

CPE 301, Embedded System Design

Final Project, Cooling System

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1 Project Description

This project is a simulated evaporation cooling system, using an Arduino Mega 2560 and the Arduino IDE. In the system, there is an LCD display that displays the measured Temperature and Humidity, as well as an error message for when the water is too low. The Temperature and Humidity are going to be found using the sensor module DHT11, while the water level will be measured using sensor [*]. The vent will be simulated using the fan motor module, and a paper clip to demonstrate the movement of the vent. The stepper motor will be connected using a separate power module, so that the Arduino will be protected from over-current. The fan will be using a fan motor which simulates the cooling that a swamp motor does. Additional smaller components will be used as well, such as LED's to signify the state the system is in, as well as resistors for the circuit components.

There are 4 states that the system can be in depending on conditions. The first state is disabled, which is where no functions are running and is designated by a yellow led, in this state there is no monitoring for either temperature or water. When the system is turned on by a start button being monitored using an ISR, it will then switch into the idle state, where the LCD is turned on reading the temperature and humidity but the fan is off. This state is designated by a green led. When the temperature reaches a certain point, it will switch the state into running. In the running state, the fan motor will turn on and the LED will be blue. The final state is the error state, which is where the fan motor does not turn on regardless of temperature. In this state, an error message will read on the LCD, and the LED will be red to signify error. When the system switches between states, a real time clock will monitor the time stamps of the switches. The system is supposed to simulate the evaporation of a cooling system, using the fan and water as means to cool the air like a swamp cooler.

2 Component Details

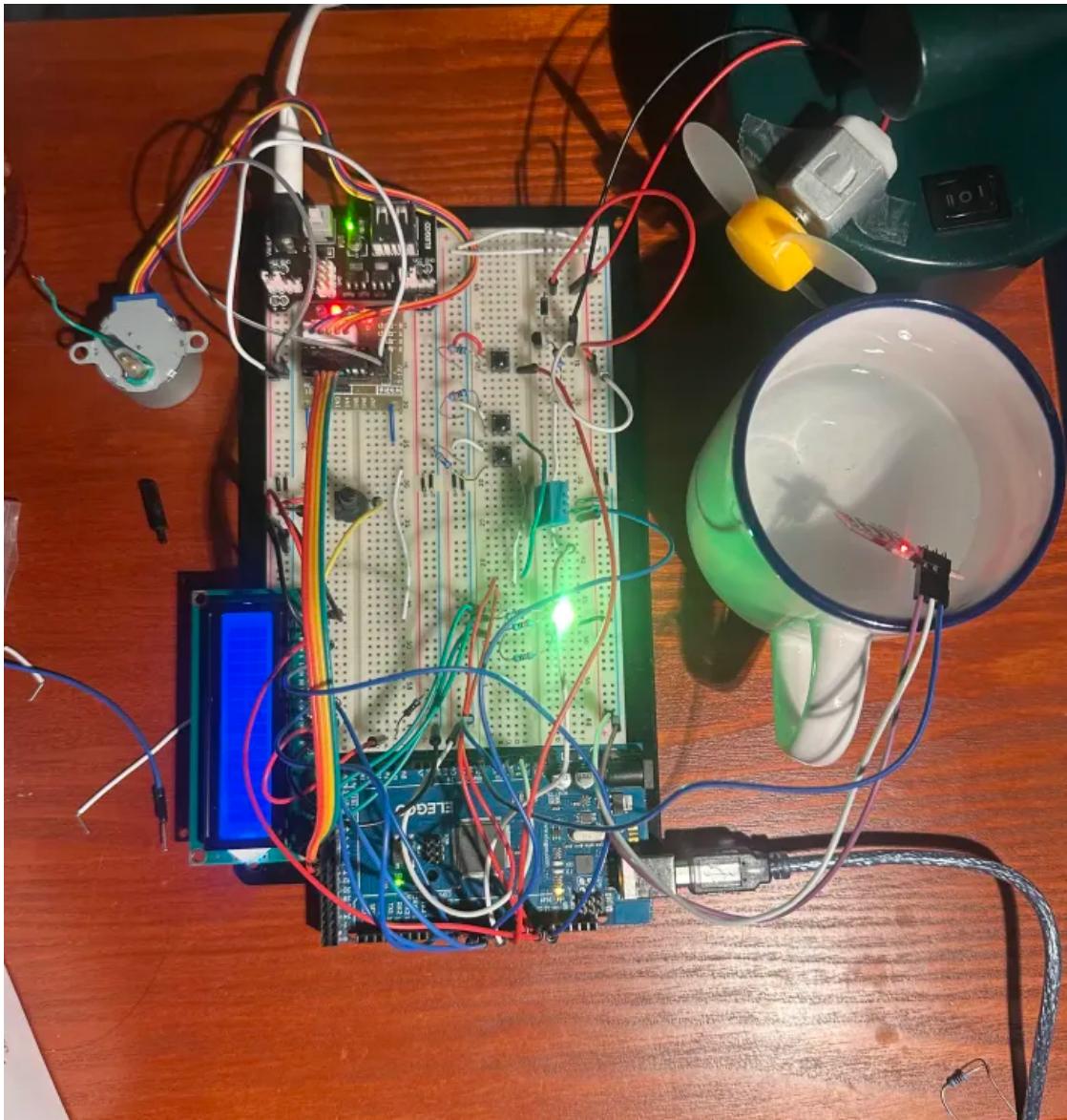
Component	Functionality
Power Supply Module	Provides either 5V or 3V power to rails, reduces risk of over-current on the arduino
LCD	Programmable display screen for information.
Water Sensor	Reads water level and returns an integer.
Stepper Motor and Connector	Precise motor used to control vent opening
Fan Motor	Motor with fan attachment with controllable speed.
Temperature And Humidity Reader	Reads and returns temperature and humidity values as integers
Led	Output light that shines in different colors
Buttons	Input push buttons
Arduino Mega	Micro controller that controls all functions

