Minor Project

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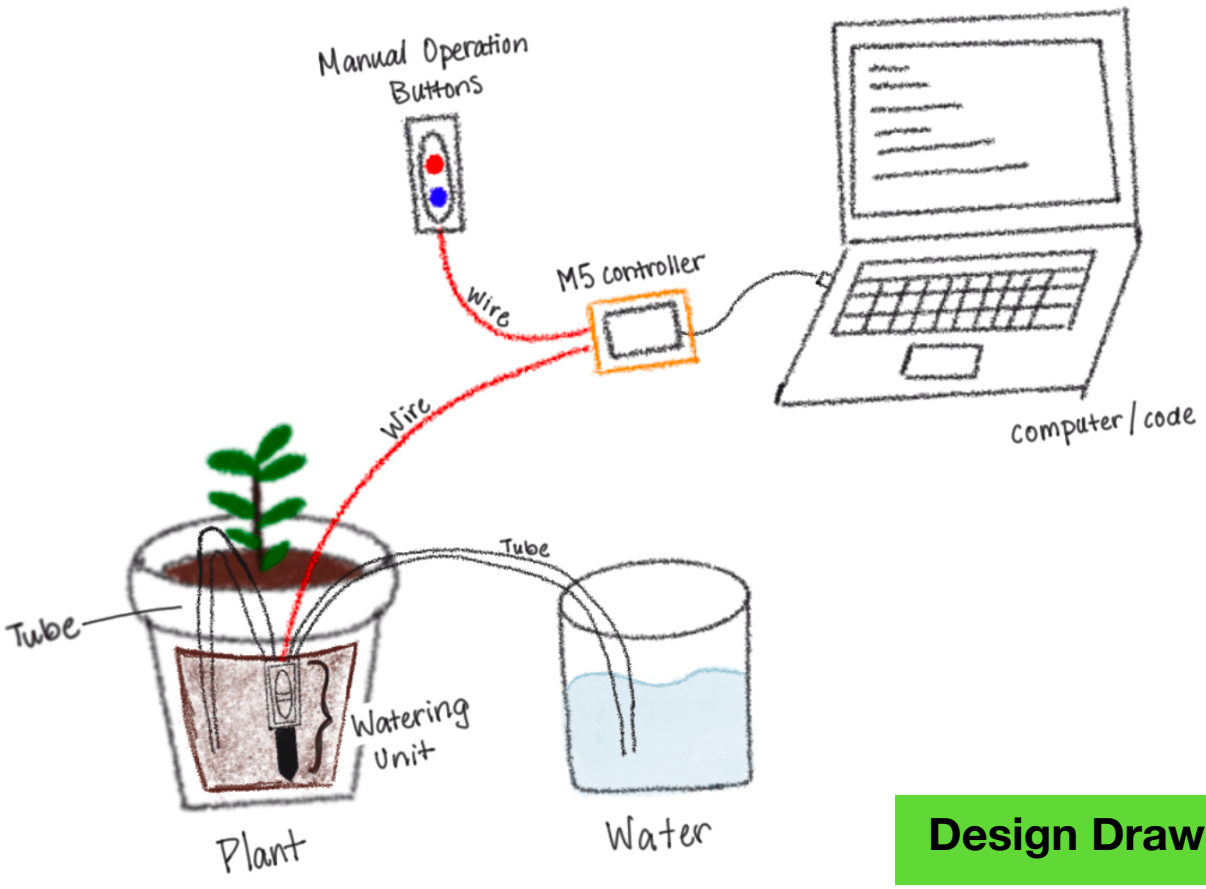
INTRODUCTION: I have created an Automated Plant Watering Machine using Matlab and M5Stack kit.
OBJECTIVES: The objectives of this project were to:

1. Monitor soil moisture in real-time using a sensor.
2. Automate the watering process based on predefined moisture thresholds.
3. Create a user-friendly interface to display system status and allow manual operation.

