CPE 301 Final Project

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Overview

The purpose of this project is to implement the functionalities and behaviors of a swamp cooler. It contains a motor for the cooling fan, a water reservoir with sensor, a motor for vent direction, a temperature and humidity sensor, an LCD to display the temperature and humidity as well as error/status messages, and a real time clock to track the times at which the state of the system changes.

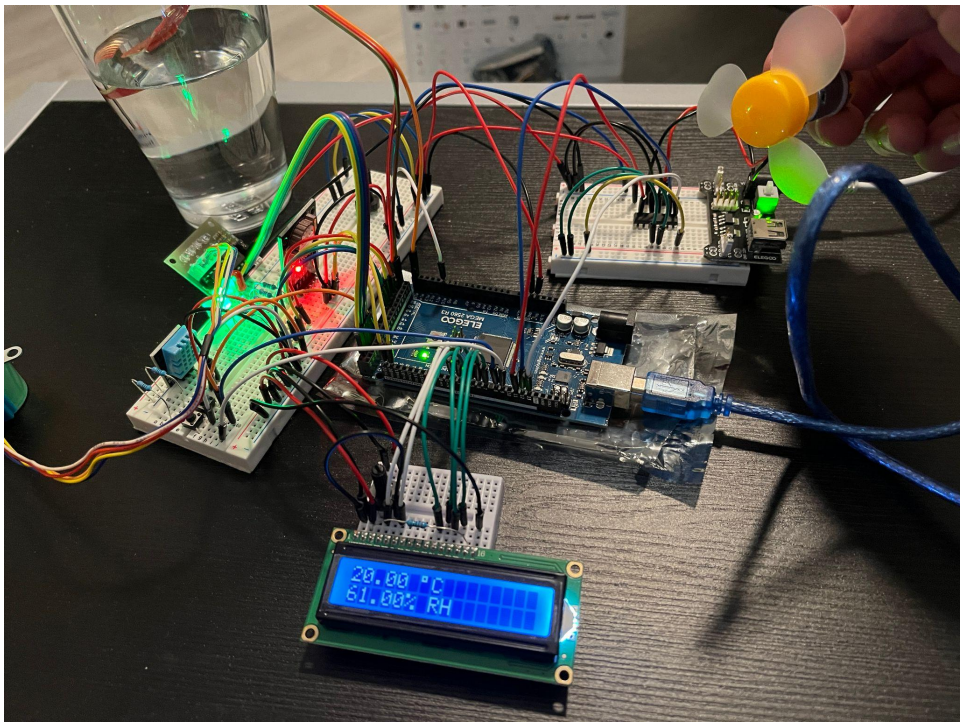
There are four states: disabled, idle, running, and error. Disabled is the default state, where nothing will happen until the start/stop button is pressed. The start/stop button switches between the disabled and idle states. The idle state monitors the temperature and humidity until it is within the threshold of activating the cooler, which brings it to the running state. In the running state, the fan is running until the temperature or humidity leave operational range. Error state is reached when the water sensor reading is too low, and the reset button must be pressed while the water reading is acceptable again to return the system to idle state.

The temperature and humidity thresholds defined by macros are 19°C and 60% RH, respectively. If the temperature drops below its threshold or the humidity rises above its threshold, the fan will not run. The testing environment had a temperature of 19-20°C and 55% RH. Briefly blowing on the humidity sensor caused it to rise above 60%, which ceased any fan movement and prevented the running state from being reached until it dropped back down.

