CPE FINAL PROJECT

May 12, 2024

Ashwin Rajagopalan

Dede Mendoza

Jordan Nattenberg

Bryan Escatel Jimenez

Introduction

The overall goal and aim of this project is to create a working evaporation water cooler using the Arduino 2560 and the sensors from the Arduino kit. The water cooler, once completed will monitor the water levels present and display an alert if its too low. It will monitor and display the current temperature and humidity on the LCD screen and it will start and stop a fan motor if the temperature is too hot. And finally, it will allow the user to turn the cooler on and off using a button.

Experimental Design

Component Descriptions:

- **Arduino MEGA 2560:** The Arduino serves as the brain of the system, orchestrating the operation of various components based on the instructions given through programming.
- **LCD Display:** The LCD screen provides a user interface for displaying the current air temperature, humidity, system status and vent direction.
- **L293D Motor Driver:** The L293D motor driver is employed to control the dc fan motor. It allows the Arduino to control the speed and direction of the fan motor by providing the necessary power amplification and protection. The motor driver essentially ensures safe and efficient operation of the fan motor whilst preventing damage to the Arduino.
- **Fan Blade/DC Motor:** The fan motor is responsible for drawing air through the device for evaporation cooling. It is controlled based on the temperature and humidity conditions to maintain the desired temperature/cooling effect.
- **DHT11 Temperature/Humidity Sensor:** The DHT11 Temperature and Humidity Sensor measures the ambient temperature and humidity. This sensor is crucial to the overall system as it provides important information for the system to regulate the temperature and cooling operations.
- **Water Level Sensor:** The water level sensor monitors the water level in the system, in the case of this project it measures the level in a cup of water. This component ensures there is an adequate supply of water for efficient cooling. It employs threshold detection to trigger alerts if the water level falls below said threshold.
- **Stepper Motor:** The stepper motor is used for controlling the direction of the vent. This motor allows users to adjust the airflow direction within the cooling system.
- **ULN2003 Stepper Motor Driver Module:** The ULN2003 Motor Driver is a module that interfaces between the Arduino and stepper motor. It provides voltage and current regulation to

drive the stepper motor. Acting as a bridge, it translates signals from the arduino into control signals needed to operate the stepper motor.

