Computer Engineering Practicum CMPE

370 – Fall 2021

A self-medicine delivery system with a pass key for COVID patients

(Technurse Device)

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Introduction

Technurse device is a device that will be used as a nurse using contactless delivery to deliver medicine between COVID patients and doctors. The application of the Technurse device will include four main functionalities. The first functionality will be a passkey that uses a dual D flip-flop (74LS74) along with an AND (7408) and NOT (7404) gates for the design to be ‘101’, where two buttons are used to function as a clock and a switch. In addition, a LED light can be added to the circuit to notify that the button has been pressed and the pulse is still in process. Secondly, sequential timer for DC motors using a 555 monostable IC timer circuit to stay in the stable state unless a trigger is applied. DC motors using simple h- bridge SN754410 circuit for direction and speed control of the DC motor, where the higher the voltage the higher the speed. To be precise, the h-bridge controls the DC motor direction using transistors. Thirdly, detecting sensors to detect motion if any type of obstacle is placed or removed using a proximity sensor connected to the dc motors circuit. Lastly, a 555 IC timer audio amplifier that works in monostable mode using a beeper circuit that consists of a 555 IC timer. By using transistors or power amplifiers the output sound can be further improved. The circuit is connected to an automatic on/off buzzer to generate a beep tone when the nurse detects an obstacle.

Schematic

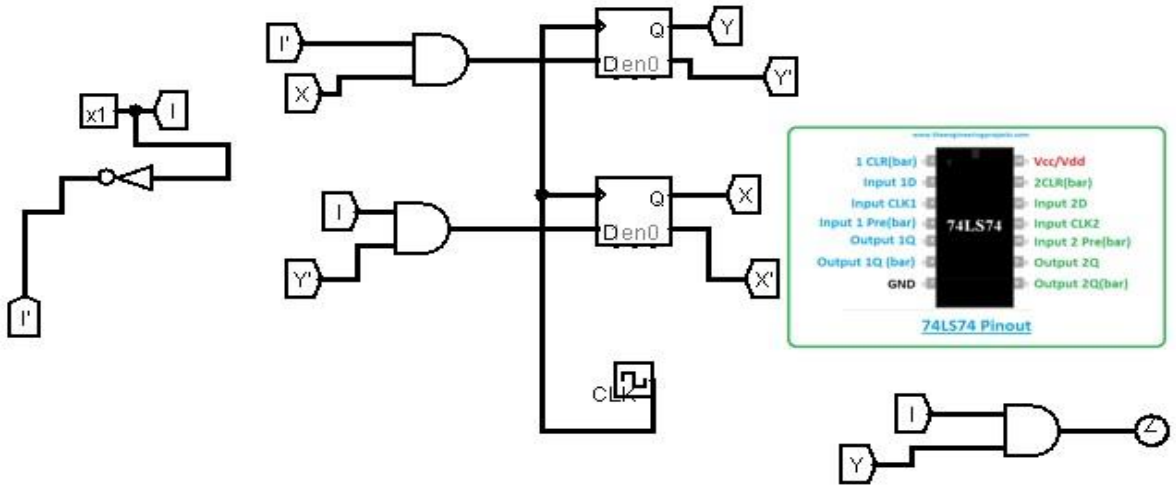


Figure 1: Flip-Flop Schematic using a D flip-flop with an AND and NOR ic chips schematic

