Final Project: Swamp Cooler

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Description of Project:

This is designed to be the required circuit to run a swamp cooler. A swamp cooler works by turning water into cool air by heating and evaporating it using the hot external air. The evaporated water is then blown out, cooling the environment it is put in. The goal is to build a sudofunctional cooler capable of cooling and humidifying air. To automate cooling using an Arduino Mega 250, integrate sensors (water level sensors and DHT11 for environmental monitoring), stepper motor, a fan, and more. Using Arduino libraries and directly manipulating register values for precise control and display information on an LCD screen. We will include a real-time clock module for logging, a system state which will manage continuous monitoring, vent control, and motor activation. It will also be transitioning between different states for different modes of running.

Components:

- x1 Arduino Mega 2560
- x2 Breadboards (1 two section, 1 four section)
- x1 LCD display
- x1 Stepper Motor

- x1 Stepper Motor Control Board
- x1 DC Fan Motor
- x1 DC Fan Motor Controller IC
- x1 Humidity and Temperature Sensor
- x1 Water Level Sensor
- x1 RTC (Real Time Clock) device
- x1 Potentiometer (3 pin version)
- x4 LEDs (1 red, 1 blue, 1 green, 1 yellow)
- x5 330 Ohm resistors
- x4 1000 Ohm resistors
- x1 USB Connector
- x1 9V Wall Adapter
- Jumper Wires
- DuPont Male to Female Wires

Design Requirements

1. Water level sensor

   Detects the amount of water in the cooler to ensure there is enough evaporation and alerts when levels are too low. It also uses threshold detection which can be achieved through interrupt-based comparator methods.

2. Stepper motor

   Controls vent movement which requires precise position control within the cooling system. It can be operated through buttons or a potentiometer to adjust the vent's orientation.

3. LCD screen

    Displays system status, sensor readings, and time/date using Arduino library.

4. RTC module

    Usines real-time clock modules to provide accurate timekeeping for logging data.

5. DHT11 temperature and humidity sensor

    Integrates the DHT11 temperature and humidity sensor for real-time environmental monitoring. It decides when to activate cooling or humidifying

6. Fan and motor

    These both circulate air through the system, pushing cooled, humidified air out into the environment. The fan and motor need different power supplies to prevent damage

