CPE 301 Final Project Report

Authors: Chris Aboujaoude, Ervin Martinez, Tevon Westby, Zachary Duggan

Group: 25

1. Project Description:

The purpose of our project is to replicate the code behind the functionality of a swamp cooler. As its functionality is used to provide energy efficient way of cooling in comparison to regular traditional air conditioning systems.

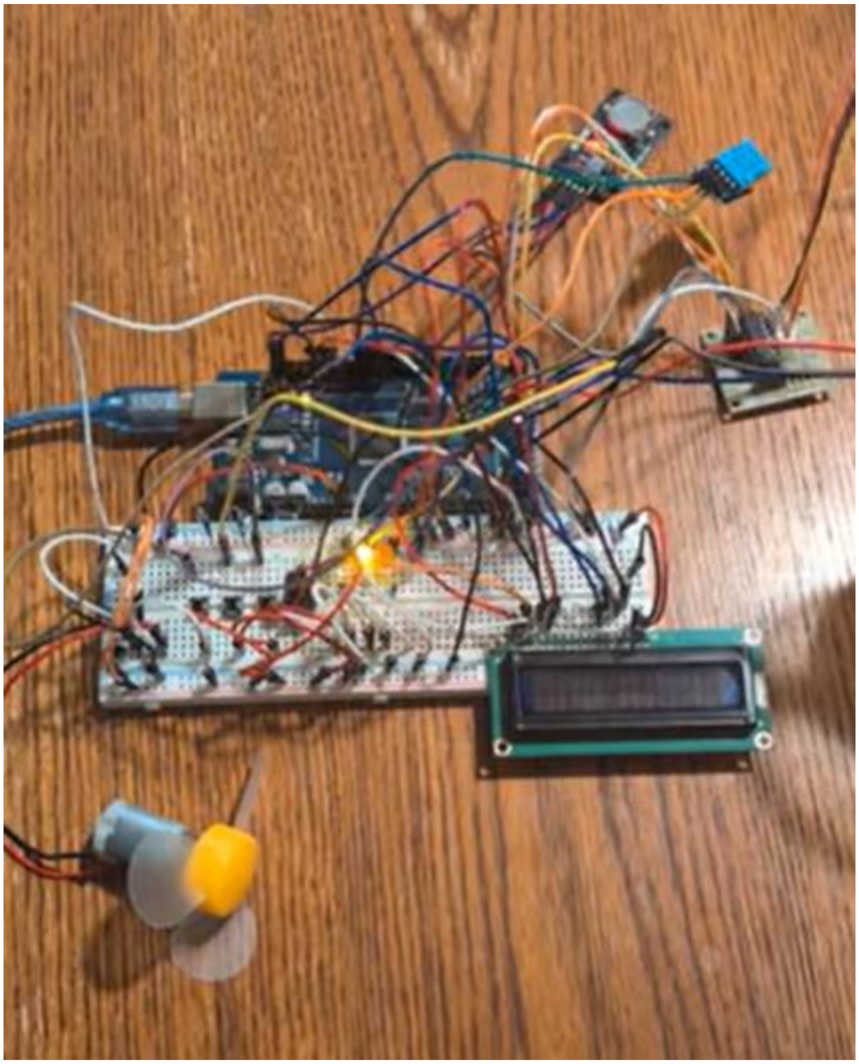
In our project, there are 4 states withing our circuit for specific functionalities of our cooler.

