CPE 301 Final Project

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1 Introduction

Our swamp cooler design allows the user to turn the cooler on and off and adjust the fan position. When it is powered on, it will constantly check if there is enough water to run the cooler. If not, it will display an error message to the LCD. If there is, it will display the current temperature and humidity instead. There is a limit for the temperature so that if it exceeds that limit, the fan will turn on. Additionally, the real time clock module reports the date and time every of every instance that the fan motor is powered on or off.

2 Materials

- Water level sensor
- DHT11 temperature/humidity sensor
- Buttons
- Stepper motor
- Motor driver
- Power supply module
- DC motor + fan blade
- LCD screen
- LEDs

3 Design

Our swamp cooler design used a DC motor, a stepper motor, a DHT11 temperature/humidity sensor, a water level sensor, an LCD, several buttons, a power supply module, and the real time clock module. Our code used a switch statement to govern the states as given in the state diagram. We coded an interrupt connected to one of the buttons that allowed the user to turn it on or off, which set the state to disabled or a state other than disabled based on the on/off state. When it was on, the switch statement would check which state the cooler was in to decide what to run, with checks on each sensor at the end of every loop to ensure that the state got changed appropriately.

If the water level from the water level sensor was too low, the state would change to the 'error' state and display the given error message to the LCD and the LED would be red. If the water level was okay and the temperature from the DHT11 sensor was within the limits, it was in the 'idle' state and the temperature and humidity would be displayed to the LCD. In 'idle', the LED was blue and none of the motors were on. When the temperature exceeded the bounds, the state would change to 'running' so that the DC fan motor would turn on and the LED would change to green. Additionally, the user would be able to use two buttons to move the stepper motor forward and backward.

4 Constraints

This swamp cooler uses the Arduino 5V power supply and either a 9V battery or an AC/DC adapter connected to the power supply module to run the motors and will only operate correctly in the bounds of the Arduino sensors. The DHT11 temperature/humidity sensor can only operate from 0 to 50°C with an accuracy of +-2°C and will only measure 20% to 80% humidity with 5% accuracy, making it not ideal for extremely humid climates. Additionally, the water level sensor can only measure a small amount of water and becomes inaccurate after a certain level due to the fact that our code will only allow values up to 255, whereas it reports values up to 1023 with the ADC library. For the timer clock code we were having issues with taking in a UART integer and translating it into ASCII symbol and turning the clock function to not read the correct value and give out gibberish. This made the clock function not work at its full potential with this error of not knowing how to get the UART to read the correct value and translate it correctly.

For the coding part when we were all working on sections of the code, we kept having conflict with everyone uploading code, when we tried to make sure no one was working on the same code, and we ended up having to create MainNoConflict.ino as a whole new file so that the main final code is in MainNoConflict.ino, but most of the changes and commit histories are in main.ino.

For the video that we filmed the potentiometer was flimsy and to get it to show us the display on the LCD we had to resort to holding down the potentiometer so that it was pressed in all the way.