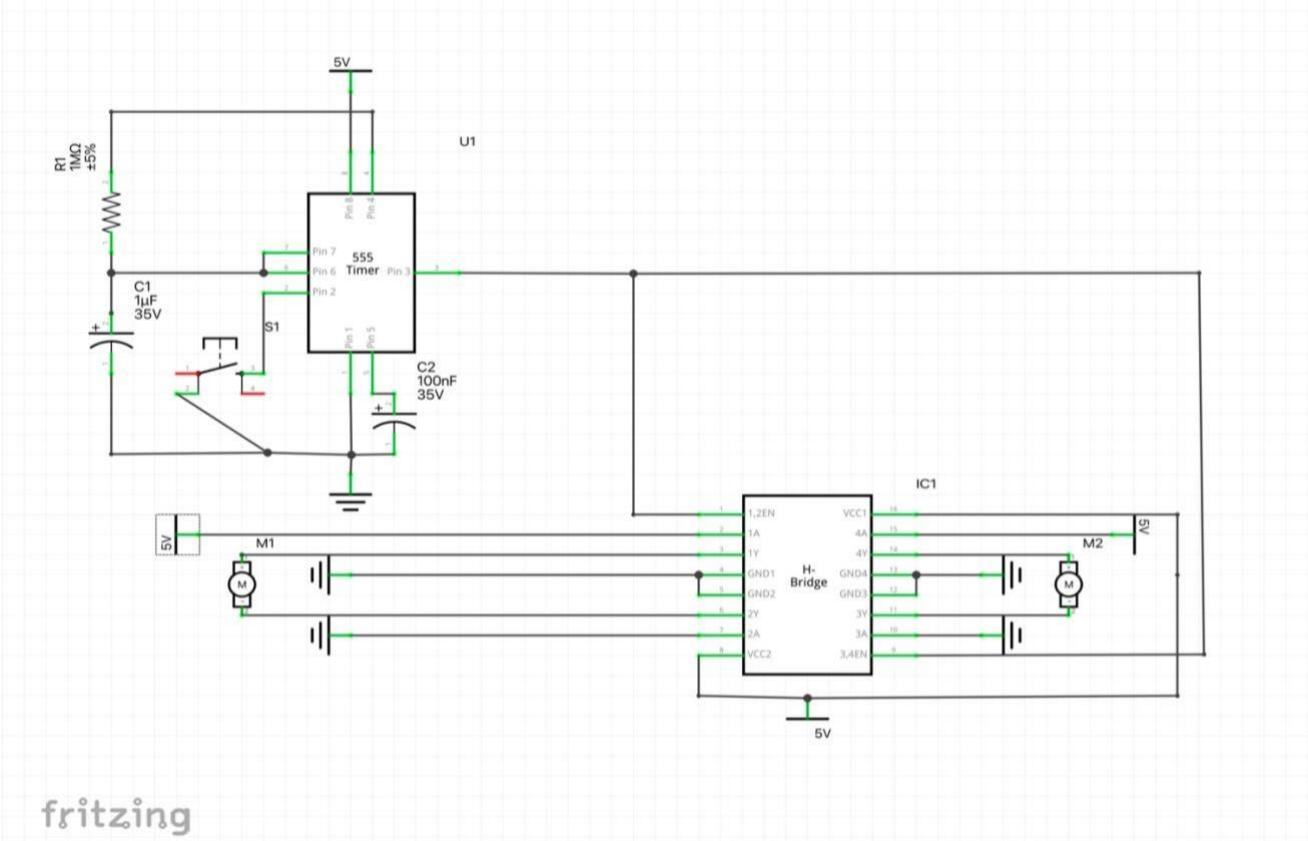


Figure 2: Sequential timer for DC Motors using 555 timer and an H-Bridge

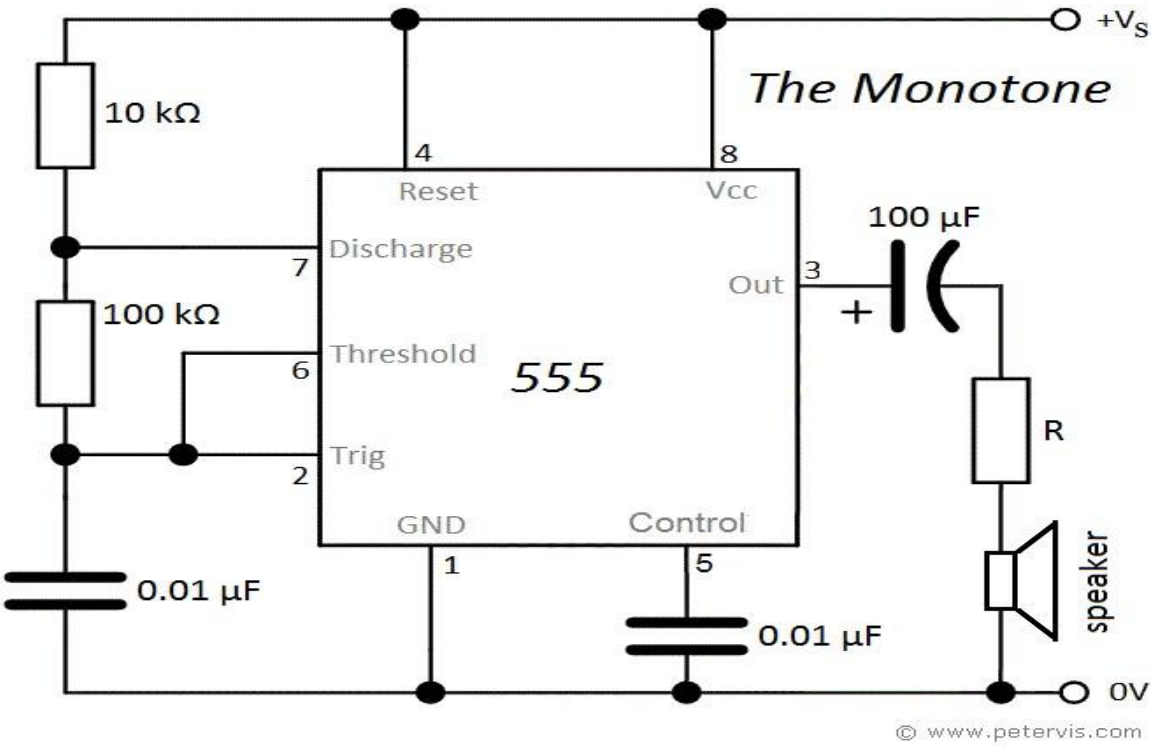


Figure 3: Audio amplifier: using a 555 timer and a buzzer

Parts list

- Dual D flip-flop 74LS74
- And 7408 ic
- NOT 7404 ic
- 2 Buttons
- R1: 100k ohm
- R2 :100k ohm
- 555 Timer
- SN754410 H-Bridge
- 2 DC motors
- Button
- R1: 1M ohm
- R2 (button): 1k ohm
- C1: 1□F
- C2: 100□F
- 555 Timer
- Buzzer
- R: 10k ohm
- C: 0.1□F
- Proximity sensor