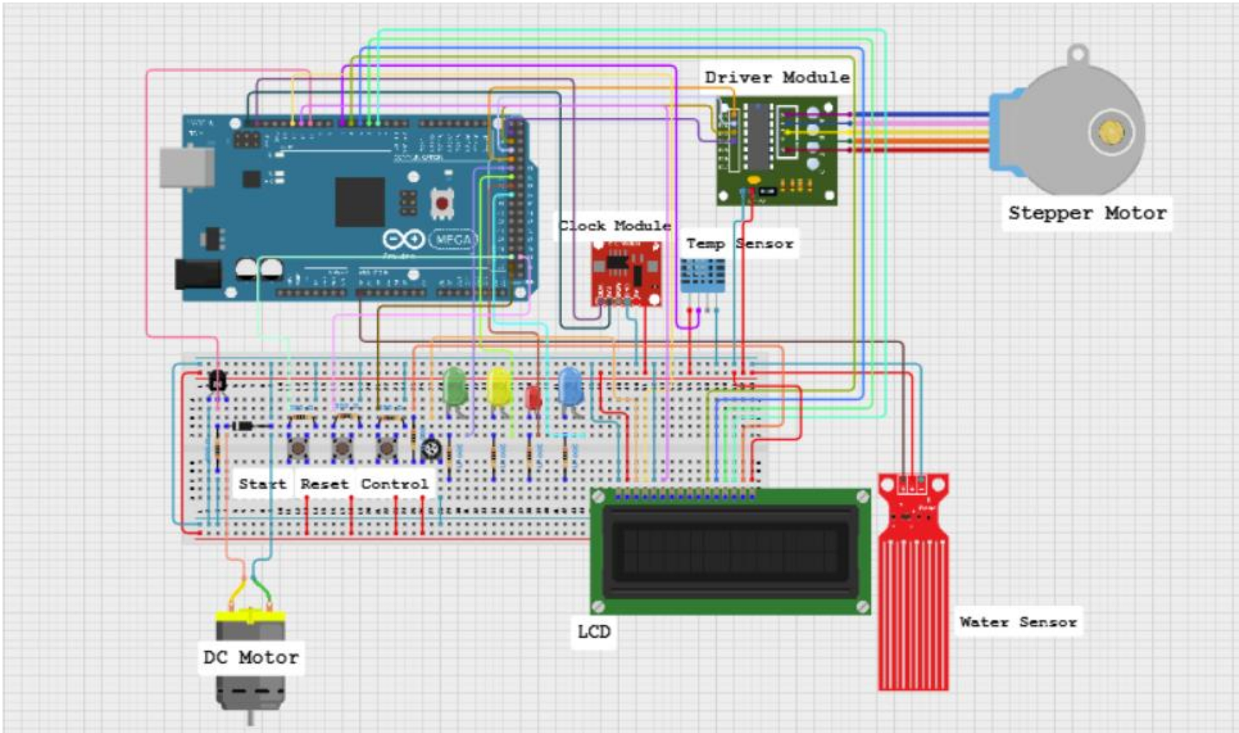
1. Disabled.
2. Idle
3. Running
4. Error

The necessary components to build our cooler include the following:

