CSE 4355/5355 - Mechatronics Lab 5

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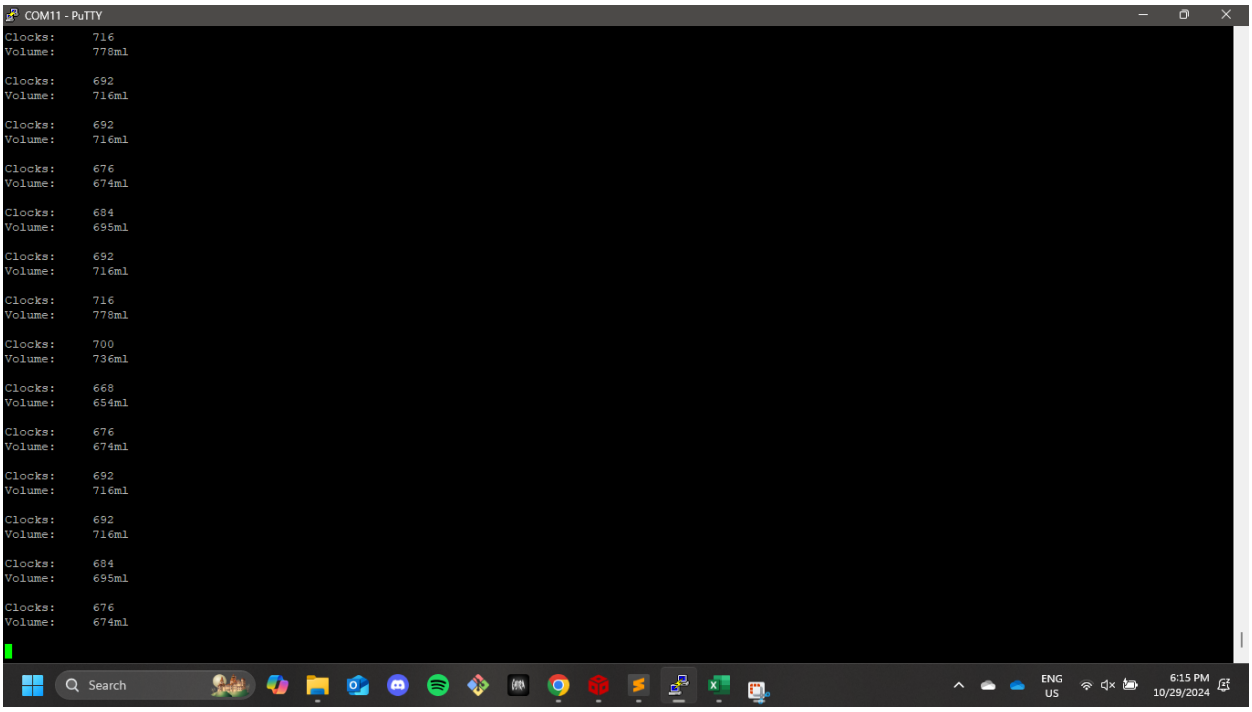
Objective

The objective of this lab was to:

1. Construct an LC sensor to measure liquid levels using a capacitor formed by electrodes attached to a container.
2. Develop an integrator circuit and control its de-integration through software.
3. Build a metal detection circuit utilizing an inductive coil and observe frequency changes when the metal is introduced.
4. Analyze the sensor's accuracy in determining liquid levels and frequency shifts due to inductive changes.

OBSERVATIONS

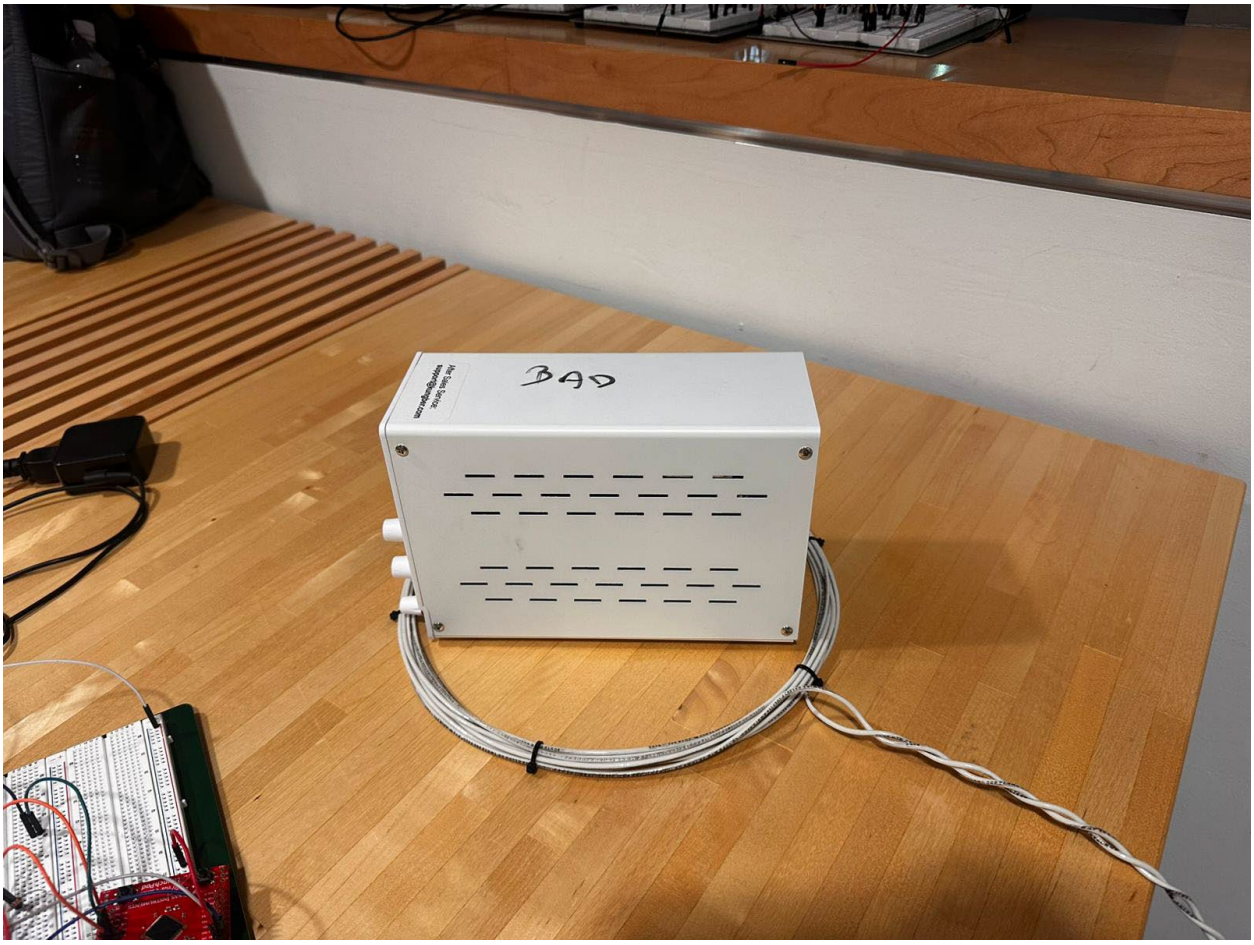
PART - A: (WATER LEVEL MEASUREMENT)