Calculations

$$Ton = 0.693(R1 + R2) * C$$

$$1 = 0.693(R1 + R2) * 10\mu F$$

$$R1 = 100\,k\square$$

$$R2 = 100\,k\square$$

$$Toff = 0.693(R2) * C$$

$$0.5 = 0.693(R2) * 10\mu F$$

$$R2 = 100\,k\square$$

Breadboard Prototype Photos

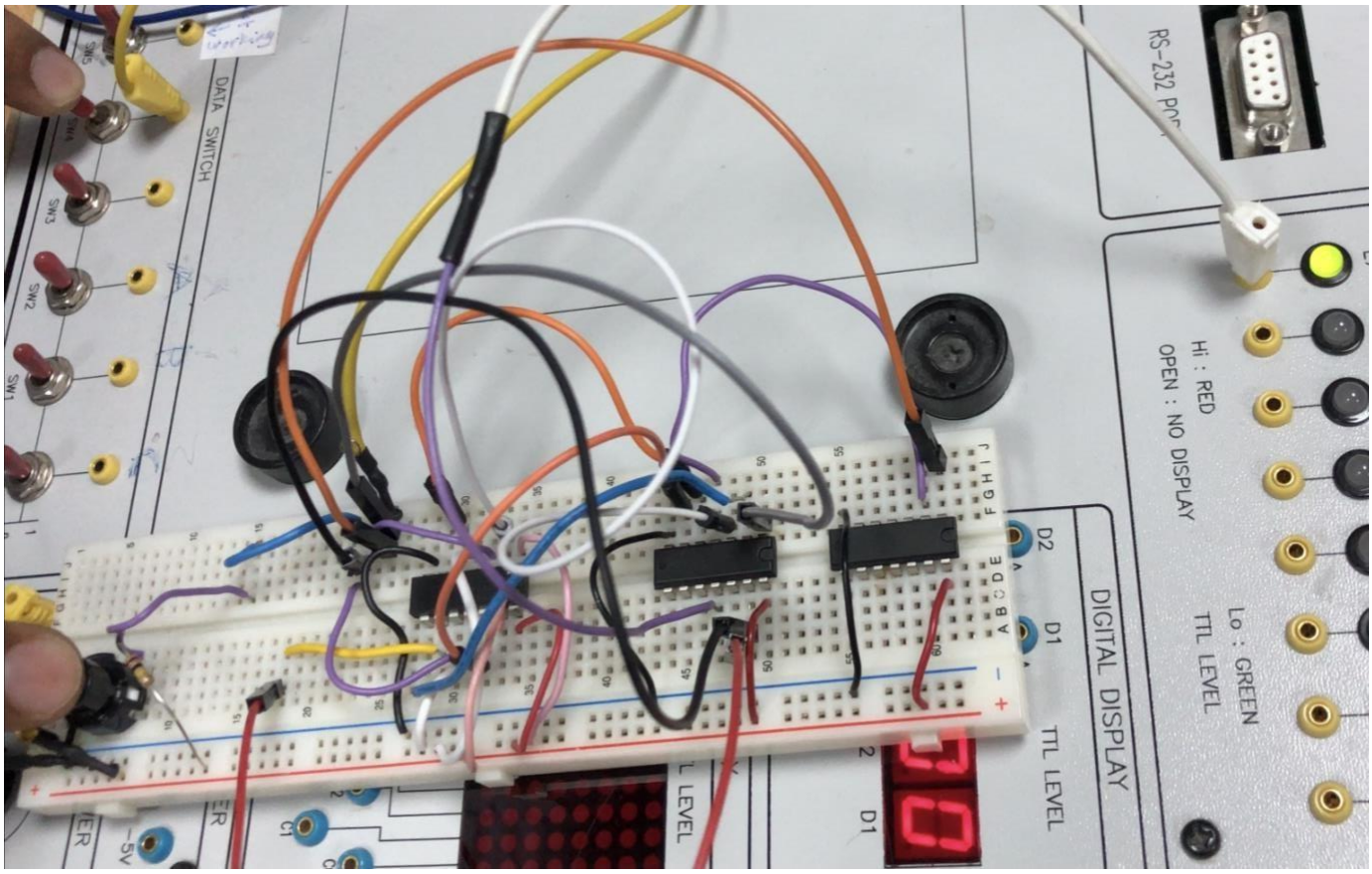