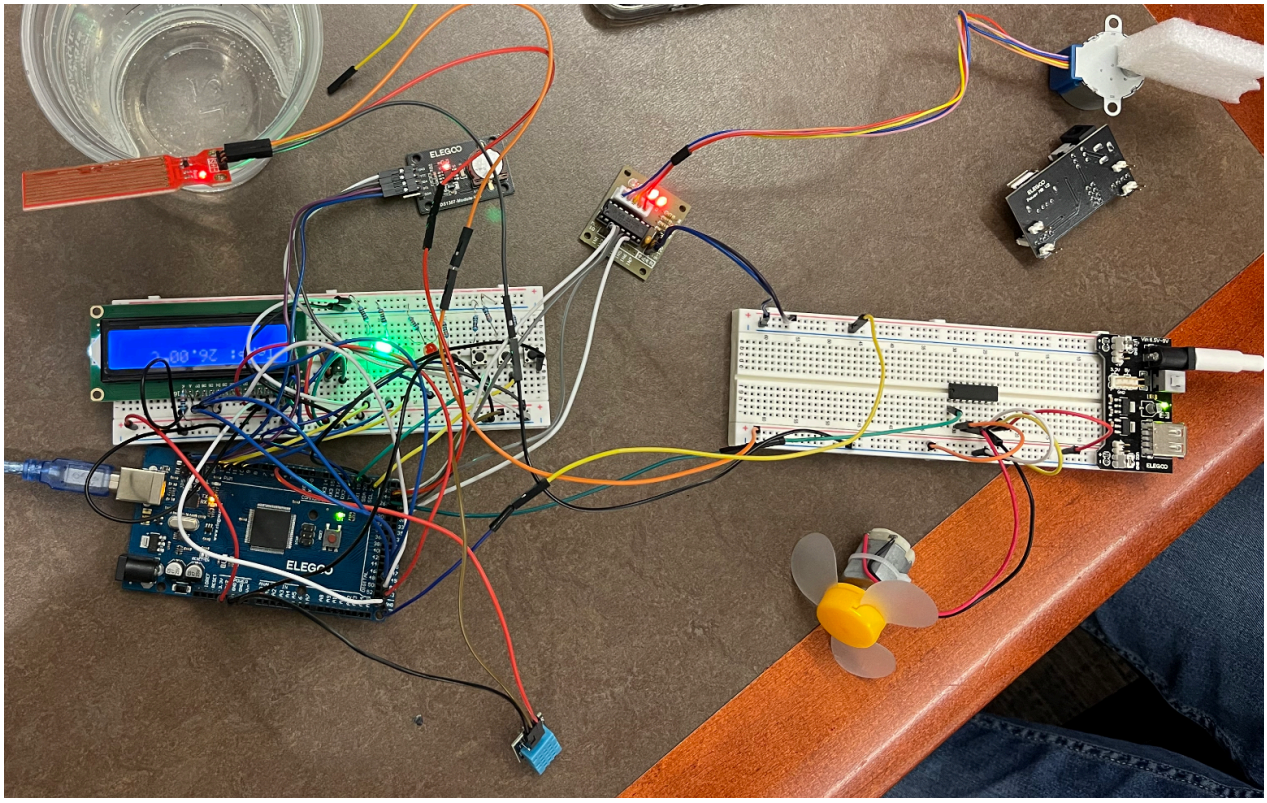
- **Real-Time Clock Module:** The Real-Time Clock Module acts as a timekeeping system. This component allows for accurate timestamping of events such as motor activation and system state changes.
- **LEDs:** The LEDs act as indicators which are used to provide users visual feedback on the status of the overall system. There are 4 different colored LEDs that represent unique states. Yellow indicates that the system is currently Disabled. Red indicates there is an Error with the system. Blue indicates everything is working and running smoothly. Green indicates that the system is idle.
- **Buttons/Potentiometer:** The buttons are integrated into the system to provide control over various functionalities. The buttons facilitate actions such as starting and stopping the system, as well as allowing users to reset the system in the event of an Error state. The potentiometer allows for adjusting of the LCD Display and control of the vent direction.
- **Power Supply Module:** The power supply module serves as a reliable source of power for the components of the cooling system. The utilization of this module ensures that there are stable voltage levels so as to prevent fluctuations that could possibly damage sensitive electronic components such as the Arduino.

Results

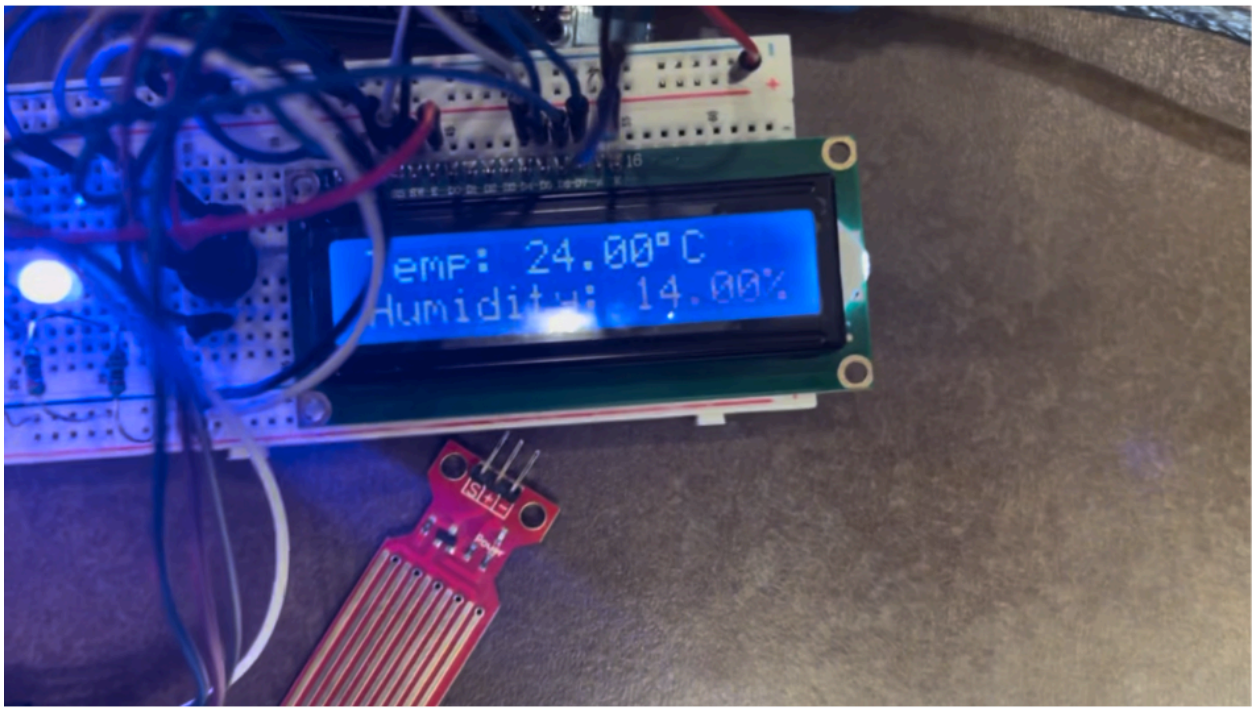
Link to GITHUB Repository:
https://github.com/1104-Rajagopalan-Ashwin/CPE-301-Final-Project-A-D-J-B.git

