

Final Project

CPE 301

Natalie Carrero

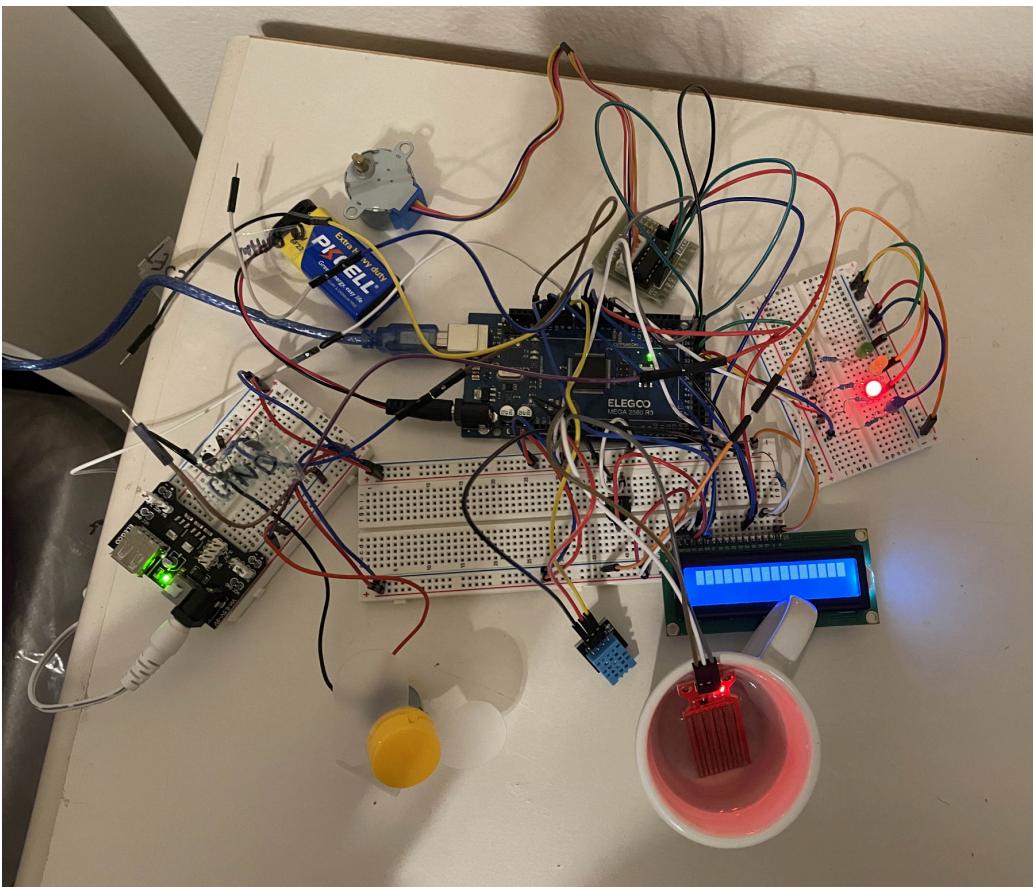
Design Overview

This embedded system is designed to control and monitor a variety of components, such as a stepper motor, a fan (with its own motor), a temperature and humidity sensor (DHT11), and a water level sensor, all while displaying information on an LCD screen. The system operates on four different states: DISABLED, IDLE, RUNNING, and ERROR. These states are either controlled by user input from buttons or sensor readings. The stepper motor is activated and controlled based on user input and sensor data, while the fan's state is determined by environmental conditions. The system also tracks water levels and adjusts its state to avoid malfunction by transitioning to an ERROR state if the water level falls below a predefined threshold.

