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EE 4930

Laboratory 4: "Finite State Machine"

1/7/2021

### **Objectives:**

The objectives of Lab 4 pertain to understanding, creating, and learning how to use finite state machine logic in conjunction with a lookup table to simulate a dehumidifier. The student will create a finite state machine to simulate a dehumidifier by using 2 potentiometers, the LCD screen, 2 different colored LEDs, and an output pin. One of the potentiometers will be used to adjust the humidity level and the other potentiometer will be used to adjust the temperature. The LCD screen will be used to show and update the user periodically what is happening to the state of the machine and the inputs. The LEDs will be used to signify the fan and the compressor; the fan is a red LED and the compressor is the blue LED. The output pin will be connected and disconnected to ground to signify there is ice in the dehumidifier. The key objective of this lab is to be able to use a finite state machine with a lookup table in C to simulate a dehumidifier.

### **Description:**

Lab 4 has students create and simulate a dehumidifier finite state machine by using a lookup table. I created a main.c file to run a main loop that will update the current state of the dehumidifier based on the user inputs from the potentiometers, buttons, or ice sensor jumper cable, as well as initializing all necessary components. I also created a fsm.c and fsm.h file to handle the finite state machine logic and lookup table for the machine. Initially, I created a state diagram of the FSM for this lab and then began reading documentation on how to initialize the components necessary to implement my FSM. After initializing the interrupts and components, I began to make my code a stateful project by using the lookup table and updating the current state of the dehumidifier based on the input components.

### **Conclusion:**

The results of the lab were successfully showing a stateful dehumidifier implemented with a FSM with a lookup table. The biggest trouble I had with this lab was understanding how the lookup table works after looking at the example code and understanding how the 2D array works. Another little hiccup with the lab was how to implement the ice sensor since I was using the 2 buttons for increasing the humidity setpoint. I ended up using a jumper wire to an output pin to make an ice variable '0' or '1' based on whether it was connected to GND or not. I learned through this lab that it is important to understand how to use function pointers, structs, and enumerated types as they are fundamental in the C programming language. Other labs will potentially need to use a FSM with a lookup table to accomplish other labs throughout this course. Overall, this was an excellent lab to foundationally improve my C coding and understand more complex, but foundational C concepts.

## Attachments:

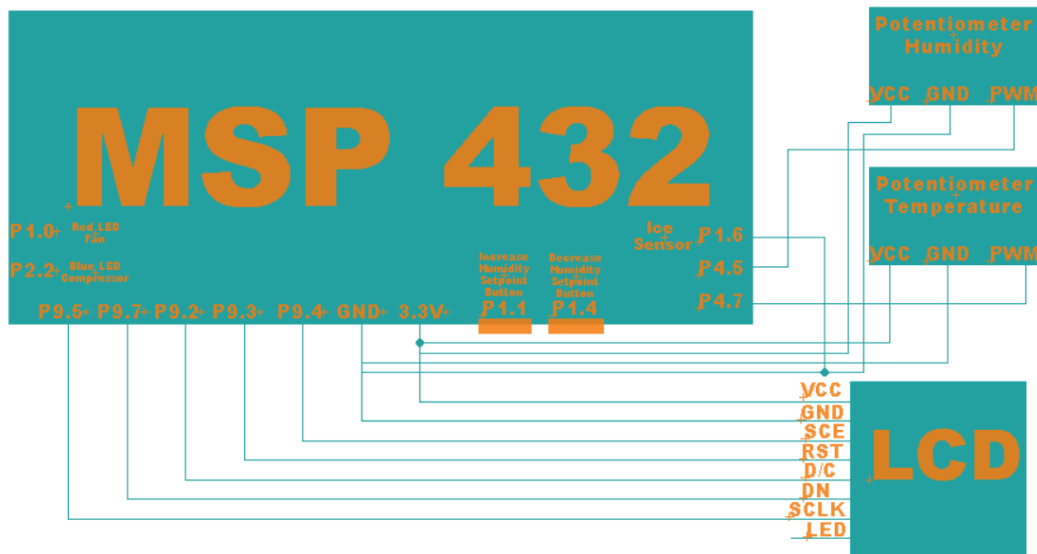


Figure 1: This figure shows the circuit diagram on how to implement a FSM with a lookup table to simulate a dehumidifier.

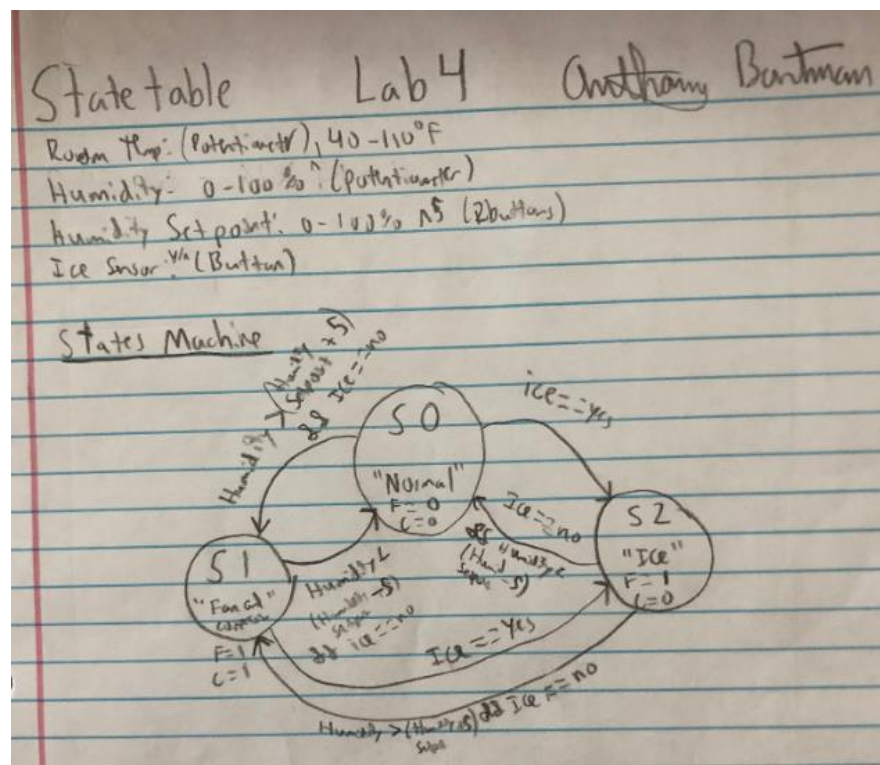


Figure 2: This figure shows the state diagram model I created that is implemented in the C code to simulate a FSM with a lookup table for a dehumidifier