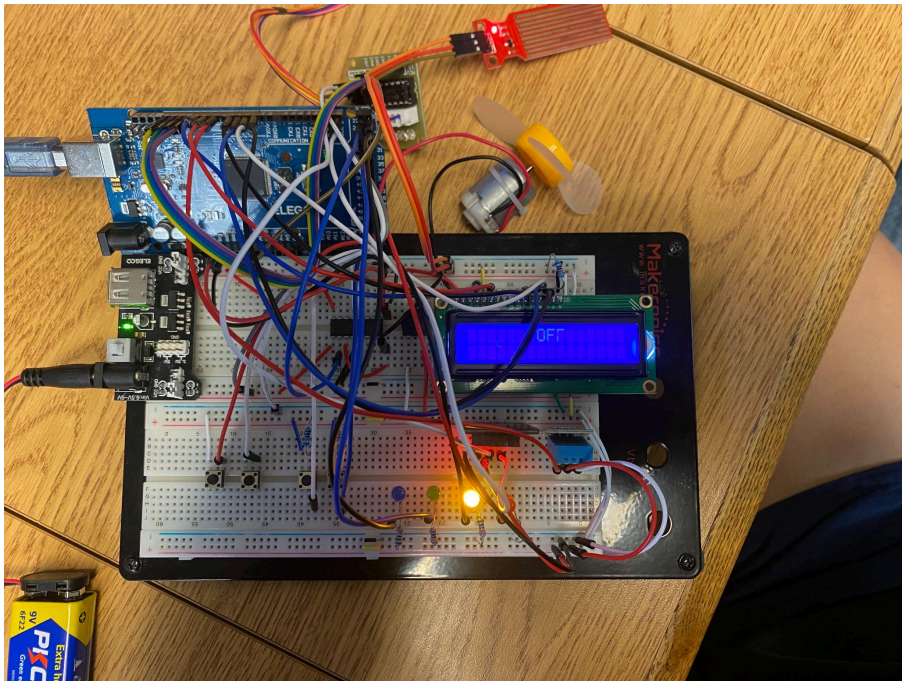
Cory Coker, Nick Abbott CPE Final Report

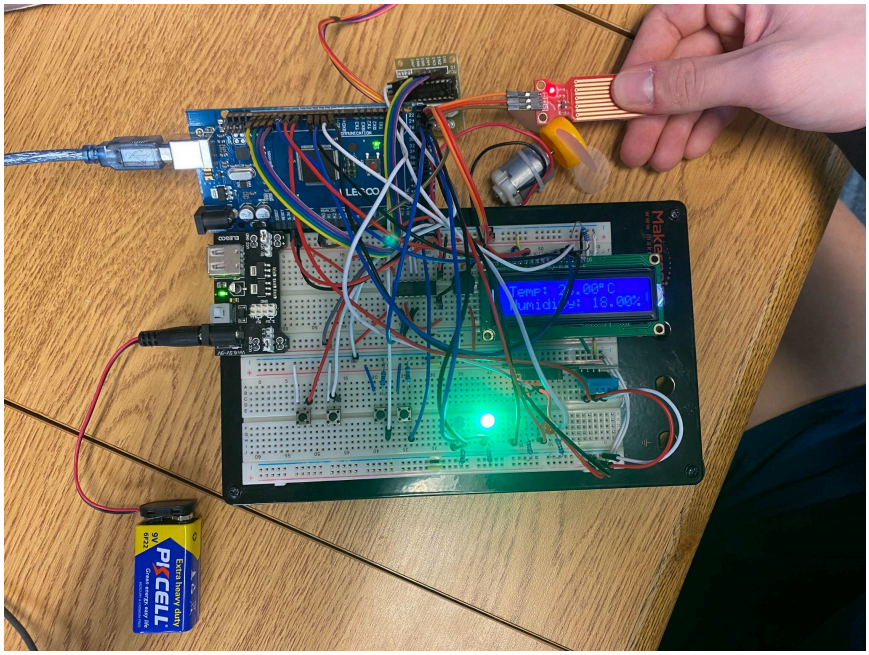
Project Description:
For this project, we were tasked with creating a swamp cooler that monitors water level, humidity, and air temperature. Our key features of this project include monitoring the water level threshold, and generating a visible alert. Displaying real time air temperature and humidity levels on an LCD screen. Automated fan that activates when the air temperature exceeds or drops below a range. An adjustable airflow vent, which the user is able to control the angle to control the air output. A dedicated on/off button that will enable or disable the entire cooling system. Finally, it includes a data logging system that will record the exact time and date when the fan motor is turned on or off.