Table 1: Component Details

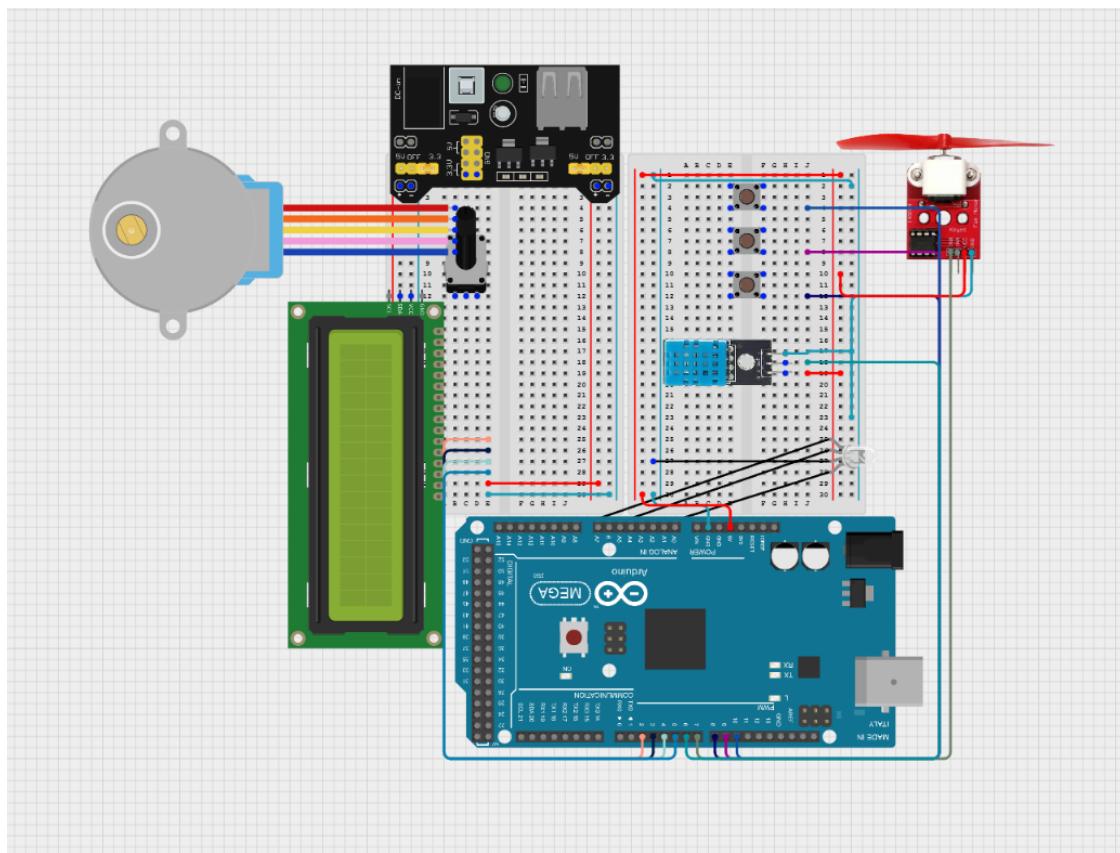
3 System Overview

The biggest problem with my system, is that the LCD was not displaying properly. In the code, there is a section for the lcd that is supposed to update and display the temperature and humidity, and when the system is in error it is supposed to display an error message. However, when the code is ran the LCD displays random characters inconsistently. I am pretty sure I wired the LCD correctly, however there is a chance something is wrong with my LCD or code. Additionally, I ran into the problem of the RTC not working. I had the code set up for the Serial input, so that the serial would be able to receive and display messages using UART in my code, but I was unable to get the RTC working for when the system changed states.