Figure 4: Flip-Flop Prototype

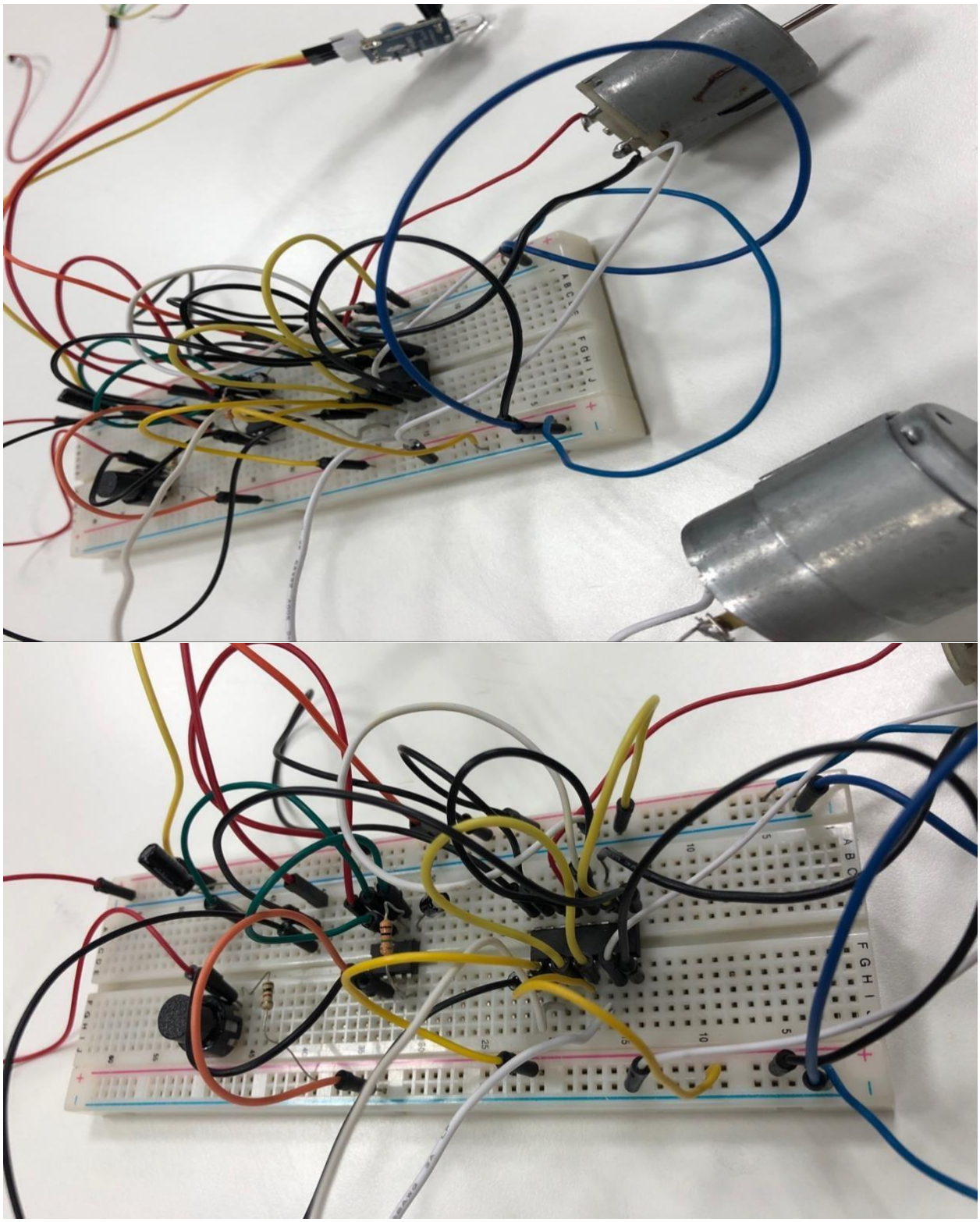


Figure 5: 555 timer with 2 DC Motors Prototype and sensor Prototype

