

Final Project: The Swamp Cooler

University of Nevada, Reno

CPE 301-1001 Embedded System Design

By Jose Diaz

Overview

In my design, I incorporated mostly all the necessary components specified in the requirements for this project. My design incorporated two breadboards, an Arduino Mega 2560, and other components that were included in the “The Most Complete Starter Kit Mega 2560 Project.” I got all the component requirements listed to work except for the fan motor. It was working initially but towards the end when I finalized my work it did not appear to work anymore. I tried everything but nothing seemed to work to get the fan motor working. As for the water level detector, LED display, stepper motor, temperature and humidity sensor, and the RTC module worked perfectly fine with minor bugs here and there.

One of the limitations I experienced was using all the components and being careful not to damage them. It is possible that I could have damaged the fan motor because I couldn't get it to work anymore. There were also times where I wired the components incorrectly which caused them to heat up significantly. This human error on my part is the reason I damaged a potentiometer that would not work anymore. I was also limited to using the Arduino 5V power supply for one of the breadboards due to not having more than one type of external power supply. There were also environmental and equipment margins of errors, but I still managed to complete the assignment.

The water level sensor was used to measure the level of water which determined which state the swamp cooler was at. Using the stepper module, I was able to get a stepper motor to move in different directions. Using a potentiometer, I was able to change the direction of the stepper motor. I also used the LCD display to display the current temperature and humidity. The LCD display got its information from a humidity and temperature sensor that also affected the

state of the swamp cooler. An RTC module was also used to keep track of real-time. This helped create output statements of timestamps when the swamp cooler would change states.

Links for Demonstration Video & Code Repository

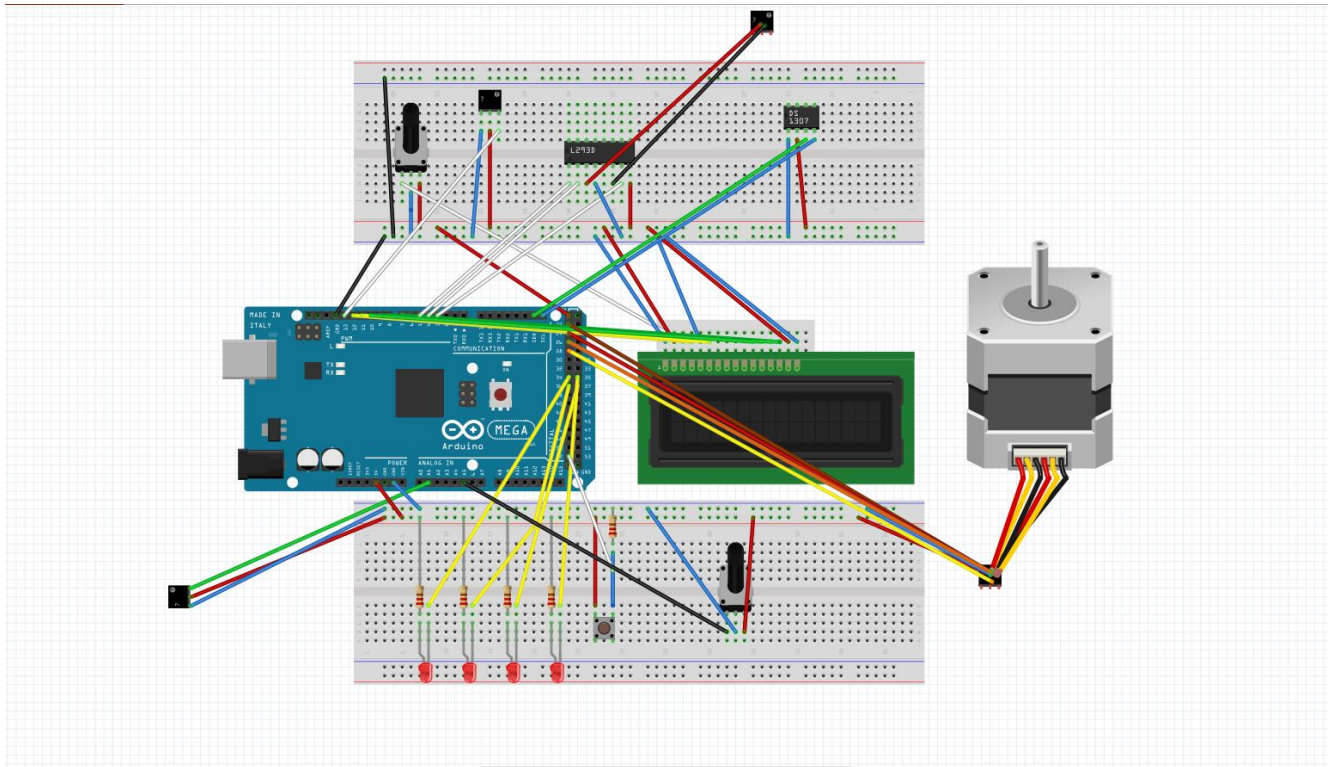
Note: All work will also be found at repository link