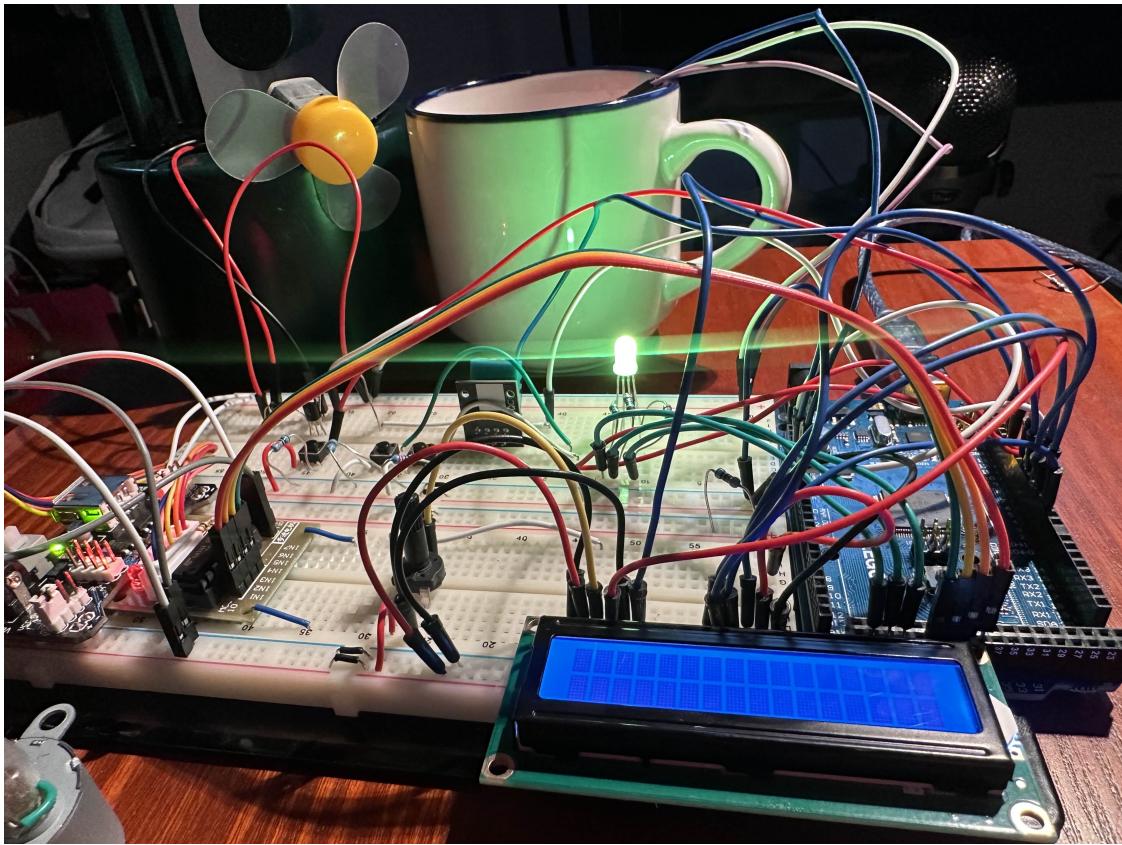
4 Circuit Image

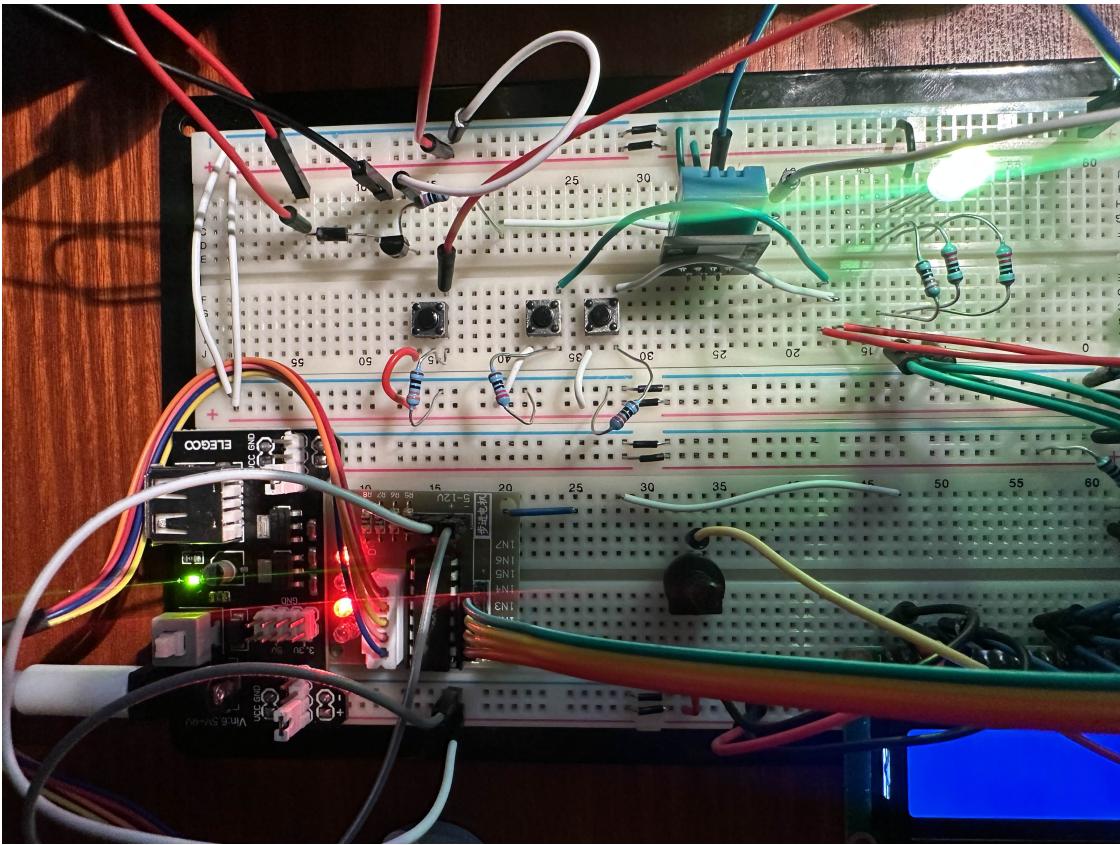