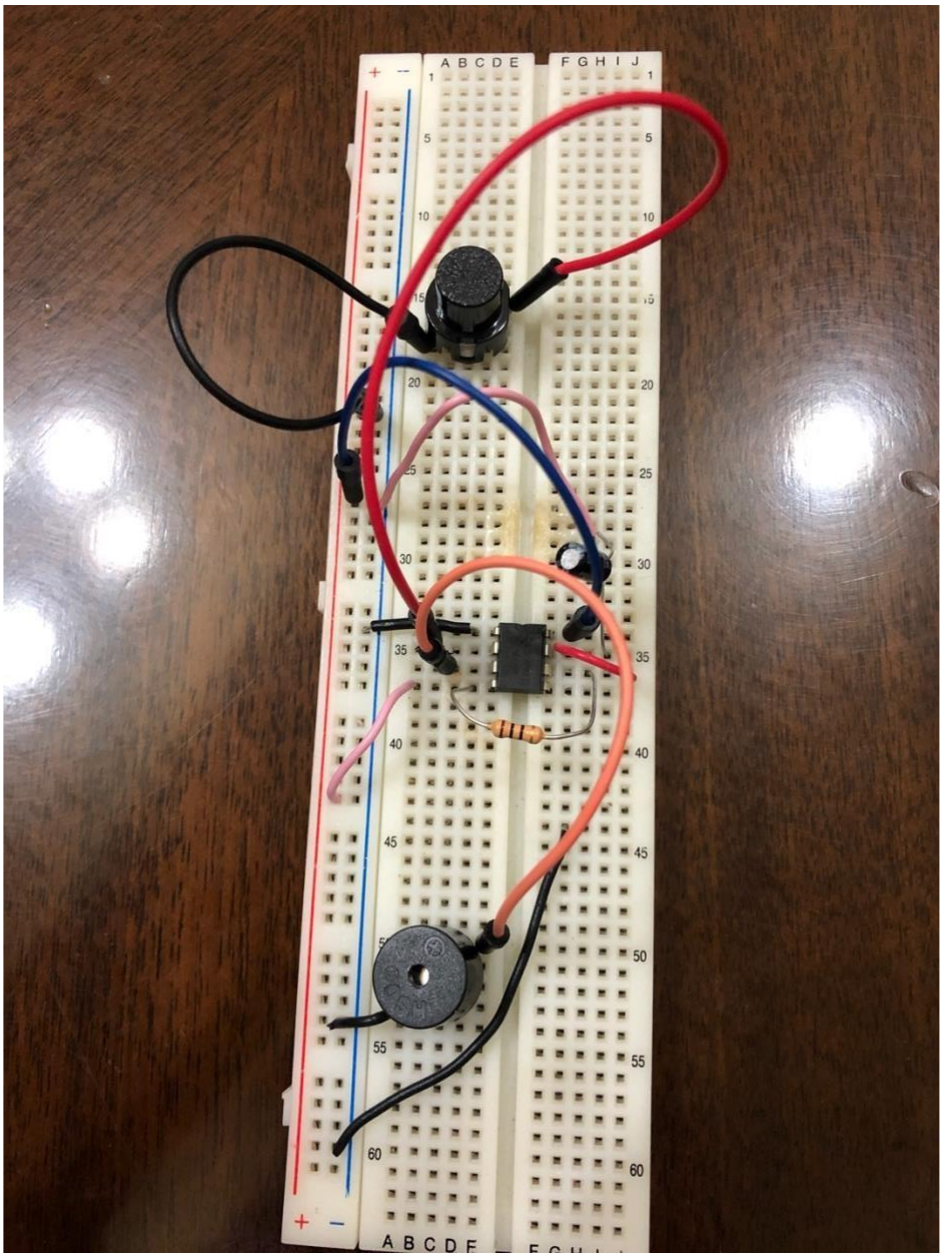
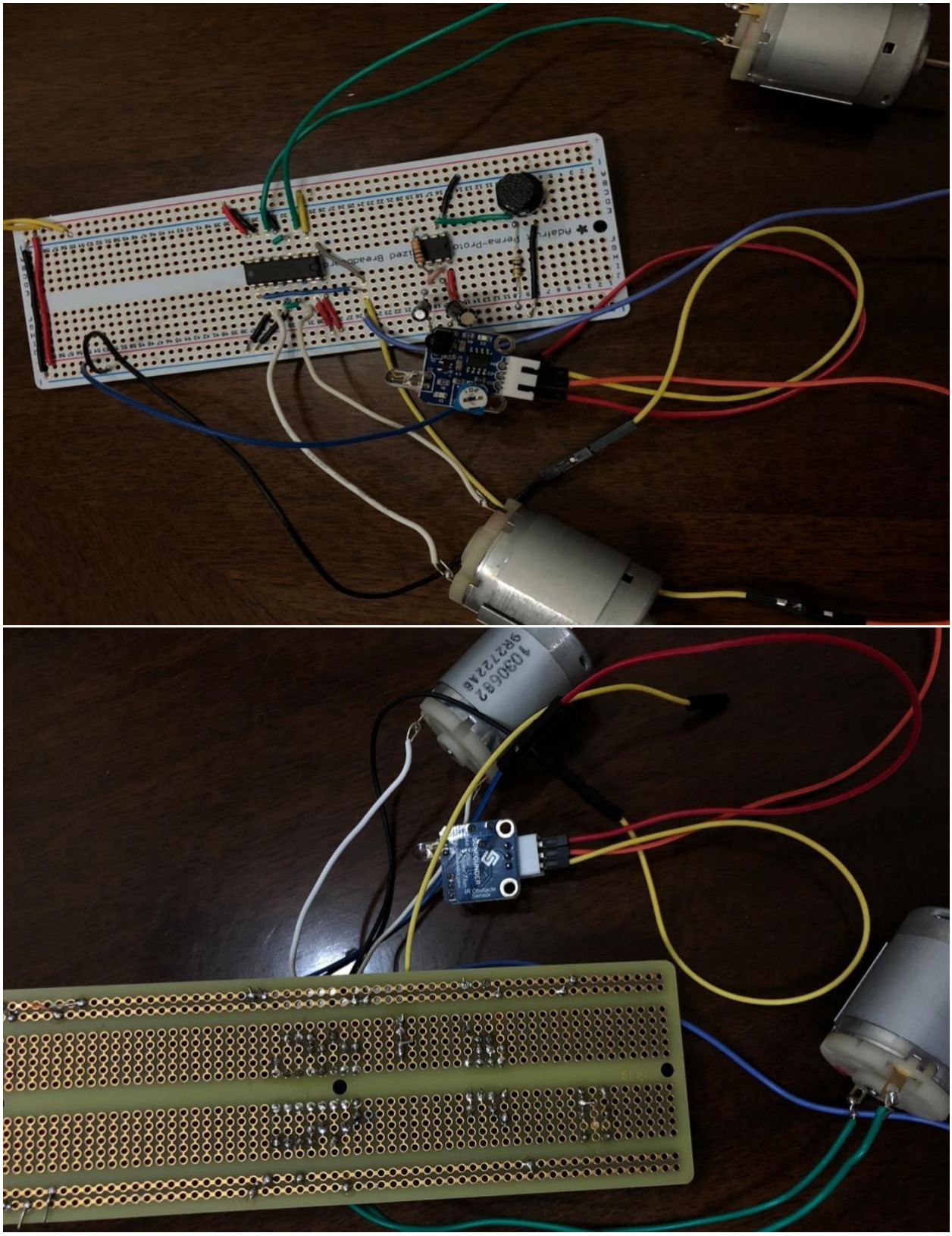
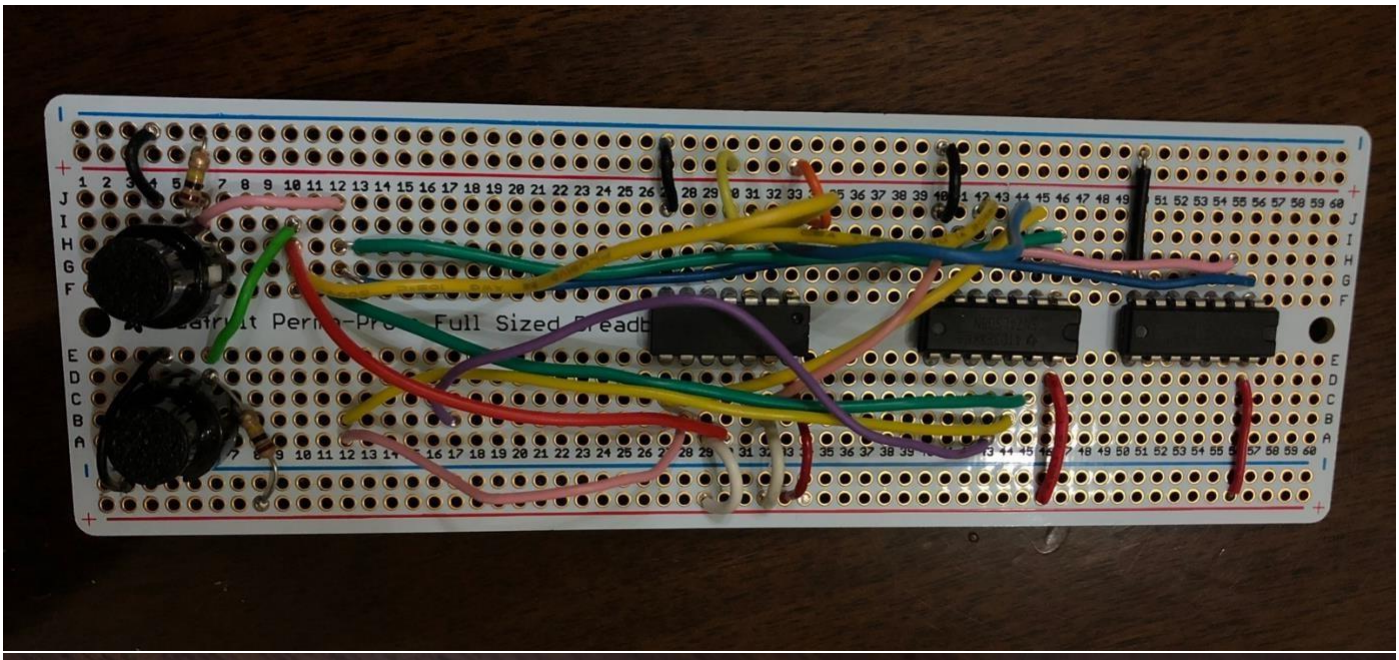
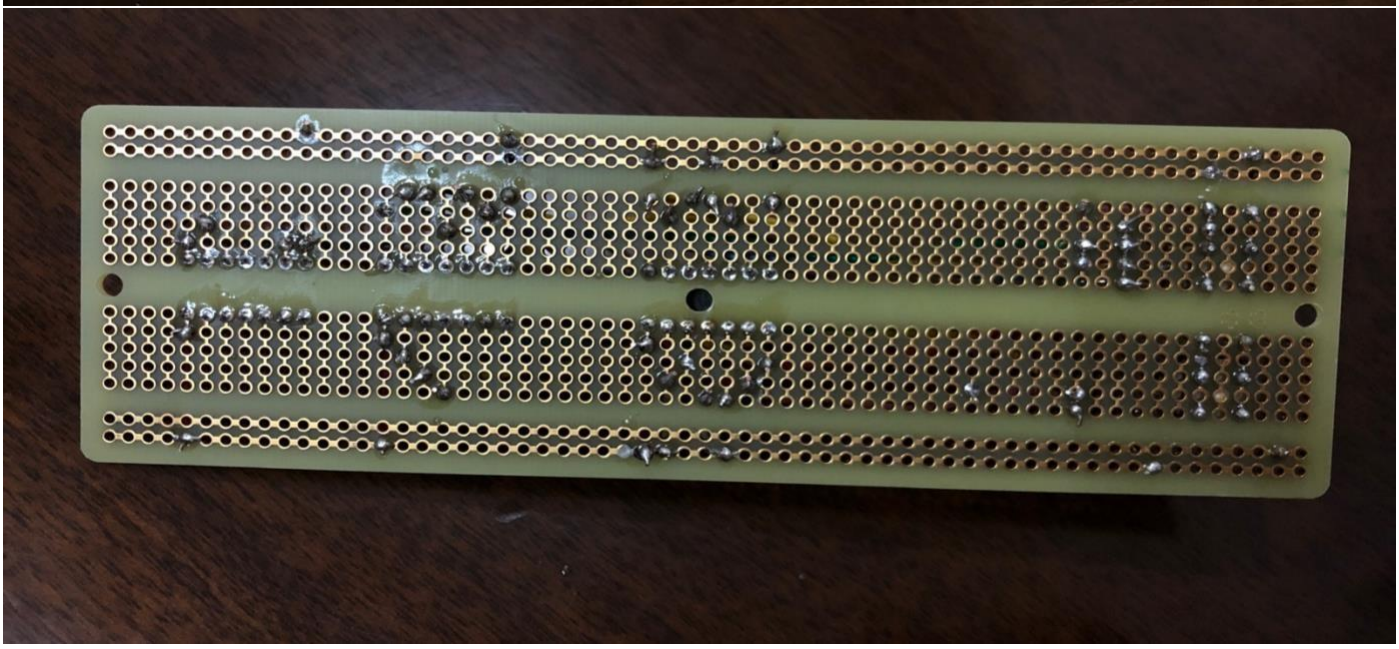