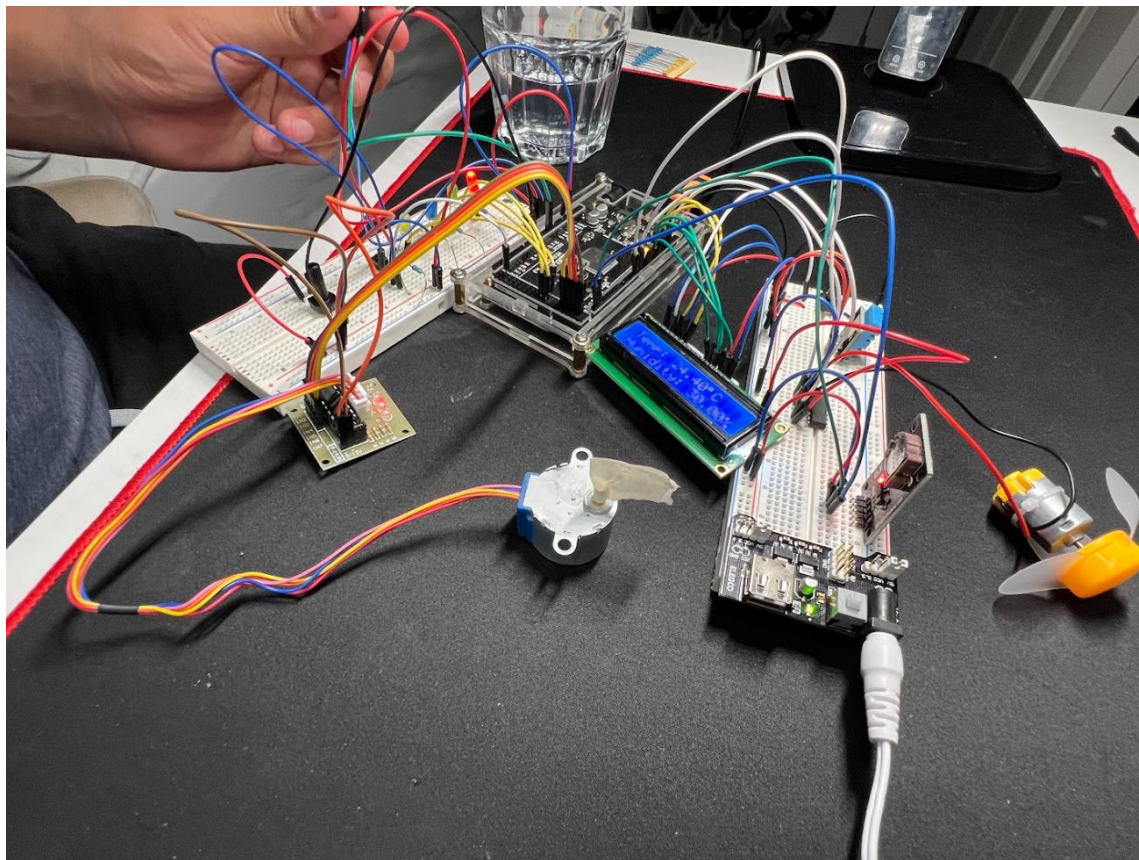
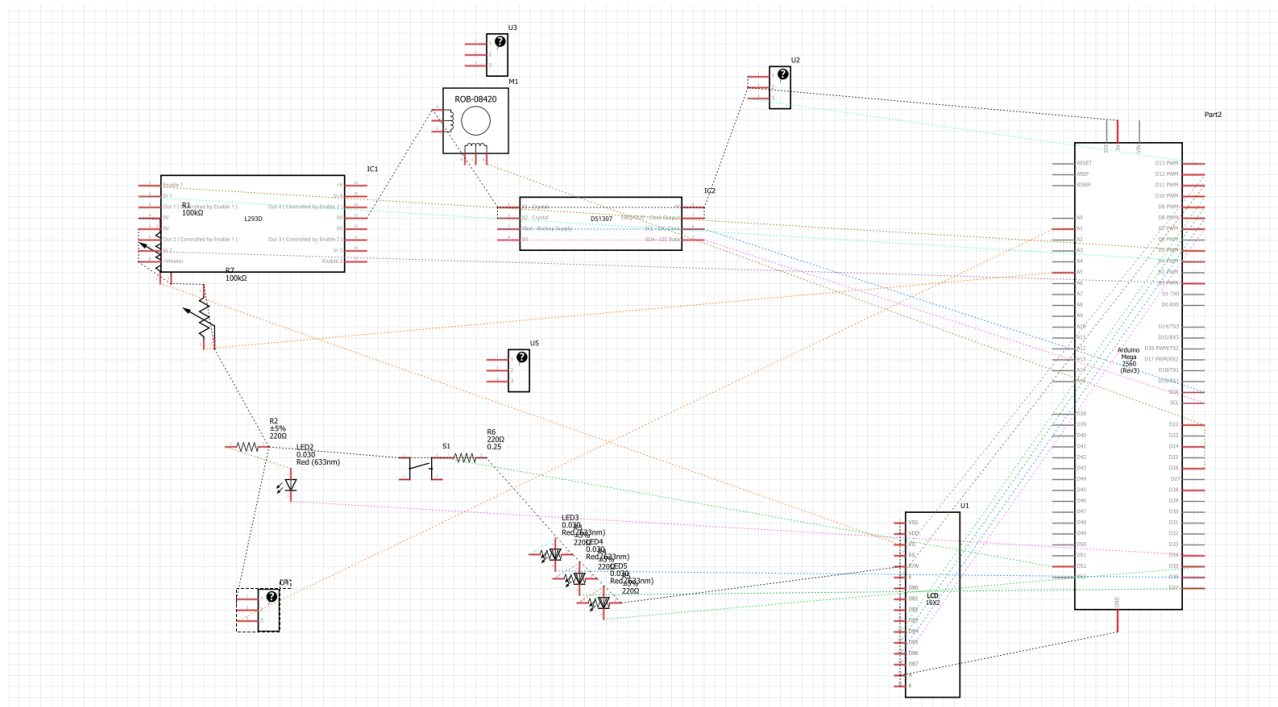
Repository Link: https://github.com/Diaz-Jose-UNR/CPE_301_Final_Project