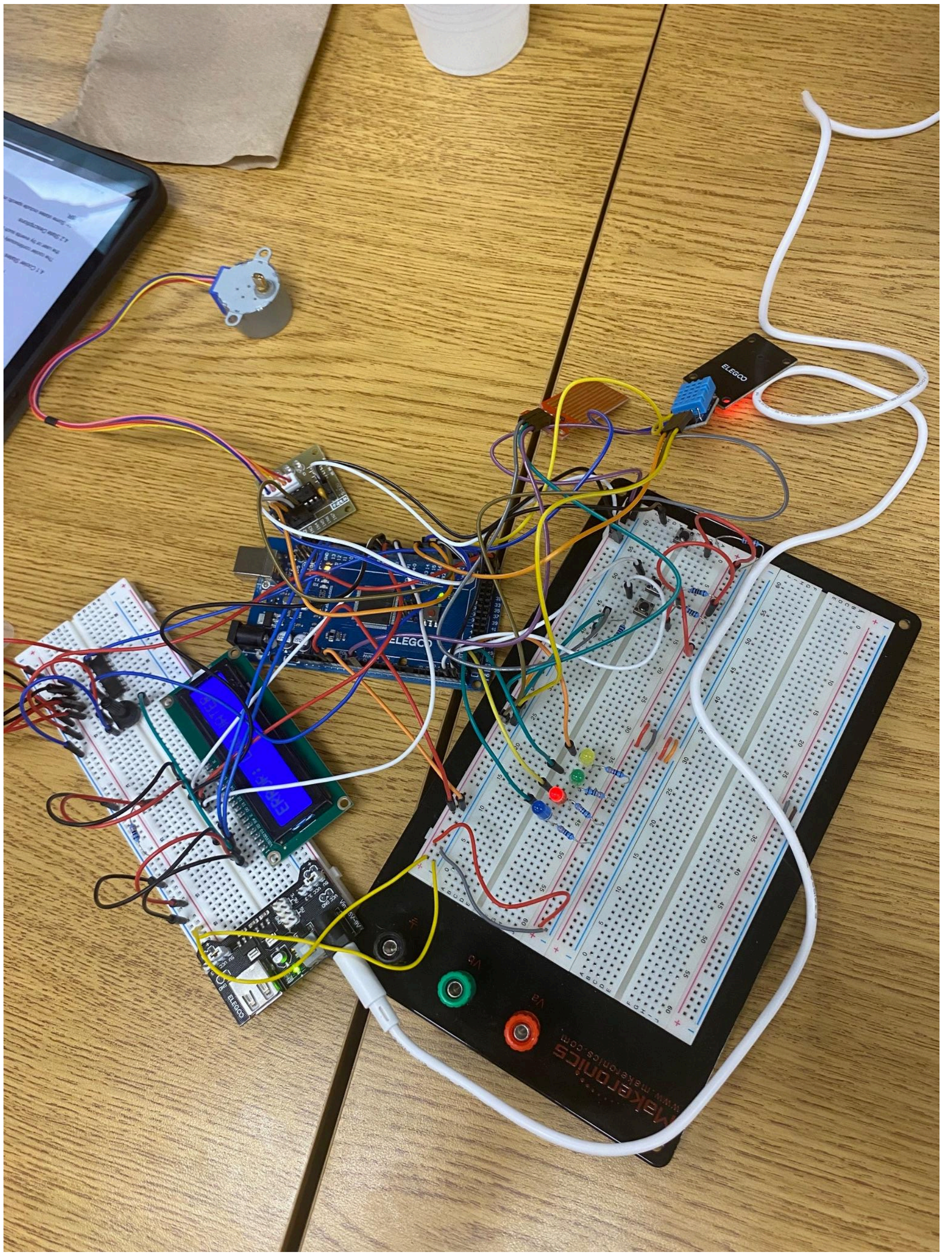
State Descriptions

- All states
    - Utilize the real time clock to log state transitions and vent position changes through the Serial port.
- All states except DISABLED
    - Utilize the real time clock to log state transitions and vent position changes through the Serial port.
    - Must respond to changes in vent position.
    - The stop button must turn the fan motor off if it is on and the system should go into a DISABLED state.
- DISABLED
    - YELLOW LED must be on.

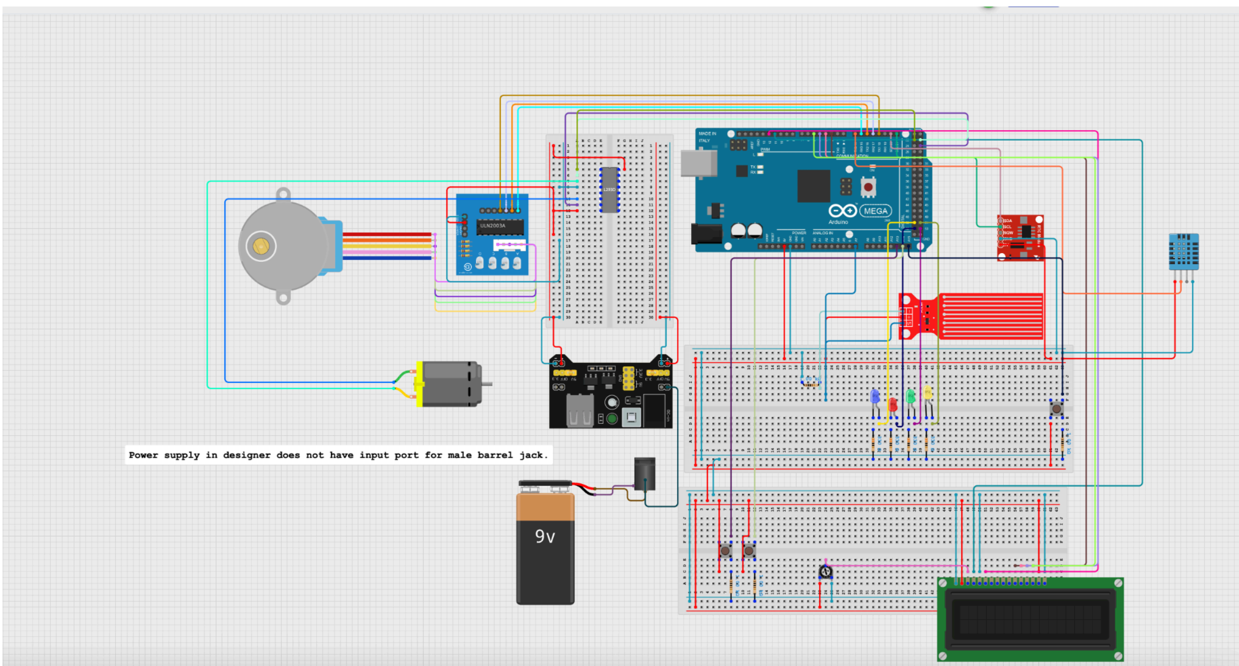
- There should be no monitoring of temperature or water being performed .
- The start button must be monitoring using an ISR.

- IDLE
  - Log exact timestamps using the real-time clock with transition times
  - Continuously monitor water levels and transitions to an error state if levels are insufficient.
  - The GREEN LED must be on.
- ERROR
  - The motor must be off and prevented from activating regardless of temperature.
  - The reset button will return to the IDLE state if water levels are restored above the threshold.
  - Display an error message on the LCD screen.
  - Must illuminate the RED LED while deactivating the other LEDs.
- RUNNING
  - The fan motor will be on.
  - The system will transition to the IDLE state once temperatures drop below the set threshold.
  - The system will transition to the ERROR state if the water levels become too low.
  - The BLUE LED will be on.

Circuit Image:



Schematic:


Power supply in designer does not have input port for male barrel jack.
MEGA
9v