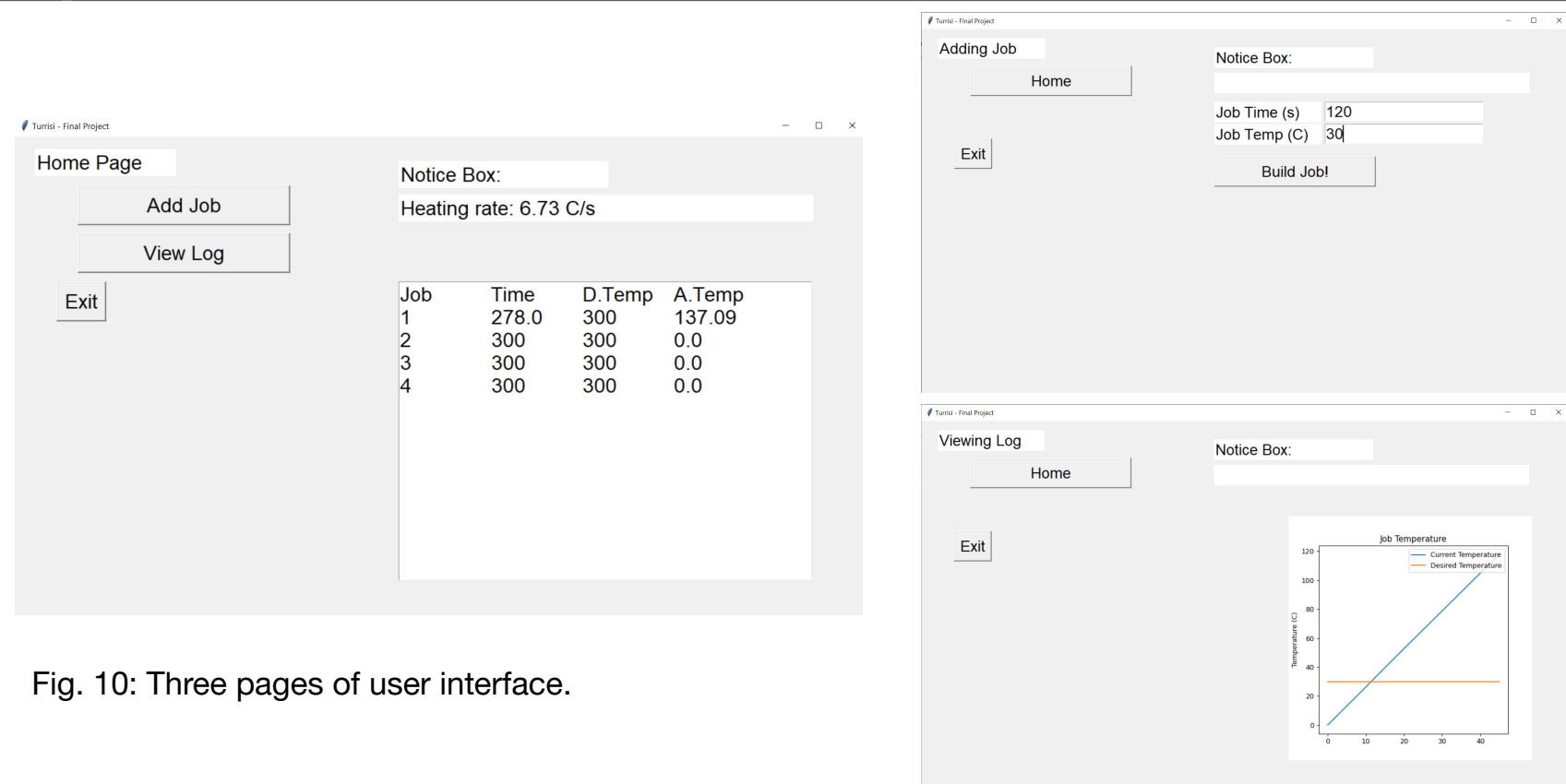
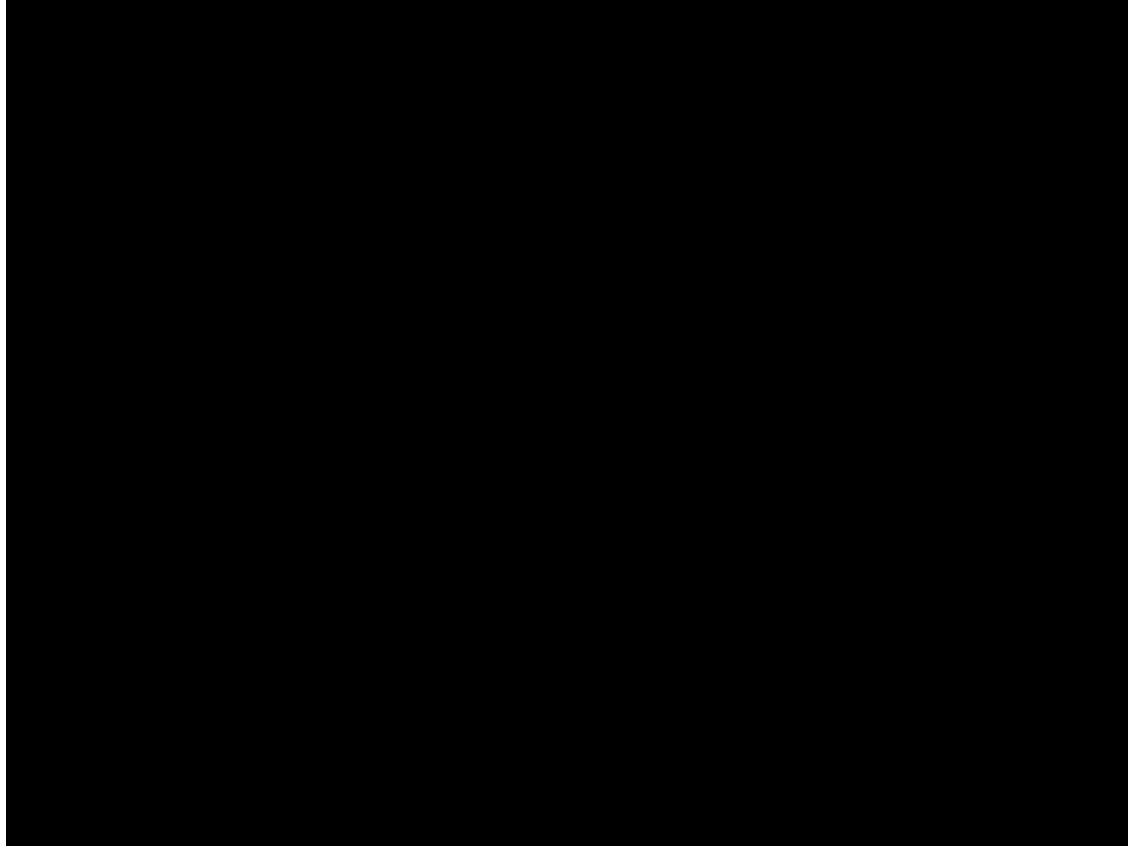


