

## **Project Topic**

An interactive plant monitoring system that has Temperature and Humidity sensors that can display the information on VGA.

## **How to Operate the Plant Monitoring System**

Step1: The sensor and motor are setup for the user

Step 2: Turn on the De1Soc board and the breadboard switch

Step 3: Open and run the project after compiling/loading it to the board

Step 4: Press the spacebar in order to continue (cover page is displayed). The next screen is the graph of moisture (%) and temperature.

Step 5: The music can be heard since the sensor has very low to no moisture. The graph shows the same information.

Step 6: Bring the sensor into a bottle of water where moisture is 100% in this case, and then the sound will stop as long as the humidity is not zero. The graph updates in information based on the new values of temperature and humidity. A warning sound appears for high moisture.

Step7: The Hex Keys will display the moisture level content in % as experienced by the sensor. The LED keys also light up.

Step 8: User may want to enter a number (to increase or decrease the moisture content in the plant). The motor will add the right amount of water content. Once user presses enter, the numbers that were entered are shown up in the search bar.

Step 9: Press escape to find the randomized report and the next steps needed to take care of the plant. This info is based on the moisture collected on the previous graph. The screen also displays information on the cause (high or low humidity) and the effect it has on the plant.

Step 10: remove the sensor from the water and then press backspace to re-enter the graph mode.

Step 11: Visual: now the graph mode is updated with the recent information.

Step 12: press escape to see the warning messages - since there is no moisture content detected; the low moisture screen will appear. The actual sensor must be present for this.

Repeat: collect data from sensor (currently in warning message view) → backspace (to get updated graph view) → escape (to get warning messages depending on the data from graph)

## **Attribution Table**

### **My Contributions:**

- VGA display
- Keyboard Input/output and storing as well as concatenating input from keyboard
- Audio: warning sound (using an integer array) when moisture level is high
- Character Buffers and clearing
- Integration of keyboard + display (and testing)
- Final Integration File With keyboard + display + moisture sensor

### **Other group member(s):**

- ADC with both moisture and temperature sensor (along with calibration) and GPIO output that drives an npn transistor switch which in turn operates a relay to turn on or off the pump
- The low moisture warning sound (hard coded he's a pirate song), coded the hex display.

## **Description of Work Done**

A real time continuous plant monitoring system that reads Temperature and soil moisture sensors' values (using an ADC) and can display the read value on a graph in VGA. With extra time we added features like using an output signal (from GPIO) to operate a water pump as moisture level decreases below a set threshold level and keyboard input to change the threshold moisture values. We also output sound for low or high moisture levels. For low moisture level we output the first two lines of the 'he's a pirate' song that we generated using square waves and hard coded every single frequency and duration. For the high moisture warning (typically 100%) we have a robotic voice to warn the users. There were also VGA warnings for low or high moisture levels which contained a random message generator to provide different useful plant care tips each time the warning was played.