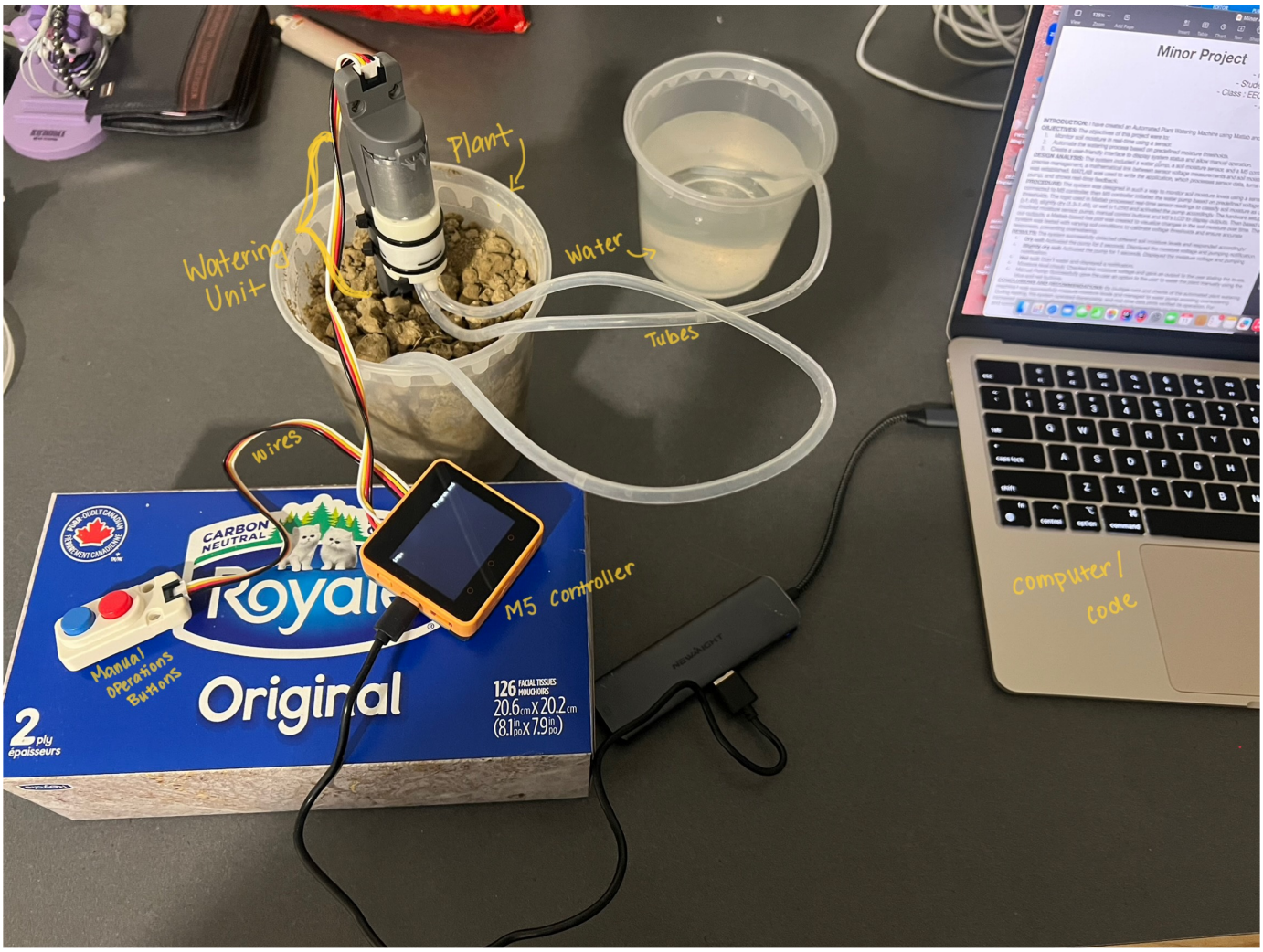
DESIGN ANALYSIS: The system included a water pump, a soil moisture sensor, and a M5 controller. For precise management, a mathematical link between sensor voltage measurements and soil moisture levels was established. MATLAB was used to write the application, which processes sensor data, turns on the pump, and shows real-time feedback.
PROCEDURE: The system was designed in such a way to monitor soil moisture levels using a sensor connected to M5 controller, then M5 controller initiated the water pump based on predefined voltage thresholds. The logic used in Matlab processed real-time sensor readings to classify soil moisture as dry (>1.4V), slightly dry (1.3–1.4V), or wet (<1.25V) and activated the pump accordingly. The hardware setup involved moisture sensor, pump, manual control buttons and M5's LCD to display outputs. Then based on our outputs, a Matlab-based live plot was created to visualize changes in the soil moisture over time. The system was tested with varying soil conditions to calibrate voltage thresholds and ensure accurate responses, preventing overwatering.
RESULTS: The system successfully detected different soil moisture levels and responded accordingly:

- **Dry soil:** Activated the pump for 2 seconds. Displayed the moisture voltage and pumping notification.
- **Slightly dry soil:** Activated the pump for 1 seconds. Displayed the moisture voltage and pumping notification.
- **Wet soil:** Didn't water and displayed a notification.
- Moisture level check: Checked the moisture voltage and gave an output to the user stating the levels.
- Manual Pump: Successfully gave the user an option to the user to water the plant manually using the blue and red buttons.

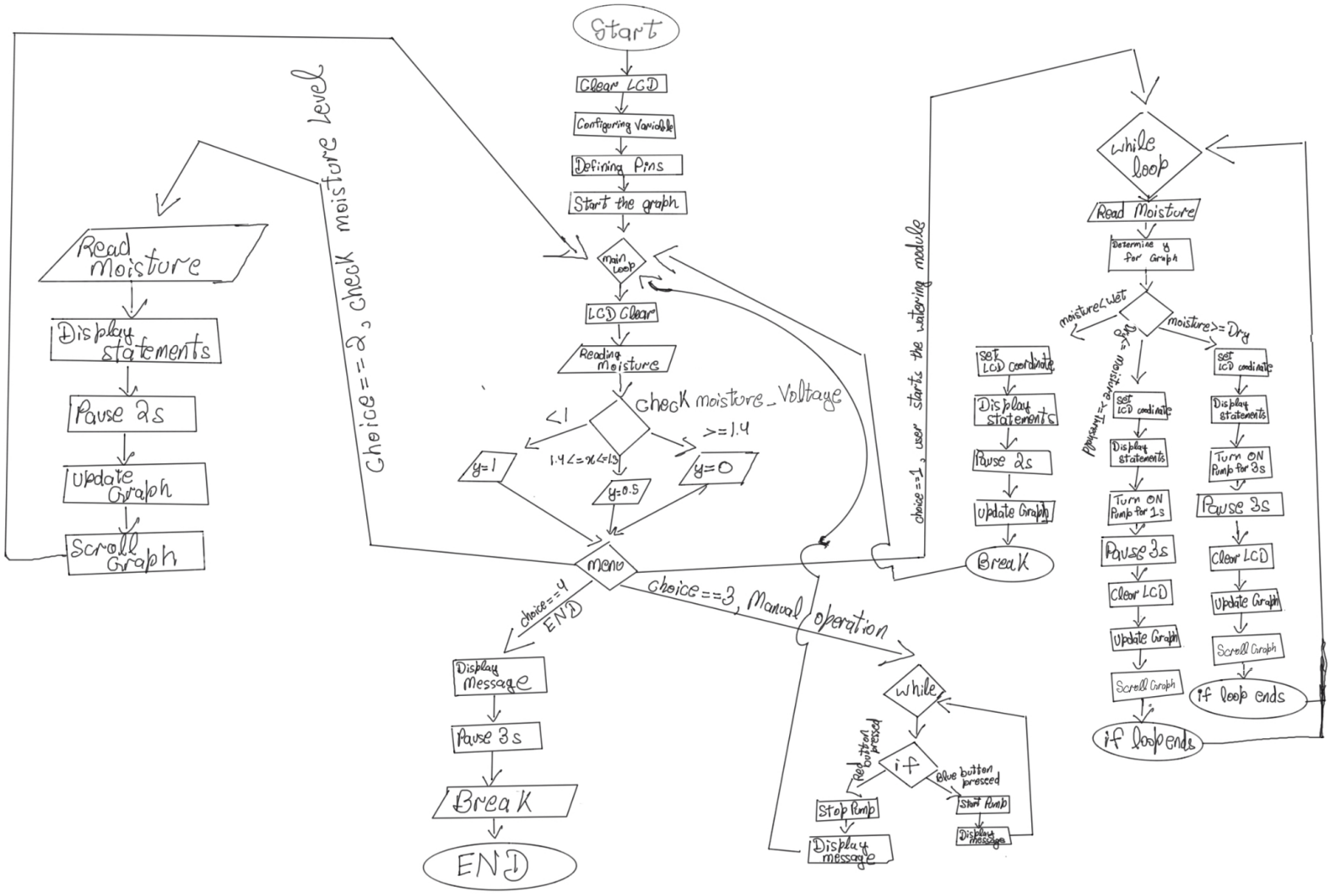
CONCLUSIONS AND RECOMMENDATIONS: By multiple runs and checks of the automated plant watering machine I was successfully measure moisture levels and managed to water pump avoiding overwatering. During testing, the system operated dependably, and real-time data plots verified its operation. For increased accuracy and efficiency, future developments should concentrate on improving sensor calibration and control code optimization.