Link to demonstration video : https://youtu.be/Q2VIFmR0cWM

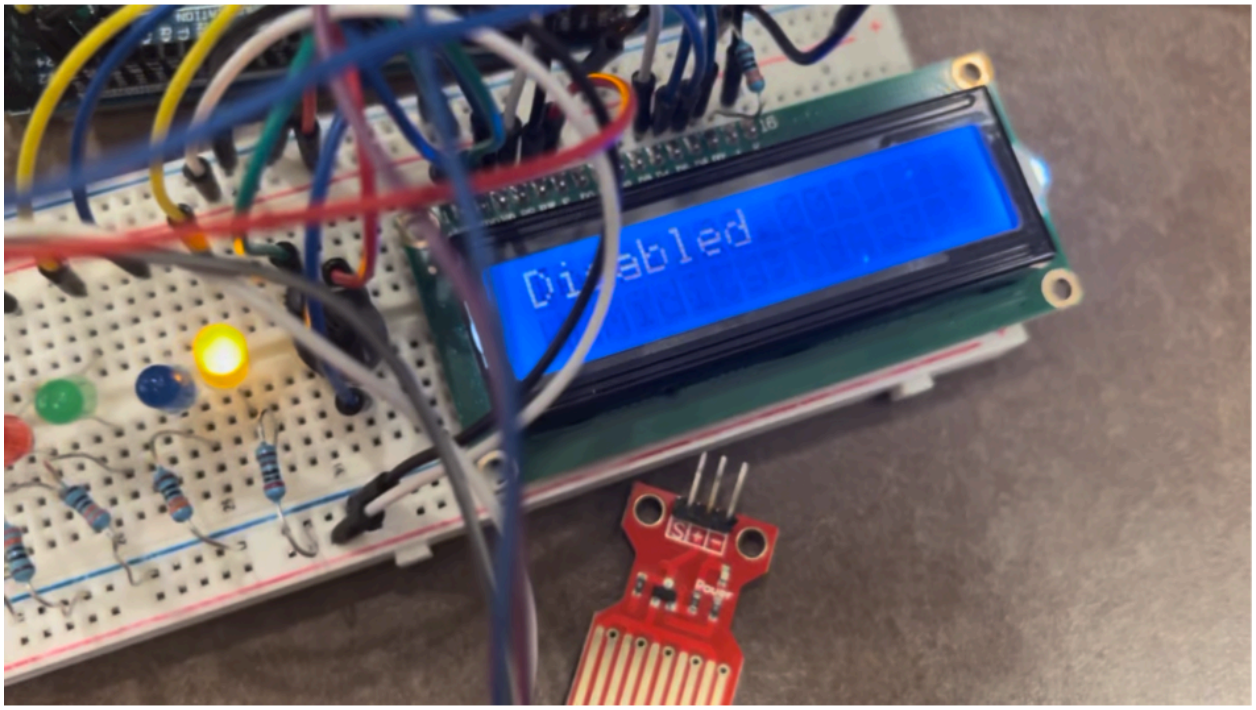
Figures of circuit below:



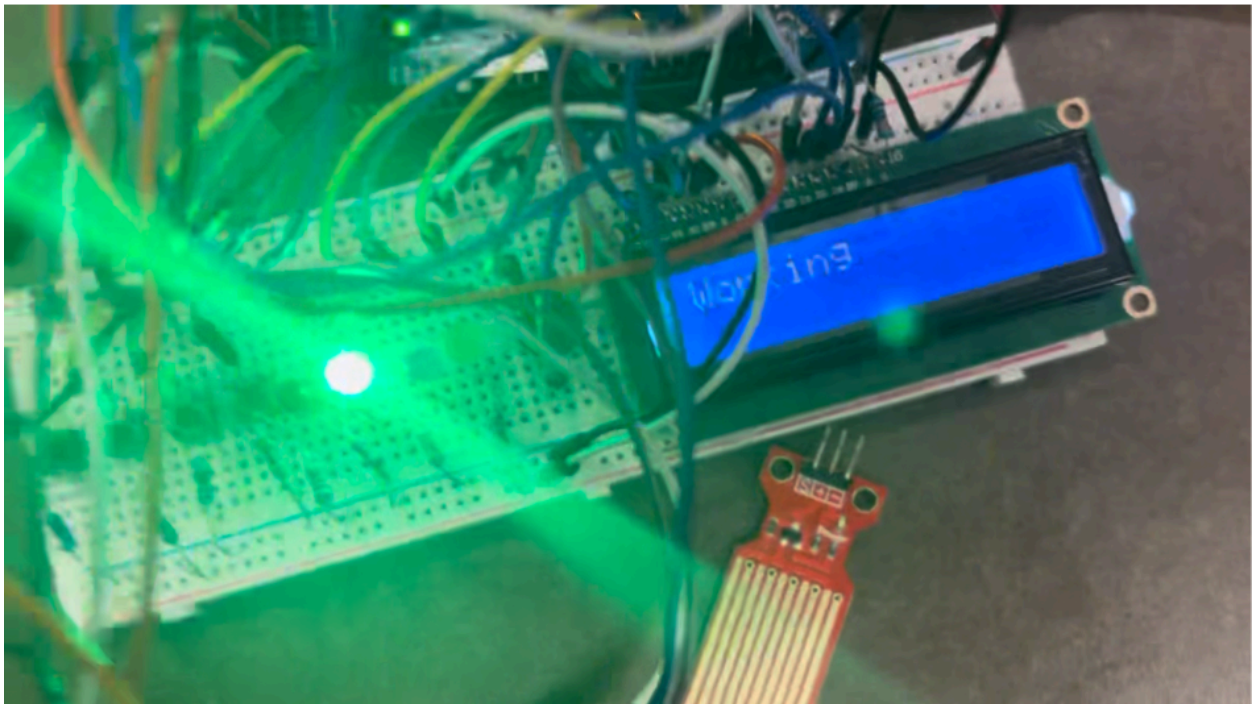
Complete Circuit



Working Mode Reading Temperature and Humidity with Blue LED



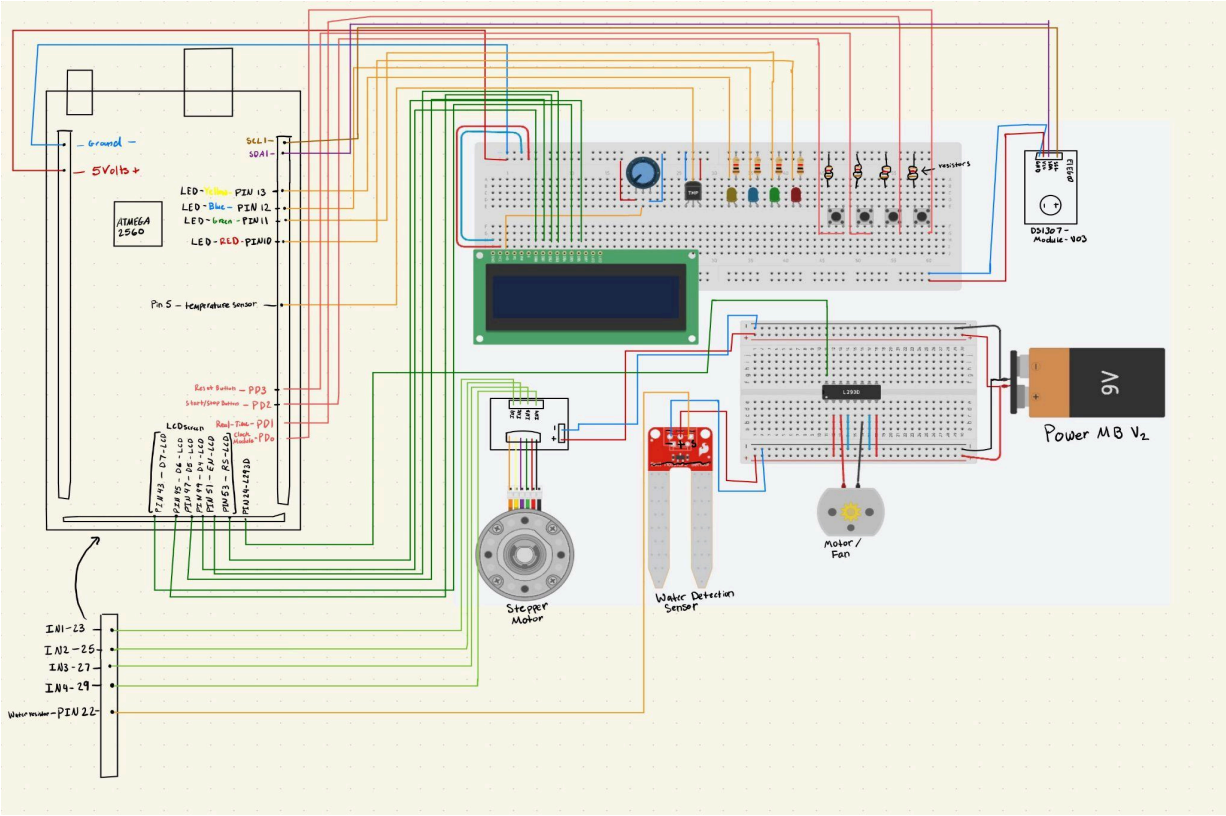
Disabled Mode with Yellow LED



Working Mode with Green LED

Error Mode with Red LED

Schematic:



<u>Links to relevant specification sheets:</u>

Pinout Links:

https://4.bp.blogspot.com/-Sj4AEX-ndNo/UeqPDlJo3DI/AAAAAAAAJN4/uN5tE84jGPI/s1600/MEGA2560.jpg

https://www.electronicshub.org/wp-content/uploads/2021/01/Arduino-Mega-Pinout.jpg

Datasheet Link:

https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-2549-8-bit-AVR-Microcontroller-ATmega640-1280-1281-2560-2561_datasheet.pdf

LCD Link:

https://arduinogetstarted.com/tutorials/arduino-lcd#google_vignette

Water Sensor Link:

https://arduinogetstarted.com/tutorials/arduino-water-sensor

DHT Sensor Link:

https://www.circuitbasics.com/how-to-set-up-the-dht11-humidity-sensor-on-an-arduino/

Stepper Motor Link:

https://lastminuteengineers.com/28byj48-stepper-motor-arduino-tutorial/

Fan Motor with Chip Link:

https://toptechboy.com/arduino-tutorial-37-understanding-how-to-control-dc-motors-in-projects/