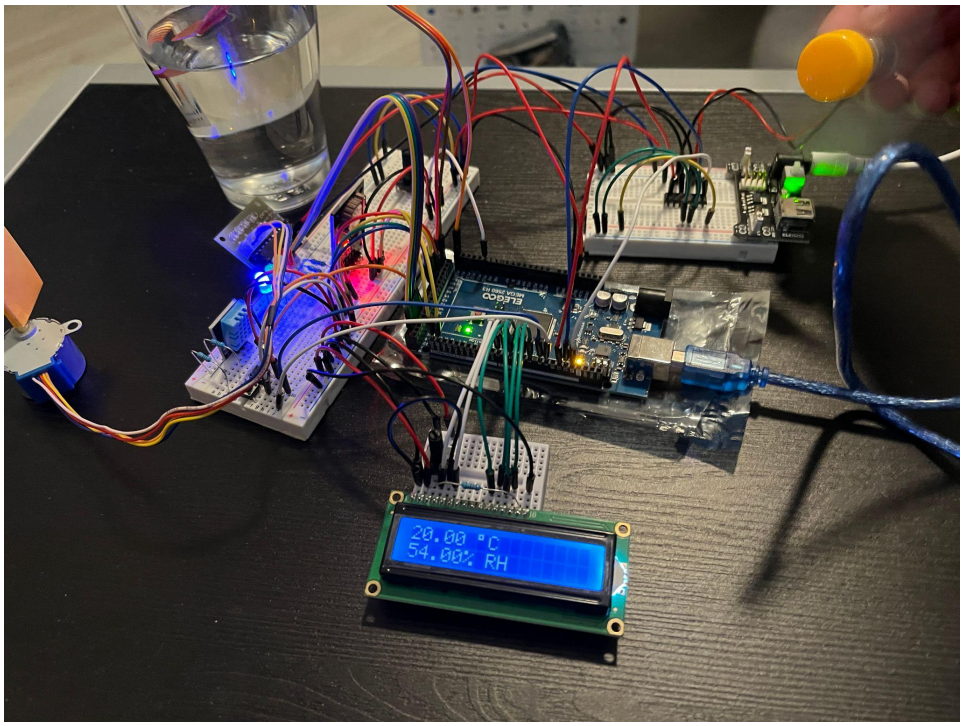
The components used the 5V power source from the Arduino board and the two motors used an external 6.5-9V power supply on a separate breadboard, with connected grounds.