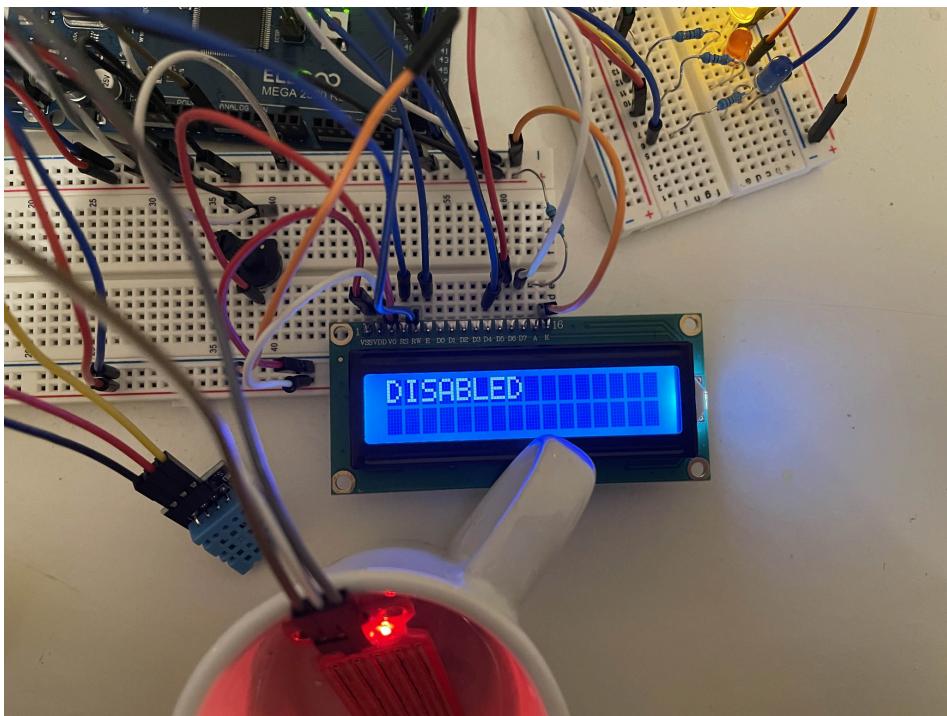
System Constraints

1. Power Requirements: With all the components, the system had difficulty ensuring a stable and reliable power distribution especially with the stepper motor, fan, and LCD being the most strenuous.
2. Sensor Accuracy: With the given kit, sensors needed to be as accurate as possible in order to avoid incorrect state transitions and improper control of components.
3. Faulty Components: Malfunctioning buttons, wires, and other components negatively affect the performance and reliability of the system. In this case in particular, buttons were inconsistent and the L293D motor drive that was supposed to be used for the fan did not work at all. The malfunctions ultimately lead to a faulty system while also making debugging difficult.

