CPE 301: Final Project Overview

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Overview:

The goal of this project is to create a working swamp cooler using the arduino ATmega 2560 and the kit we have been using for the labs over the course of the semester. If this project is completed successfully the arduino should properly perform the following tasks:

- Monitor the water level in a cup and print an alert if the water level is too low.
- Monitor the air temperature and humidity and print said values to the LCD screen.
- Start and stop a DC motor fan when the temperature falls out of a specific range.
- Allow a user to control the fan angle using a stepper motor.
- Allow the user to turn the whole system on and off by pressing a button.
- Record the time and date everytime the DC motor is turned on/off.

To operate the required circuit components with the arduino we are allowed to use certain arduino libraries, However use of arduino libraries should follow the design requirements. For this project we are allowed to use the Arduino libraries for the stepper motor, LCD, real-time clock (RTC), and the temperature and humidity sensor (DHT11). All the parts needed to complete this project can be found in the arduino kit. A few of the other design requirements are as follows:
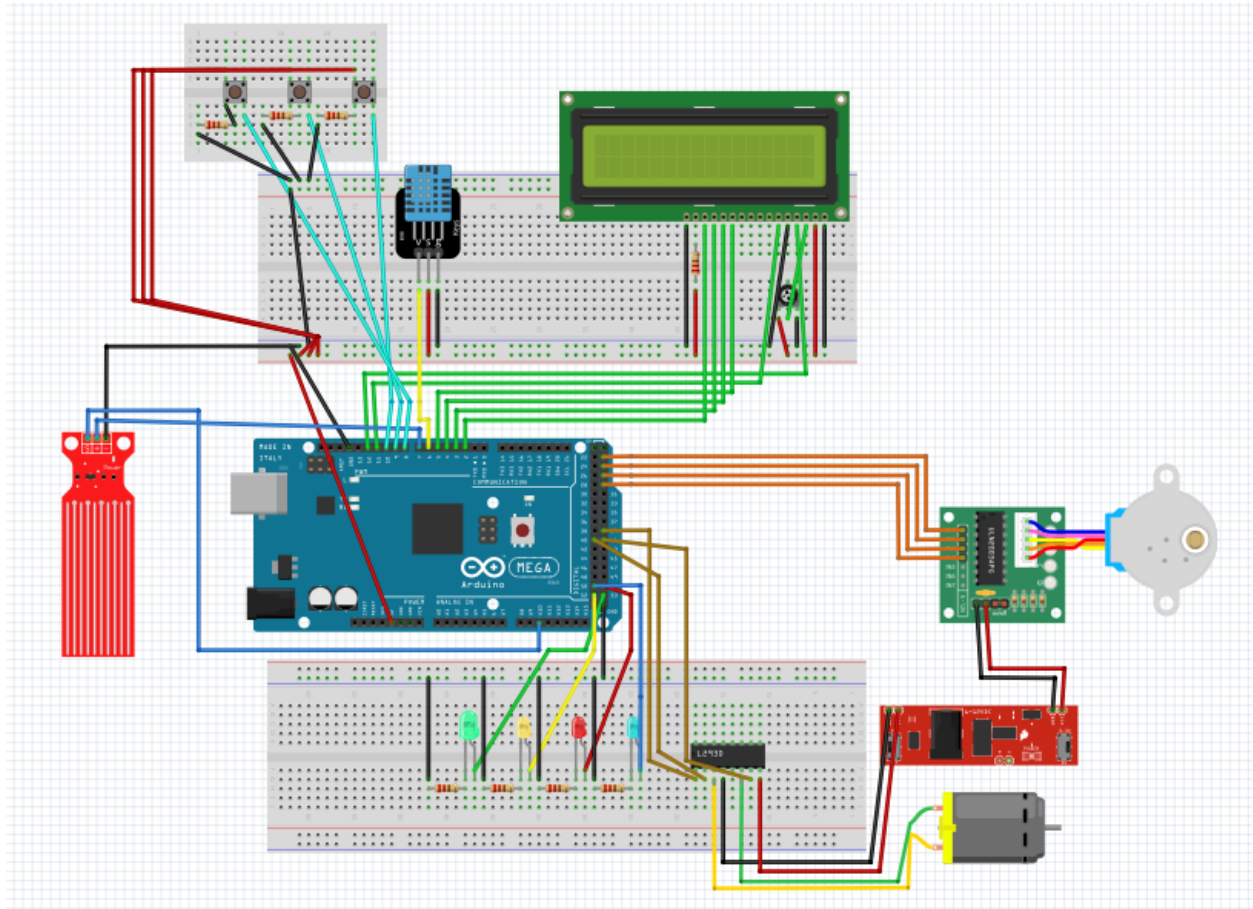
1. The water level sensor must sample using the ADC and compare the value to a defined threshold.
2. The stepper motor direction must be controlled using either a button or potentiometer.

3. The LCD is used to display what state the system is in, as well as the temperature and humidity while in certain states.
4. The RTC is used to report when events happen.
5. Must use the DHt11 to read the temperature and humidity of the systems
6. The DC motor should be used for the fan of the system. The power for the motor should come from a separate power supply so as to not damage the arduino.

Along with the design requirements above, the system should have four different states; Disabled, Idel, Running and Error. In the Disabled state a yellow LED should be on and nothing else should happen. If the system is Idle a green LED should be on, the water level, temperature and humidity should be recorded, and the temp and humidity should be displayed on the LCD screen. If the system is Running then the fan should be on, the temp and humidity should be displayed, and water level should be monitored, also a blue LED should be on. If the system is in the Error state a error message should be displayed on the LCD and a red LED should be on. The system should be able to be turned off from any state which means the system enters the Disables state.

Schematic:

To create the schematic I used Fritzing because it works similarly to tinkercad but has all the components and the arduino ATmega 2560 in its component library.

Relevant component links:

LCD Library:
- https://www.arduino.cc/reference/en/libraries/liquidcrystal/setcursor/
- https://docs.arduino.cc/learn/electronics/lcd-displays

RTC library:
- https://www.arduino.cc/reference/en/libraries/rtclib/
- https://codebender.cc/example/RTClib/ds1307#ds1307.ino

Arduino Datasheet:
- https://ww1.microchip.com/downloads/en/devicedoc/atmel-2549-8-bit-avr-microcontroller-atmega640-1280-1281-2560-2561_datasheet.pdf
- https://www.electronicshub.org/arduino-mega-pinout/

Water Level Sensor:
- https://arduinogetstarted.com/tutorials/arduino-water-sensor
- file:///C:/Users/hunte/Downloads/CPE301_Sensors-1.pdf (Lecture slides on Sensors)

DHT11:
- file:///C:/Users/hunte/Downloads/CPE301_Sensors-1.pdf (Lecture slides on Sensors)

Stepper Motor:
- file:///C:/Users/hunte/Downloads/CPE301_Motors.pdf (Lecture slides on Motors)

DC Motor:
- file:///C:/Users/hunte/Downloads/CPE301_Motors.pdf (Lecture slides on Motors)
- https://lastminuteengineers.com/l293d-dc-motor-arduino-tutorial/

Video Link:

https://youtu.be/qrRA8mFTJ3k