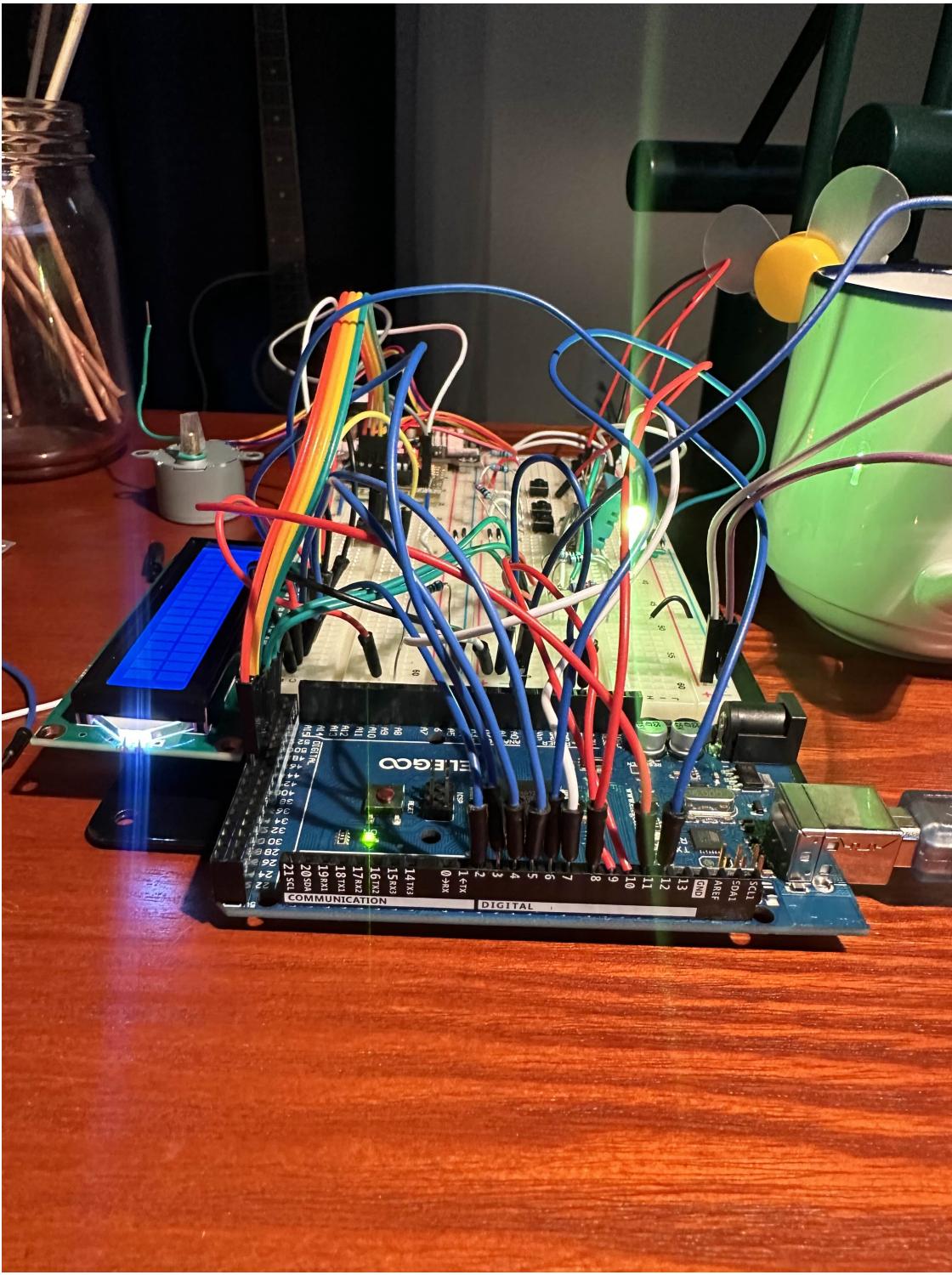
5 Schematic Diagram



6 System Demonstration







7 Submission Links

Video: <https://youtu.be/ZQqCAwAA3eo?si=m2GGMlJEXhfYRr6w>

8 Team Information

Names: Castor Bunachita **Group Number:** 64