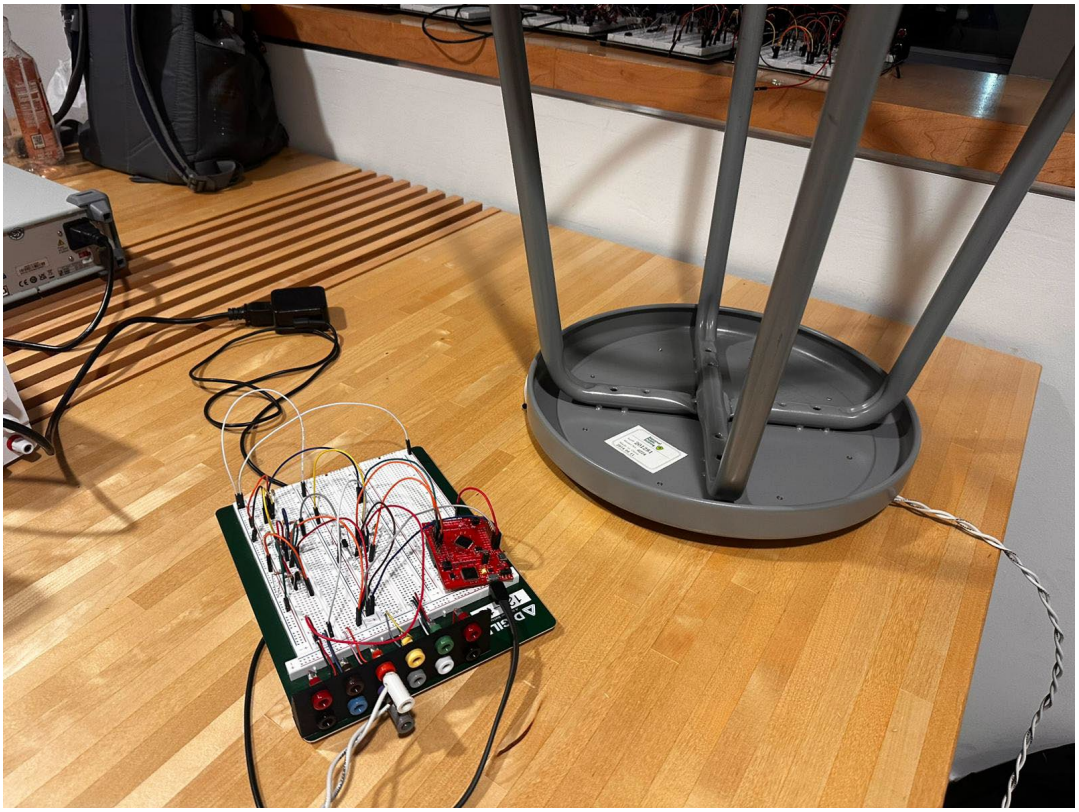
We setup the circuit for the de-integrator, which consisted of an NPN – transistor which was turned on to discharge the capacitance formed between the copper strips on the water bottle. Once the

capacitor was fully discharged, the transistor was turned off and a timer was triggered to start counting from Zero and an Analog Comparator was hooked up to the collector to measure the voltage across the capacitance, which was measured with a reference voltage of 2.44V configured in the comparator's initialization. Once the capacitor charged above the reference voltage, the comparator flipped the OVAL bit, which served as an indication to turn the timer off and measure the number of clock edges the timer counted and put in an equation as shown in the excel sheet attached with the submission to calculate the volume of water present in the water bottle.

PART – B: (METAL DETECTOR)




1 inch² 66 FT



For this part of the lab, we used a Colpitts's Oscillator circuit to measure the change in inductance in a loop to determine if a metal was near the loop. We used a timer to report the frequency change of a GPIO pin connected to the circuit when a metal was brought near the inductance loop. Whenever a metal is brought near the loop, the frequency reported by the timer increases due to the eddy currents developing inside the metal causing the voltage in the loop to drop.

CIRCUIT BOARD (122 - 15)