States:
All states except DISABLED:
In this state, temperature and humidity will be continuously monitored and reported to the LCD screen. The Stop button will stop the fan motor, and the system will go into a DISABLED state.
DISABLED:
In this state, the yellow LED will be turned on, no monitoring of temperature and humidity will be performed.



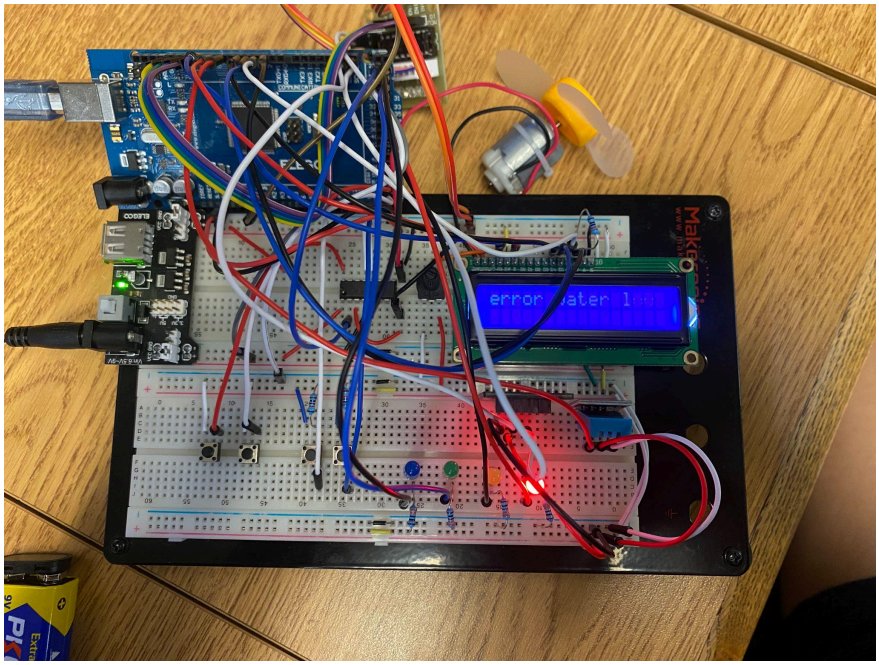
IDLE:
In this state, there will be an exact time stamp, signaling when the transition happened. The water level will be monitored at this state, and will report ERROR if the level is too low. In

this state, the green LED light will be on.



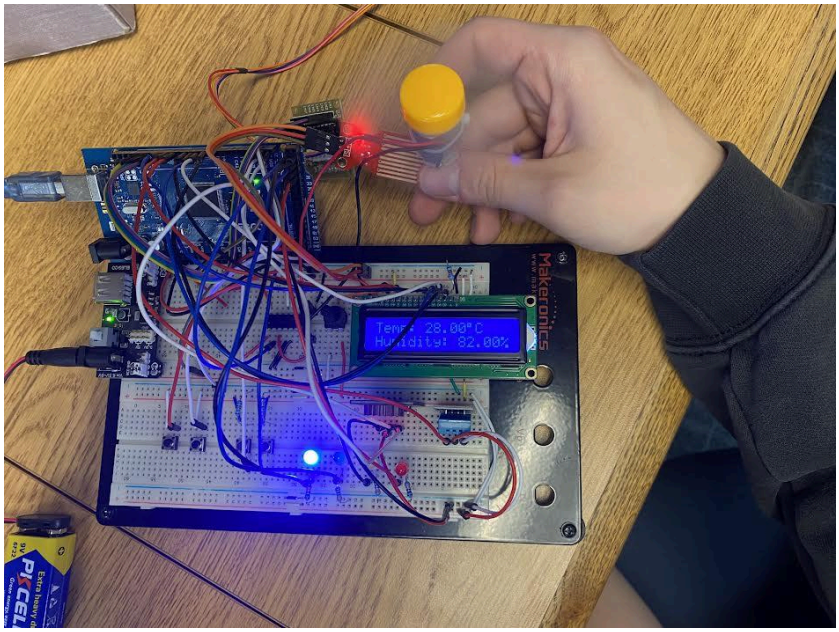
ERROR:

In this state, the motor should not turn on regardless of what the temperature is. Using the reset button will change the state to IDLE if the water level is above the threshold. In this state, an error message will be displayed on the LCD, and the red LED should be on.