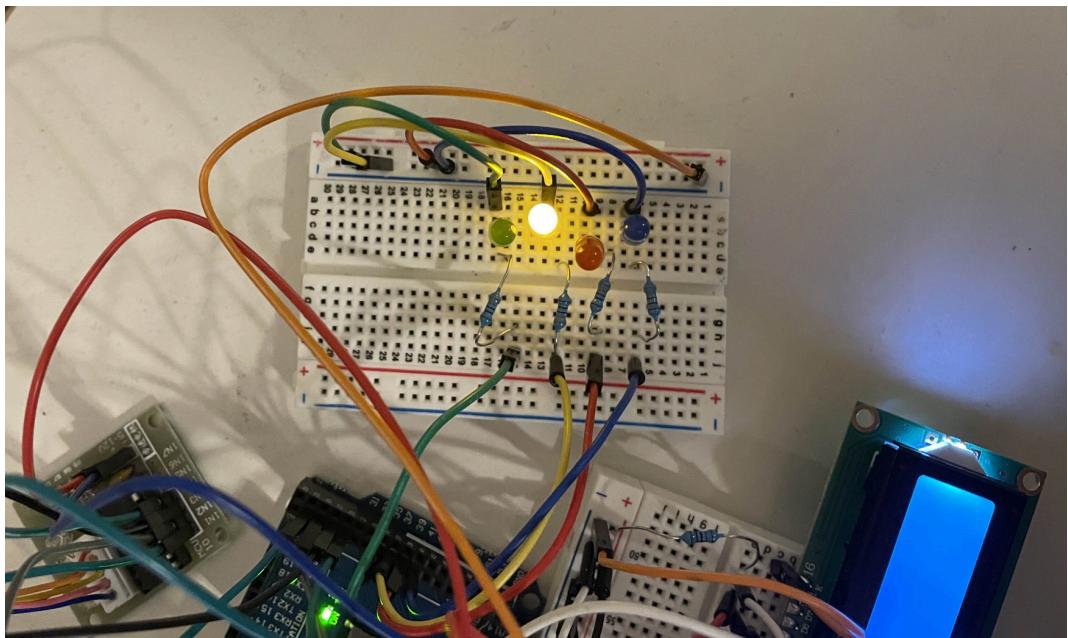
Final System Images



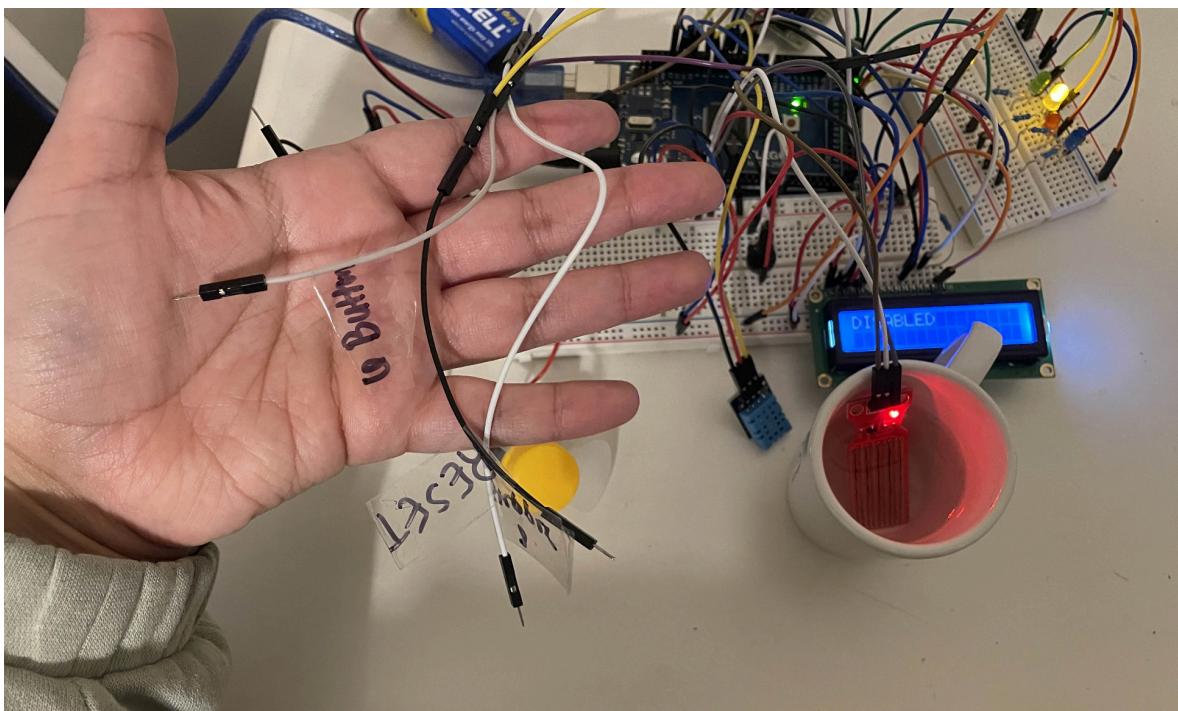
Entire System



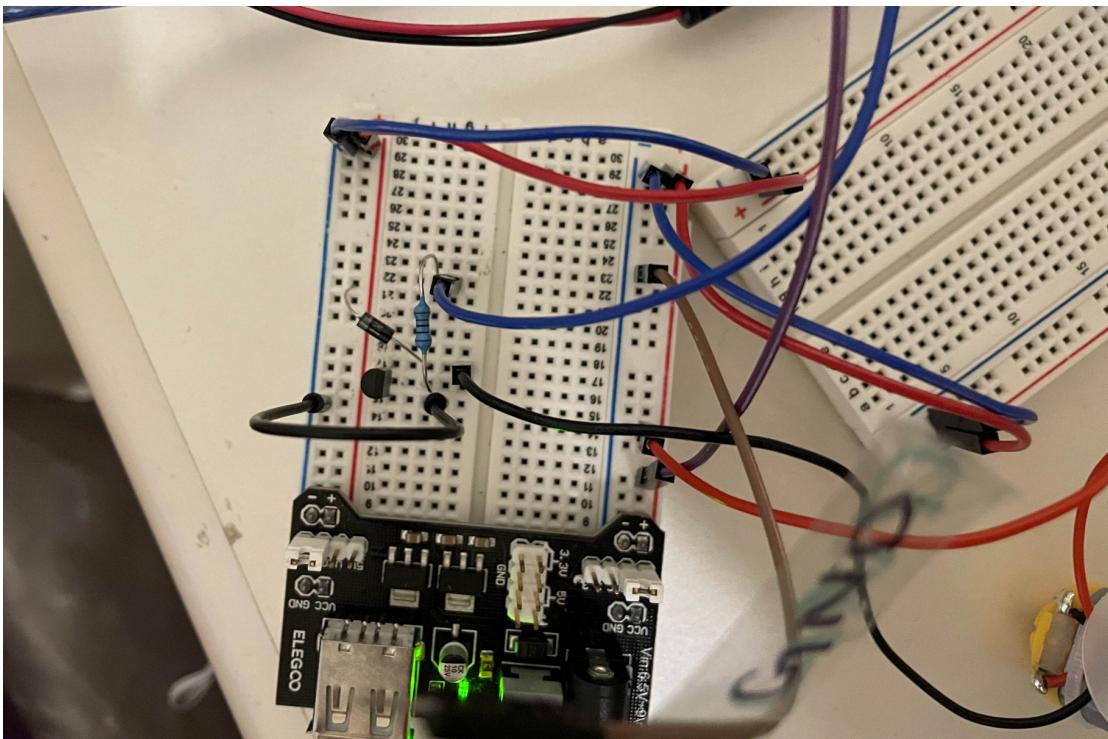
LCD Setup



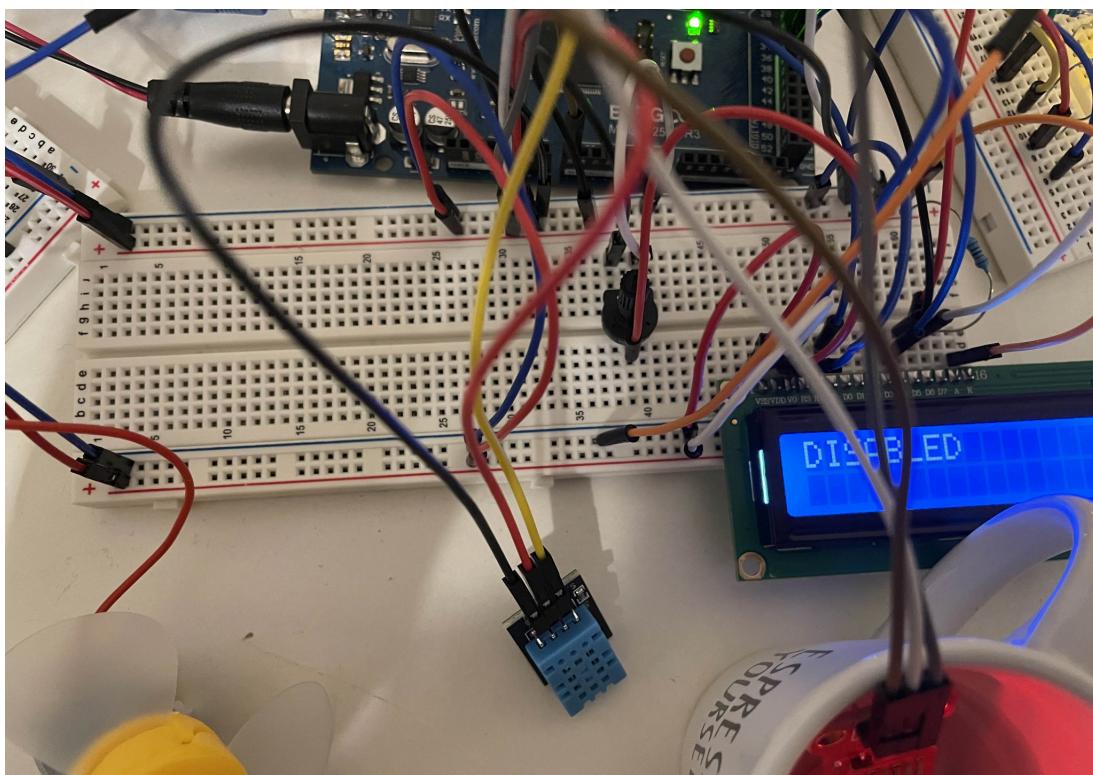
LED Setup



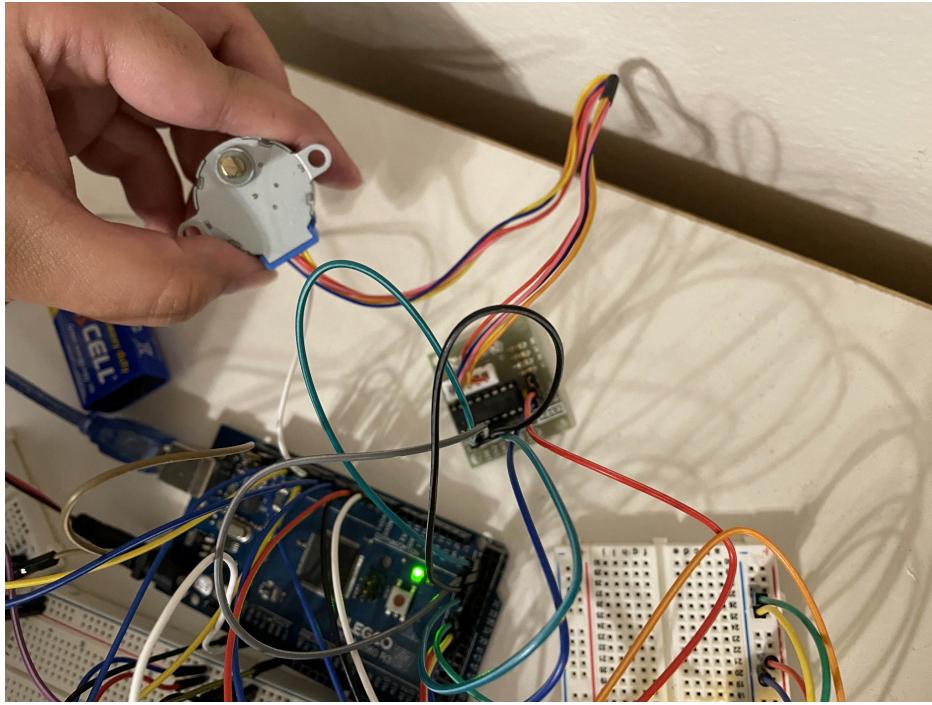
3 Buttons: On/Off, Reset, Stepper Motor



Fan and motor setup



Main Breadboard - Sensor setup



Stepper Motor Setup

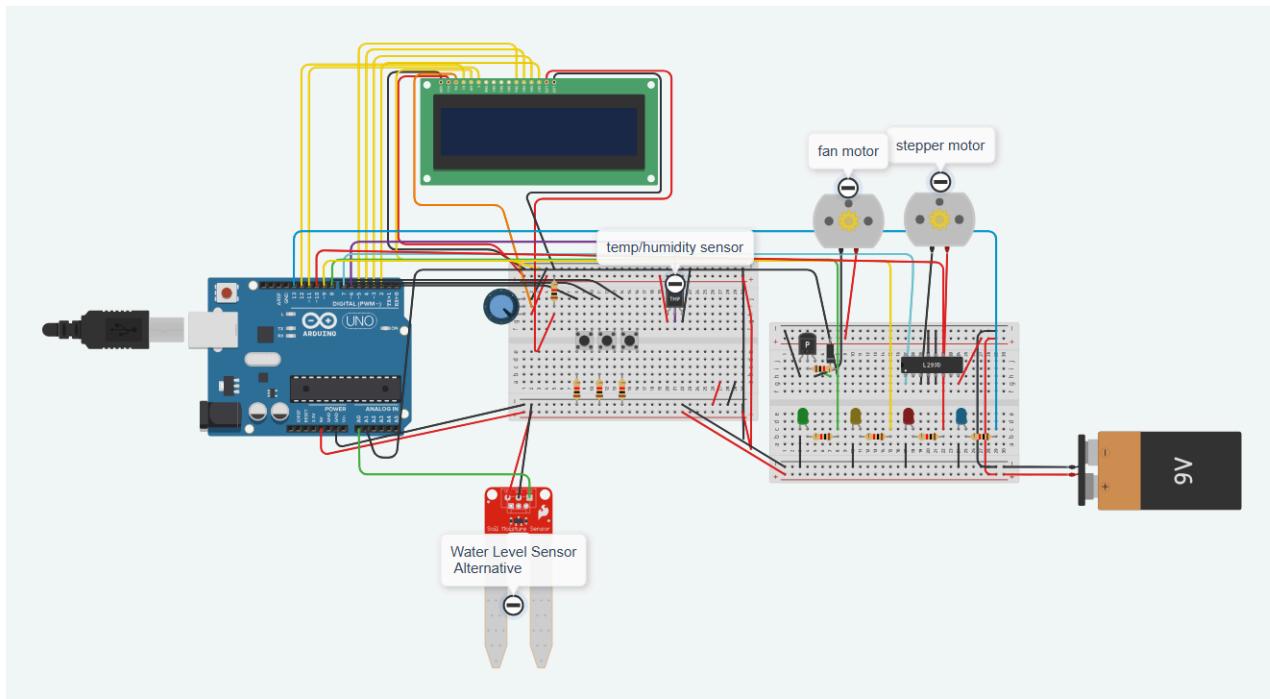
```
Output Serial Monitor ×