Fig. 10: Three pages of user interface.



Recorded Demo



Live Demo & Questions

- Questions?
 - Live Demo?
 - Python Code?
 - Arduino Code?
 - Electronics?
 - User Interface?
 - State Transition Diagram?
 - Entry code structure!
 - Electronics Diagram?

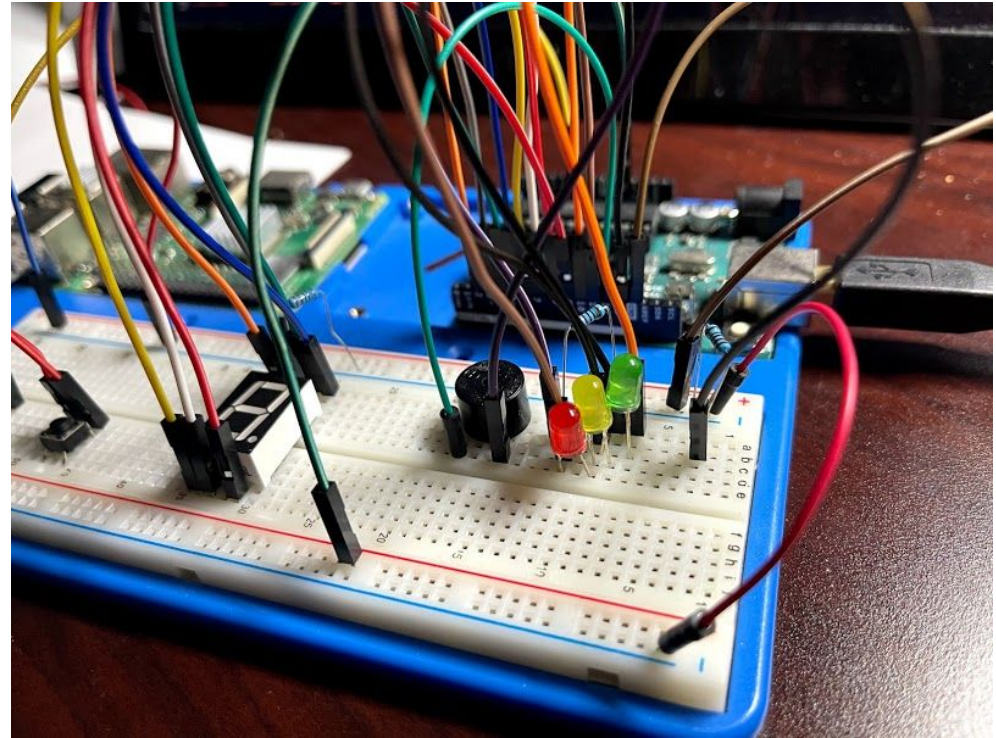


Fig. 11: Electrical Hardware.