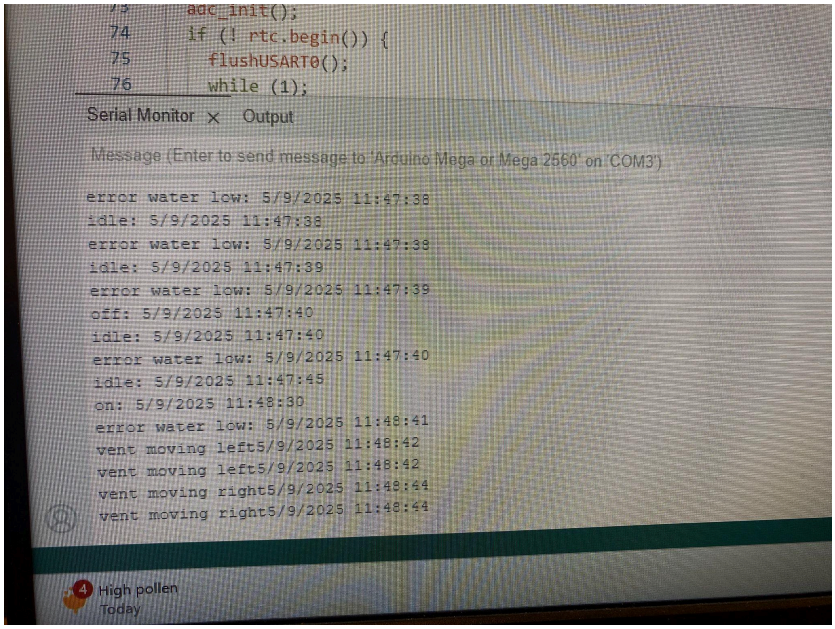


RUNNING:

In this state, the fan motor will be on. It will change to idle, if the temperature drops below threshold temperature. It will transition to ERROR if the water becomes too low. For this state, the blue LED should be on.



Picture of Serial Monitor after going through each state:

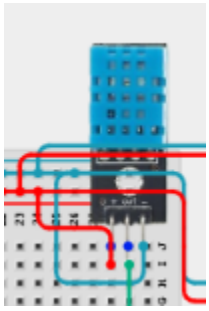


Components:

DHT Sensor
LCD Screen
RTC
Stepper Motor (Vent)
Water Sensor
Fan Motor

Component Details:

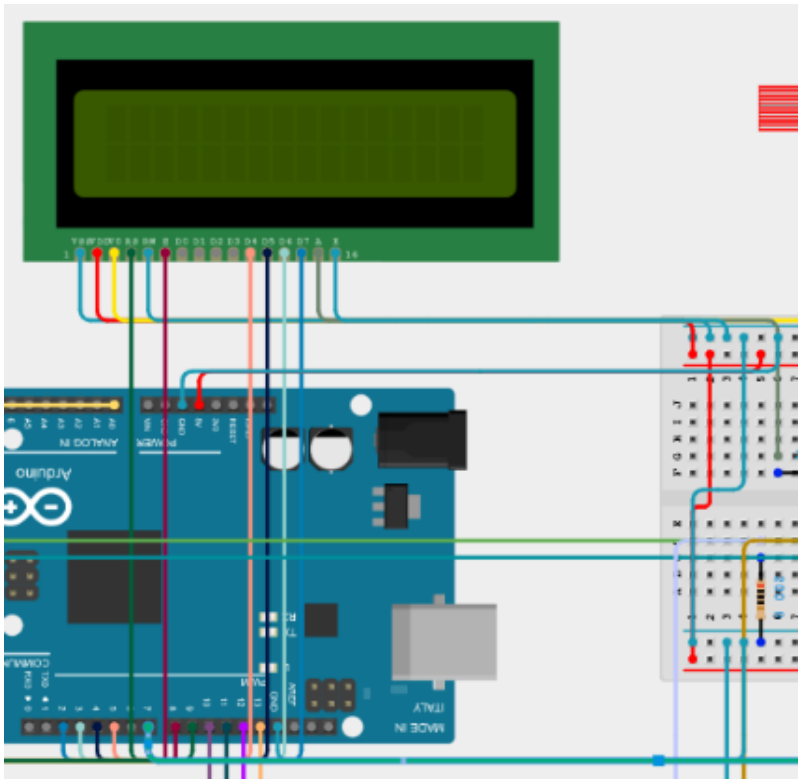
DHT Sensor:



For this portion of the project, we simply hooked up our ground and power into its respective power and ground lines, and connected the data pin to digital pin 7. The DHT sensor reports temperature in degrees celsius, and humidity in percent.

