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EECS 1021 MINOR PORJECTS

## INTRODUCTION:

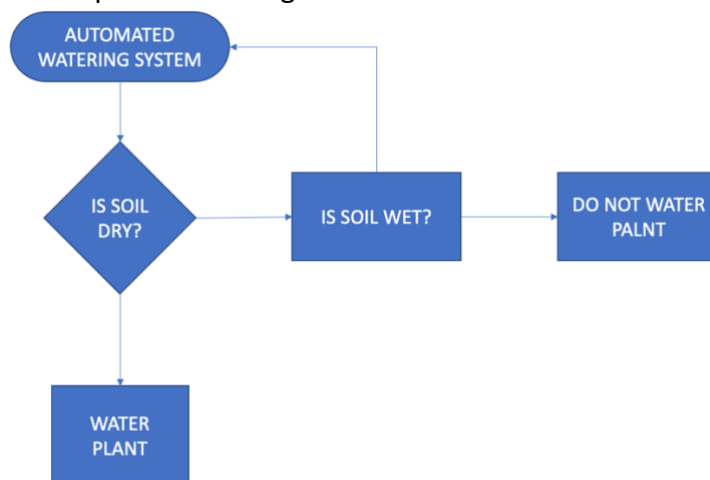
I am expected to create a Java program that can automatically water a plant using Arduino and firmata4j. Data taken from the soil moisture and the pump operation will be displayed on an Arduino-compatible display.

## CONTEXT:

The Java program sends commands to the Arduino device and read the soil moisture level and apply water when necessary. If the soil was too dry, the pump would be activated and water will be poured to the plant until the soil gets to a better soil moisture level. Once this process occurs, the soil will be wet and the pump will stop providing water. Doing this project has brought an importance in automated watering, they help ensure that all plant receive the appropriate amount of water which is very ideal to their survival and growth. They can save time and effort for people who are responsible for the plants care. They prevent over and under watering the plants as they study the soil's moisture.

## TECHNICAL REQUIREMENTS/SPECIFICATIONS:

- Princeton is an API that was used to draw the sensor graph and also interfaced with the OLED display.
- Firmata4j was used to communicate everything using Firmata.
- Util package was used for general utility functions in the program.
- HashMap was used to gather data from the sensor in aid of plotting the graph used.



## COMPONENTS LIST:

- OLED display was used to display the data of the soil moisture and the pump. This is connected to the Arduino grove board.
- Soil moisture sensor is connected to the Arduino board and is used to measure the soil moisture levels.
- Water pump is connected to the Arduino board and is used to provide the plant water when the soil gets dry.

- Arduino grove board is used with the water pump, soil moisture sensor. It controlled the pump and received data from the soil sensor and sent it to the java program.
  - Plant
  - Battery
  - MOSFET
- \*insert photo\*

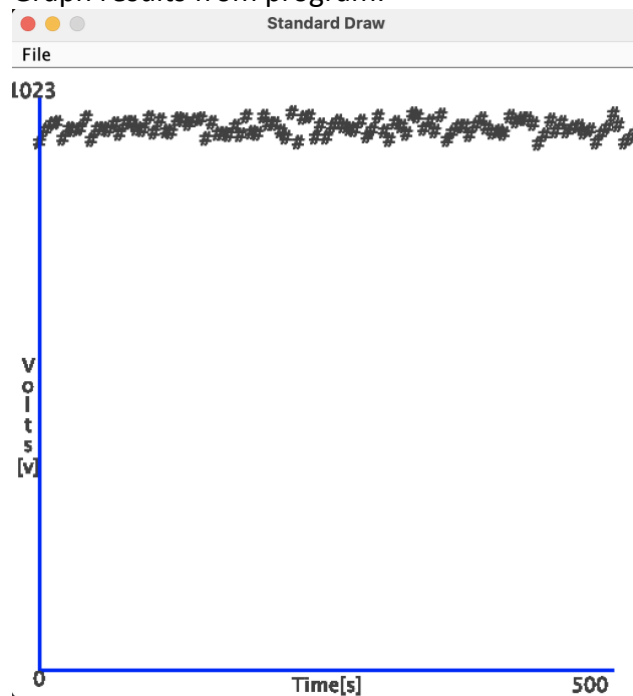
## PROCEDURE:

I set up the watering system by connecting the pump, moisture sensor and MOSFET to the Arduino board, the computer and the tube to the plant. Once I ran the program, the graph showed up on my computer and started reading the soil's moisture level. Once it starts, the soil is initially dry so the sensor sends data to the program which activates the pump to provide water to the plant till the soil gets to it's desired soil moisture level. Once it does, the pump stops providing water and the system repeats anytime the soil is in need of watering.

## TEST:

I tested this project by using my flowchart and by comparing the java code to the MATLAB code from EECS 1011. I had to make sure the Arduino parts were connected properly and were responding to the program I made. I also had to make sure the sensor could analyze the moist and dry soil by also making sure the conversion of the analog value is 0 to 0 volts and 1023 is 5 volts.

Graph results from program:



## **LEARNING OUTCOMES:**

CLO:

1. I was able to test and debug my program to give the correct results.
2. I was able to state the technical specifications used and the API's related to the project.
3. I was able to use a java collection, HashMap, to plot the graph in the project.
4. I used the state machines for the soil in its wet state and dry state.
5. in order to compare MATLAB and java I used what was taught in this course.

## **CONCLUSION:**

From the procedure of the system, the system is able to both monitor and control soil moisture levels in the plant's soils using then Arduino grove board and java. The automated watering system can be used for long periods of time which would ensure the plant receives the appropriate amount of water to be used.