Demonstration Video Link:

https://drive.google.com/file/d/1TPxEncI_X62rRHosDVRt5DrHToH5Nn5N/view?usp=sharing

Circuitry & Schematics





Major Components & Specs

Arduino Mega 2560 :

- Operating Voltage: 5V ; Input: Voltage (recommended):7-9V
- Operating Temperature: -40°C to +85°C
- Datasheet:
<https://docs.arduino.cc/static/27237993e052099f72646d245184c5b7/A000067-datasheet.pdf>

Water Level Detection Sensor :

- Operating Voltage: 5V DC
- Operating Temperature: +10°C to +30°C
- Operating Humidity: 10% to 90 % non-condensing
- Datasheet: https://curtocircuito.com.br/datasheet/sensor/nivel_de_agua_analogico.pdf

LCD1602 Module (with pin header) :

- Operating Voltage: 5V \pm 10%
- Operating Temperature: 0°C to +50°C
- Datasheet: <https://www.openhacks.com/uploadsproductos/eone-1602a1.pdf>

ULN2003 Stepper Motor Driver Module :

- Operating Voltage: Max 50V
- Operating Temperature: -40°C to +70°C
- Datasheet: <https://www.hadex.cz/spec/m513.pdf>

28BYJ-48 – 5V Stepper Motor :

- Operating Voltage: 5V DC
- Operating Temperature: -45°C to + 125°C
- Datasheet: <https://www.mouser.com/datasheet/2/758/stepd-01-data-sheet-1143075.pdf>

Potentiometer 10K :

- Operating Voltage: Max 200 VDC (lin) 100 VDC (no lin)
- Operating Temperature: -25°C to +70°C

- Datasheet: https://datasheet.lcsc.com/lcsc/1912111437_Amphenol-ICC-PT10LV10-103A2020_C390097.pdf

DS1307 RTC Module :

- Operating Voltage: 4.5V to 5.5V
- Operating Temperature: 0°C to +70°C
- Datasheet: <https://www.sparkfun.com/datasheets/Components/DS1307.pdf>

DHT11 Temperature and Humidity Module:

- Operating Voltage: DC 3.3V to 5.5V
- Operating Temperature: 0 to +50°C / $\pm 2^\circ\text{C}$
- Datasheet: https://components101.com/sites/default/files/component_datasheet/DHT11-Temperature-Sensor.pdf