Constraints: For the temperature, we set our threshold to be 27 degrees celsius. If the temperature is higher than 27 degrees, the fan will turn on. For the purpose of demonstration, we changed the temperature threshold to 26, so that you can see the functionality.

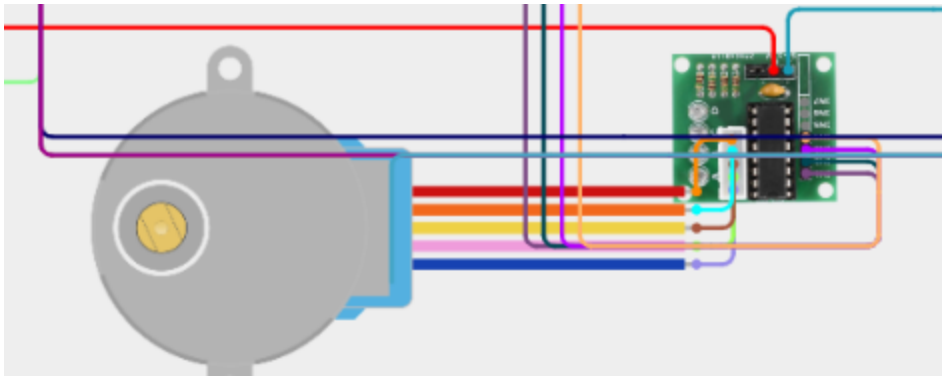
LCD Screen:



For the LCD screen, we plugged each pin into their required outputs/inputs (ground/voltage). We used digital pins 2-5, and pin 7 for their respective parts on the LCD screen.

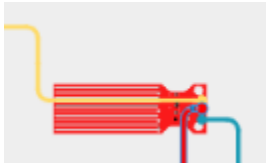
RTC:

Stepper Motor:



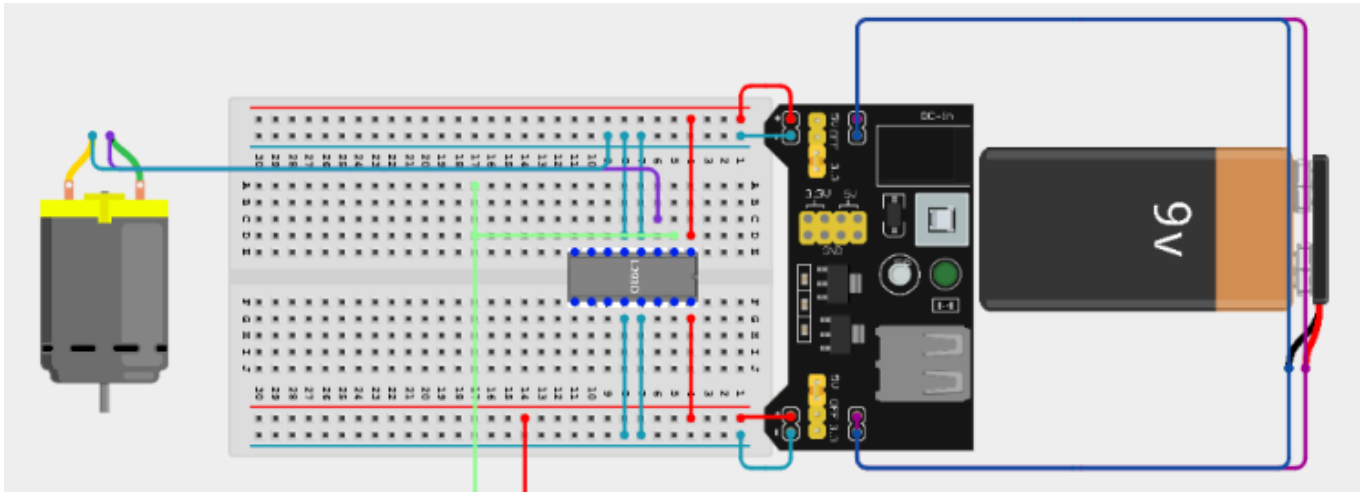
For the Stepper motor, we plugged each pin into their respective counterpart (voltage/ground). We used digital pins 10-13 for the outputs of the motor. We used pins 50 and 51 as the input buttons for the stepper motor (vent) controls.

Water Sensor:



For the water sensor, the red and blue wires go to voltage and ground respectively. While the yellow wire gets plugged into our analog pin A0.
Constraints: For the water level threshold we used 100/255 that we found from testing as the maximum water level.