Design Drawings



Flowchart(Hand-made)

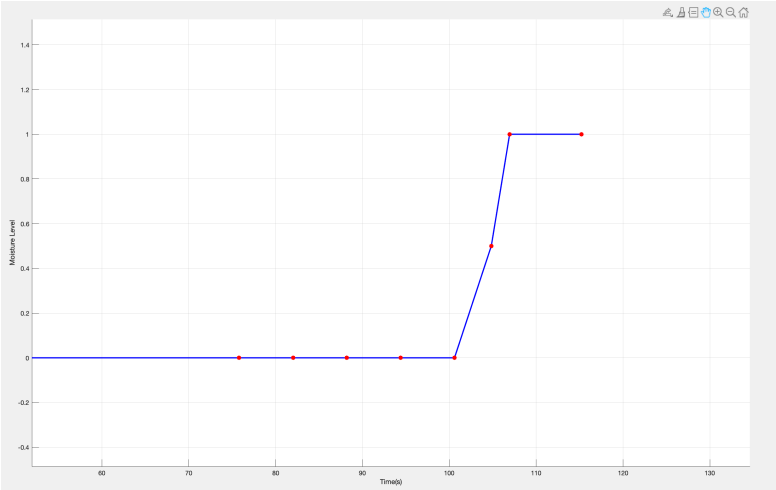


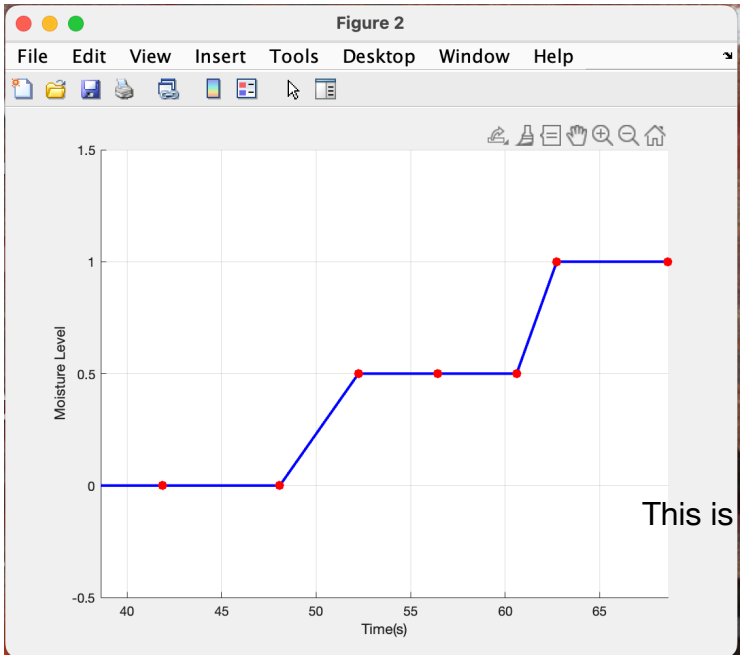
Youtube Video Link

https://youtu.be/9PDpPyCwyQI

*sped up some parts of the video to make it fit the requirement of 2 mins.

My Live Plotted Graph





This is my graph from another run.

Model Of Moisture

The general form of the equation might be: $M = aV+b$

Where:

- M is the moisture level.
- V is the sensor voltage.
- a and b are constants determined by calibration.