THE UNIVERSITY OF TEXAS AT ARLINGTON

COMPUTER SCIENCE AND ENGINEERING

MECHATRONICS

LAB 5 REPORT

**ELECTROMECHANICAL SYSTEMS & SENSORS**

Submitted toward the partial completion of the requirements for CSE 5355-001

**Submitted by,**

Jennifer Hernandez &

Servando Olvera

Date 10/30/2024

**1. Using a one of the provided plastic containers, attach electrodes on the outside of the container to form a capacitor that is used to measure liquid level. Build an integrator circuit that consists of a resistor from 3.3V to the capacitor (Vcap node). The other end of the capacitor is grounded. Add a transistor to deintegrate the charge in the capacitor under software control as shown in class. Connect Vcap to the input of the controller comparator 0 (C0-) and configure the internal reference to drive C0+ (Vref).**

|  |
| --- |
| **Circuit Diagram** |
| |  |  | | --- | --- | | **Built Circuit** | **Readings** | |  |  | |

**2. Write code to de-integrate the charge by turning on the transistor briefly and then measuring the time until the comparator changes state (Vcap > Vref). Empirically determine how to convert the time to mL of water in the container.**

**//** *Explain part 1 code*

**3. Build a metal detector circuit using a large loop of wire and a Colpitts oscillator connected to the WT1CCP0 input. Place metal over the loop and note the change in frequency resulting from the eddy currents in the metal and the resulting change in inductance.**

|  |
| --- |
| **Circuit Diagram** |
|  |

|  |  |
| --- | --- |
| **Built Circuit** | **Readings** |
|  | A screen with a screen on it  Description automatically generated with medium confidence |

**4. Write code to determine the average frequency of the loop. When the metal is brought near to the coil (similar to a car riding over the inductive loop at a traffic intersection), pulse an LED on briefly show that metal is detected.**

For part 2 of the lab, logic was implemented in code to detect three different metals based on corresponding frequency ranges and feedback was provided using three LEDs (Red, Blue, & Green). Pin PC6 (WT1CCP0 timer) was connected to the frequency detection circuit to obtain the measured frequency, and a Wide Timer was configured to 1sec periodic to store the frequency (tick variable) and rese it. This frequency value was constantly printed out to putty and by placing the loop on three different metals (chair, power supply, & monitor) the respective ranges for each metal were determined. This step took a bit of data gathering, testing and tweaking. Finally, in the main loop the frequency is compared every second against the predefined ranges to identify the metal type, and based on the matched range the corresponding LED is turned on.

|  |  |
| --- | --- |
| **METAL EXAMPLE** | **PICTURE** |
| Voltage Supply  (Blue LED) |  |