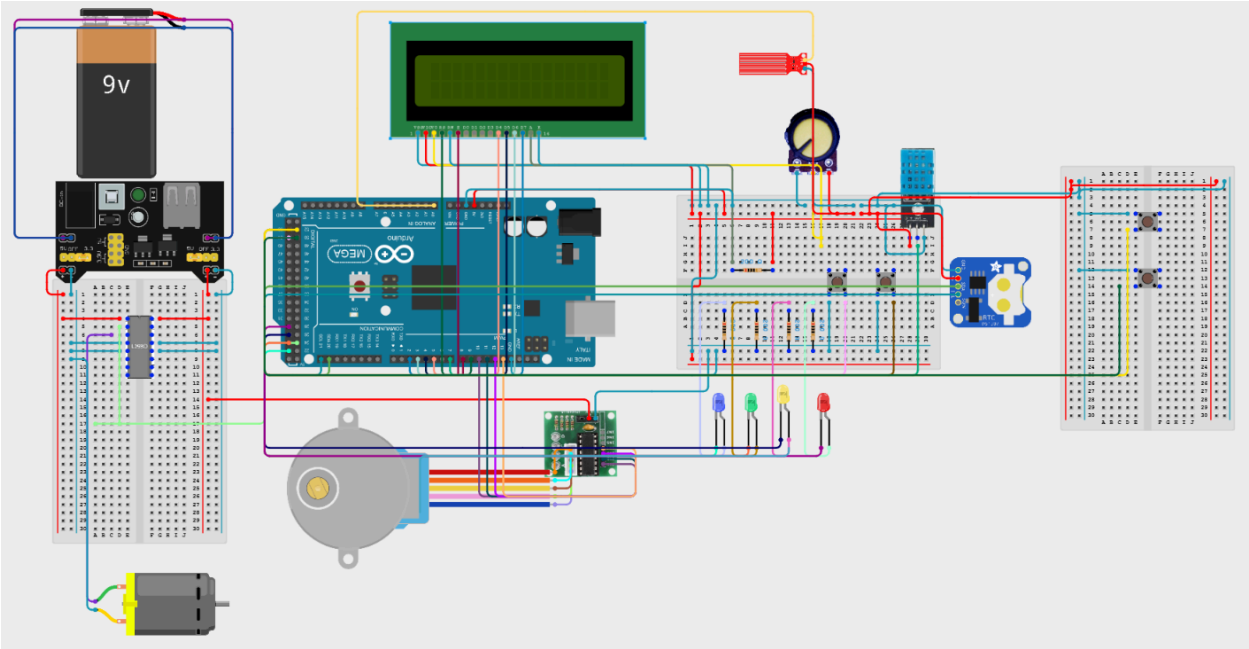
Fan Motor:



For the fan motor, insteading of drawing 5V power from the arduino, we used a separate 9V battery to power our fan. By using the L293D driver chip, we were able to get the fan to spin in both counterclockwise and clockwise directions. We used digital pin 24 as the input for the fan.

System Overview:
Libraries Used:
“Dhtlib”
“Rtclib”

Schematic Diagram:



Specification Sheet Links:
DHT11 Sensor:
https://components101.com/sites/default/files/component_datasheet/DFR0067%20DHT11%20Datasheet.pdf
DS1307 RTC Module:
https://www.analog.com/media/en/technical-documentation/data-sheets/ds1307.pdf
L293D Chip:
https://www.ti.com/lit/ds/symlink/l293d.pdf?ts=1746812371099&ref_url=https%253A%252F%252Fwww.ti.com%252Fproduct%252FL293D
LCD1602 LCD Screen:
https://www.vishay.com/docs/37484/lcd016n002bcfhet.pdf
Fan Blade and 3-6V Motor:
https://cdn-learn.adafruit.com/downloads/pdf/adafruit-arduino-lesson-13-dc-motors.pdf
Water Level Detection Sensor Module:
https://curtocircuito.com.br/datasheet/sensor/nivel_de_agua_analogico.pdf?srsltid=AfmBOop0Uv8D7LuV1Ihfm2C4-pTD-n6xsc7SdhsHK9dY_I2XFyaMon6p
ULN2003 Stepper Motor Driver Module:
https://www.ti.com/lit/ds/symlink/uln2003a.pdf?ts=1746792240918&ref_url=https%253A%252F%252Fwww.ti.com%252Fproduct%252FULN2003A%253Futm_source%253Dgoogle%2526utm

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Power Supply Module:
https://www.handsontec.com/dataspecs/mb102-ps.pdf