Message (Enter to send message to 'Arduino Mega or Mega 2560' on 'COM3')
Time: 2002-00-00T00:65:00State changed from DISABLED to IDLE
Time: 2003-00-65T00:02:00State changed from IDLE to ERROR
Time: 2025-00-65T00:11:00State changed from IDLE to ERROR
Time: 2003-00-65T00:139:00State changed from IDLE to ERROR
Time: 2003-00-65T00:30:00State changed from IDLE to ERROR
Time: 2025-00-65T00:04:00State changed from ERROR to IDLE
Time: 2004-34-00T00:02:00State changed from IDLE to ERROR
Time: 2003-00-65T00:00:00State changed from ERROR to IDLE
Time: 2003-00-65T00:02:00State changed from IDLE to ERROR
Time: 2025-00-65T00:04:00State changed from IDLE to ERROR
Time: 2003-00-65T00:00:00State changed from IDLE to ERROR
Time: 2003-00-65T00:04:00State changed from ERROR to IDLE
Time: 2002-00-09T00:65:00State changed from IDLE to RUNNING
Time: 2000-43-01T00:65:00State changed from RUNNING to IDLE
Time: 2002-00-00T00:65:00State changedto DISABLED
```

Serial Monitor From Demo

Video Link

https://www.youtube.com/watch?v=dzxu43FU4yI&ab_channel=Nahtaly

Schematic



Relevant Specification Sheet Links

<https://lastminuteengineers.com/arduino-1602-character-lcd-tutorial/>

<https://www.theengineeringprojects.com/2017/06/introduction-to-uln2003.html>

<https://components101.com/motors/28byj-48-stepper-motor>

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

<https://learn.adafruit.com/adafruit-arduino-lesson-13-dc-motors?view=all>

Github Repository

<https://github.com/CarreroNatalie/CPE301-FinalProject>