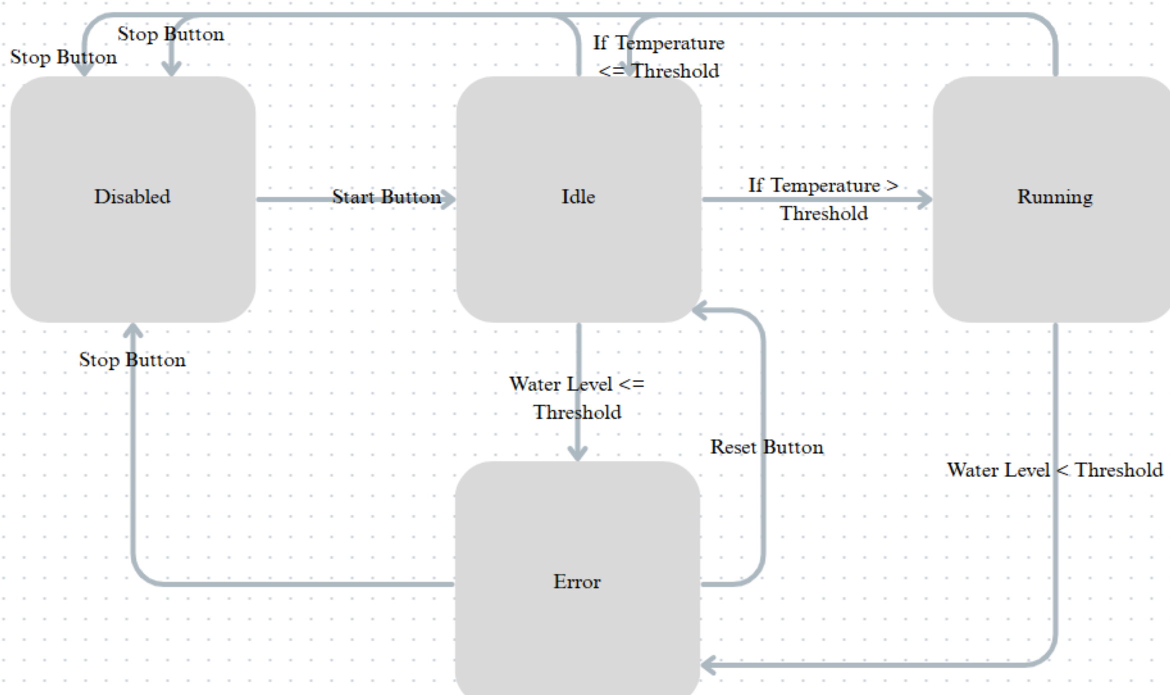
- LCD1602 Module (used to display the varying states that our project is in real time),
- Water Level Detection Sensor Module (used to detect and sense water in our project).
- DS1307 RTC Module (provides our project accurate time to track real time progress for the delays within our project).
- DHT11 Temperature and Humidity Module (Measures temperature and relative humidity of water recorded within our project)
- Fan Blade and 3V-6V Motor (Used to indicate the running state within our project and indicate that our swamp cooler is currently on).

2. Schematic Diagram, Circuit Picture, & Description of State Changes:





Differing States and Causes for Changes



Video Link: https://www.youtube.com/shorts/nnmRUcwV2Ik

- **Disabled:** This is the initial state of our cooler, as when we are within the Disabled state, there is nothing that goes on within our circuitry besides the yellow light being on. When we click the start button, we transition into the Idle state of our system through an ISR (Interrupt Service Routine) that triggers as the button is pressed, interrupting the Disabled status to transition into a working system.
- **Idle:** This is the initialization of our system, as in the idle state our system determines what is the next state to transition to base on data collected from all our sensors. Our Arduino code provides the required threshold for both temperature and water levels that we expect. If the water level does not adhere to our threshold, we will transition to an Error state. If the water level adheres and the recorded temperature is higher than our threshold, then we will transition to the Running state. If the stop button is pressed in this state, we will return to the Disabled state.
- **Running:** When in the Running state, our system will activate the motor and fan to begin "cooling" our system to attempt to lower our temperature below our threshold. Once our recorded temperature reaches a temperature under our desired temperature and is no longer delayed, our system will transition back to the Idle state. If our system detects that the water level is lower than our threshold, it will transition our system into an Error state. If the stop button is pressed in this state, we will return to the Disabled state.
- **Error:** When in the Error state, we know we have reached this level due to low water levels within our system. To transition into the Idle state from here, we must ensure that water levels reach the required threshold our system is detecting for. Once this is ensured, we hit the reset button and transition right back into Idle state. If the stop button is pressed in this state, we will return to the Disabled state.

3. Environmental Impact

The design of this system has a real impact on the conservation of our environment and considering the use of energy as efficiently as possible. Each stage is designed to lower energy consumption and turn on the motor for cooling only when necessary. The following transition to each stage shows this by each stage being a check and balance of one another enhancing the safety of the system. The proper handling of energy within our system also makes running this system affordable and sustainable due to the use of cost-effective and well-designed circuitry. Because of all these benefits, these types of systems can be created in abundance and accessible for many consumers with it being easy to operate and build, as well as being very user friendly when all components are properly put together.