5 Schematic and Pictures

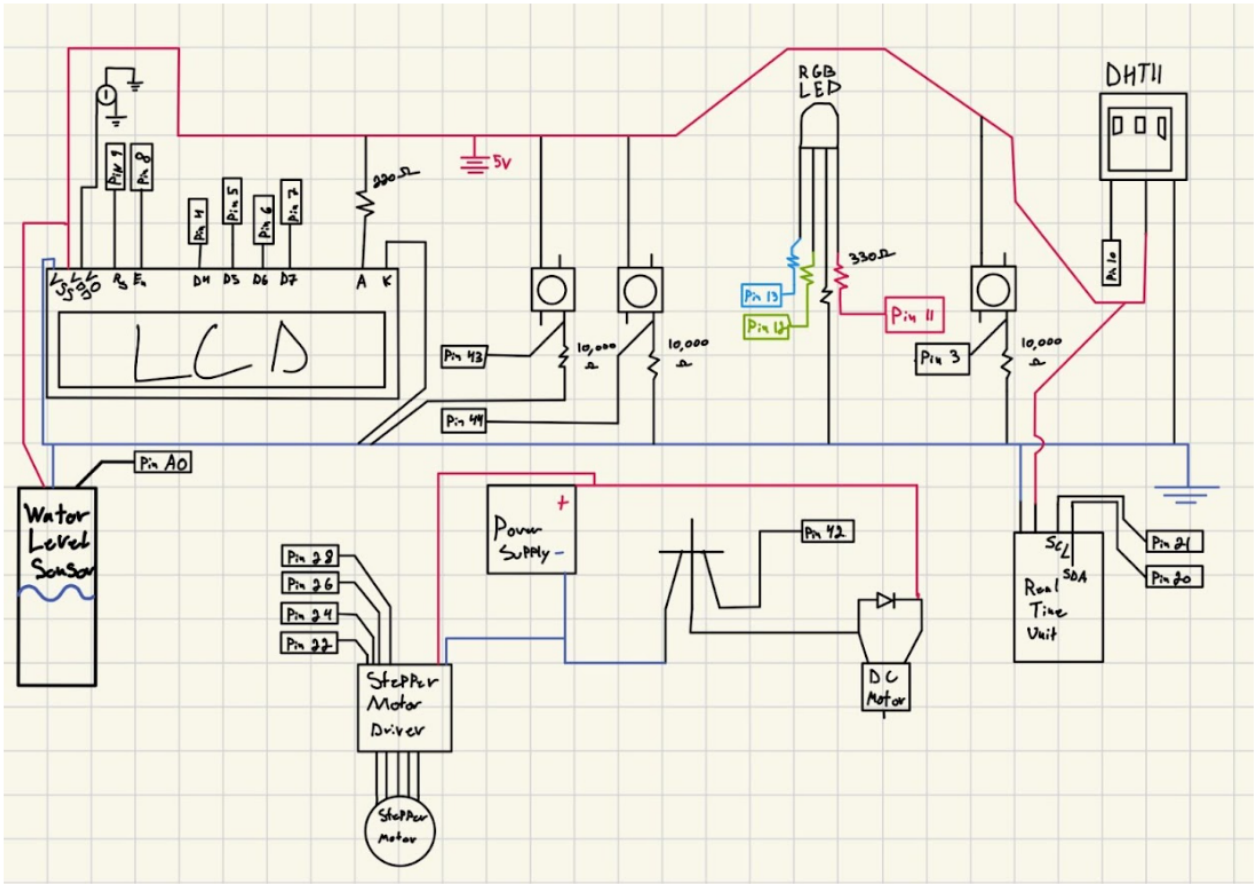

Figure 1: Circuit schematic.