Images

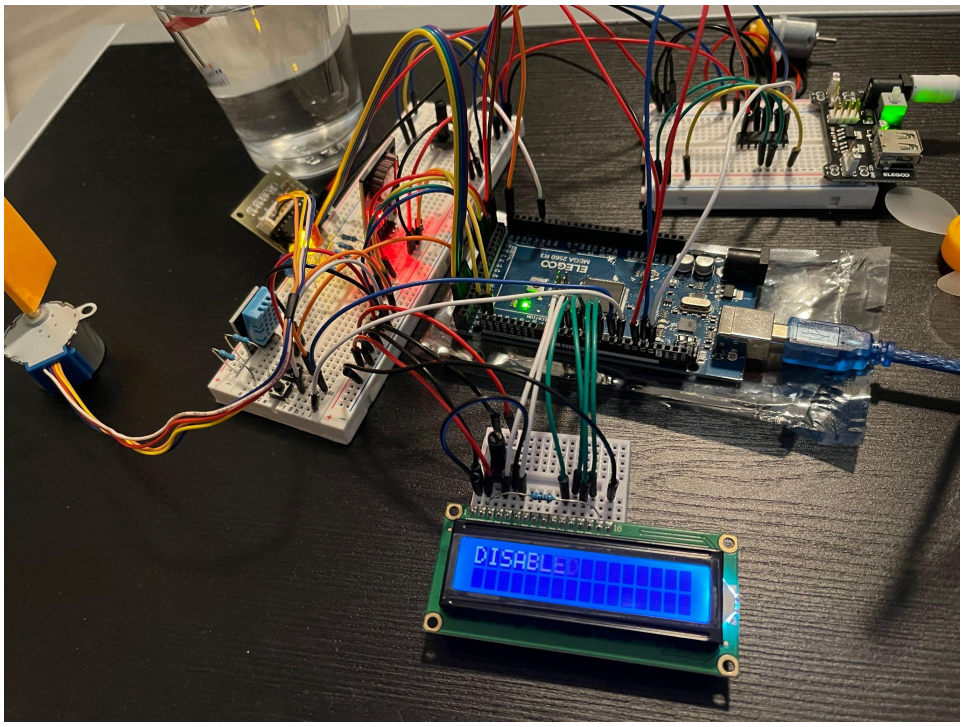
Idle state



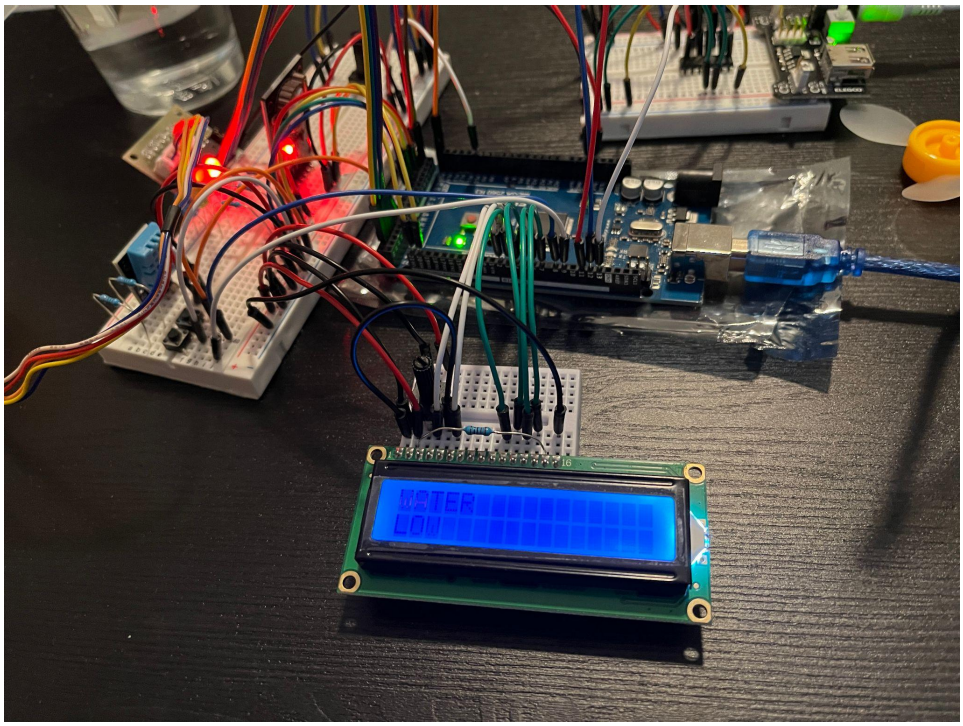
Running state



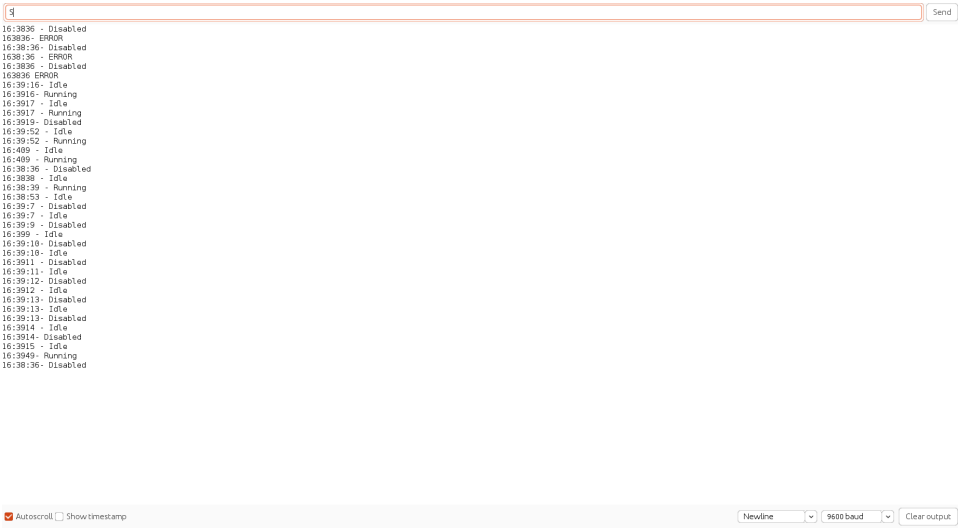
Disabled state



Error state



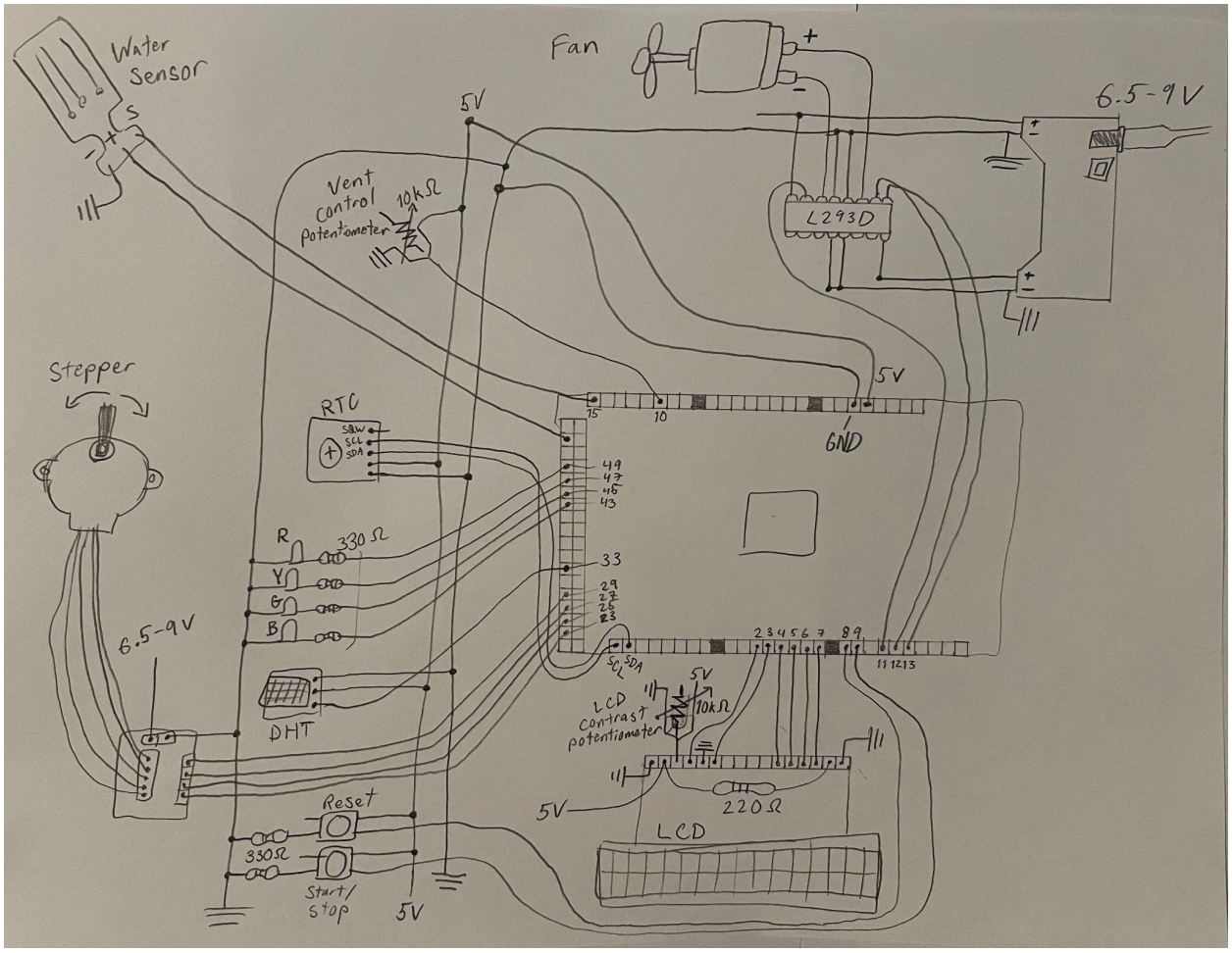
Serial monitor



Video of operation

https://drive.google.com/file/d/1gbRU13yrS6mn_UUjLYB9tIPkvIvWC27k/view?usp=sharing

Schematic



References Used

Arduino Mega 2560

Datasheet: https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-2549-8-bit-AVR-Microcontroller-ATmega640-1280-1281-2560-2561_datasheet.pdf
Pinout: https://www.electronicshub.org/wp-content/uploads/2021/01/Arduino-Mega-Pinout.jpg

Libraries

LCD: https://github.com/arduino-libraries/LiquidCrystal
RTC: https://github.com/adafruit/RTClib
DHT: https://github.com/adafruit/DHT-sensor-library
Stepper: https://www.airspayce.com/mikem/arduino/AccelStepper/

GitHub Repository

https://github.com/wagner-kurt/CPE301-Final
Includes full-size versions of the images in this document