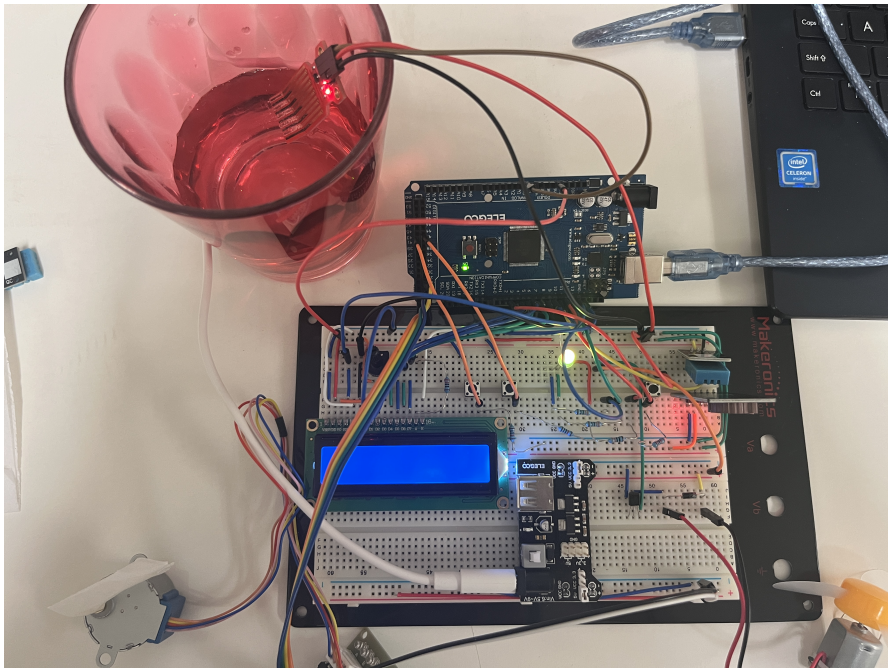

Figure 2: Top view of the circuit.

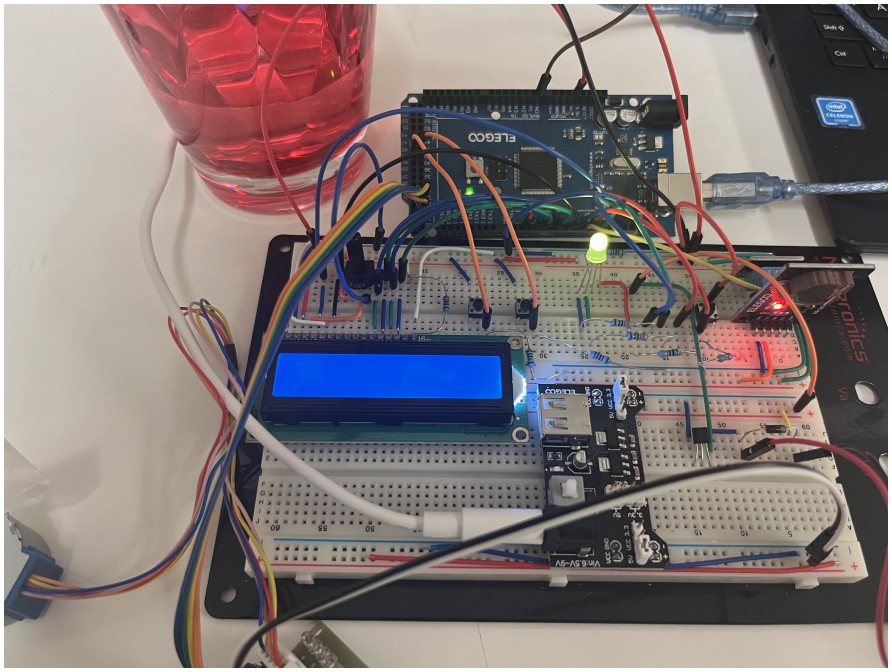

Figure 3: Angled view of the circuit.

6 Datasheets

DHT11: `https://www.mouser.com/datasheet/2/758/DHT11-Technical-Data-Sheet-Translated-Version-1143054.pdf`
Dc motor: `https://wiki-content.arduino.cc/documents/datasheets/DCmotor6_9V.pdf`
Step motor: `https://www.mouser.com/datasheet/2/758/stepd-01-data-sheet-1143075.pdf`
Lcd: `https://www.mouser.com/pdfdocs/DFR0464Datasheet.pdf`
Power supply module: `https://www.handsontec.com/dataspecs/mb102-ps.pdf`

Potentiometer: https://components101.com/resistors/potentiometer
Buttons: https://wiki-content.arduino.cc/documents/datasheets/Button.pdf
Motor driver: https://www.hadex.cz/spec/m513.pdf
Water level sensor: https://www.biomaker.org/block-catalogue/2021/12/17/water-level-sensor-tzt-water-level-

7 GitHub repository link:

Link to github: https://github.com/mrfroggyjoe/CPE-301-Final.git

Link to video: https://drive.google.com/file/d/1W47P4GRyywn8ytEXYFU2VzS80TWau1tS/view?usp=sharing