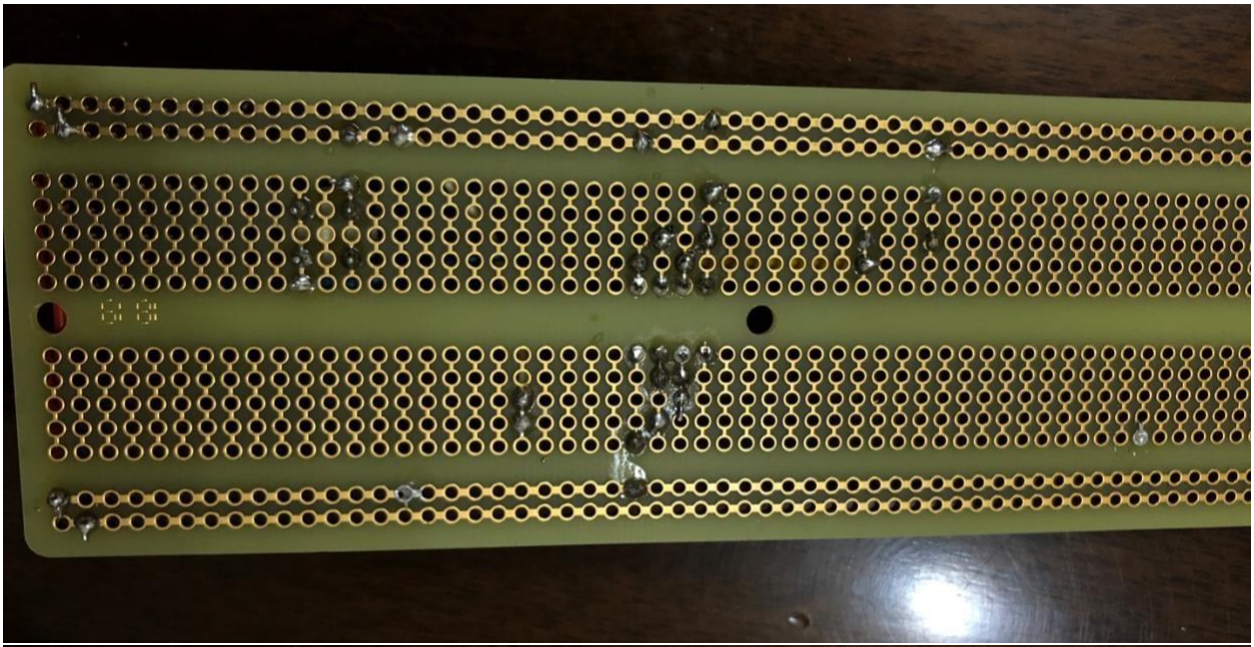
Figure 7: Audio amplifier Prototype

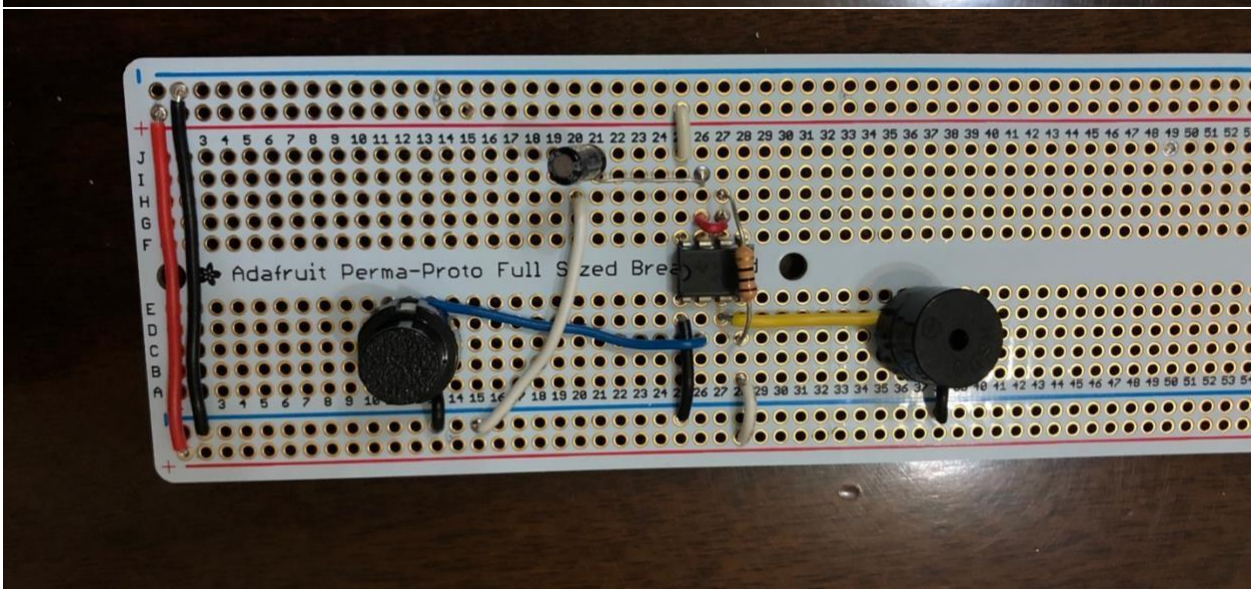
Picture of top and bottom of functional PCB prototype







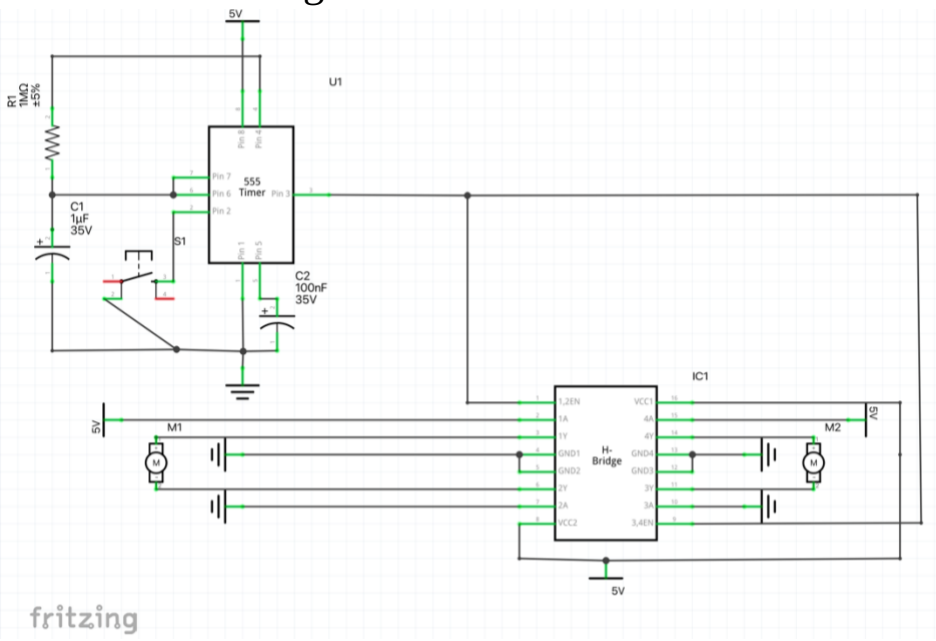



Adafruit Perma-Proto Full Sized Bread

Motor Choice:

1. DC Motor:

- Easy to control
- Affordable
- It rotates at its speed without interruptions
- Its movement is continuous such as in toy cars.
- Connected to power supply directly or using H-bridge
- Circuit Design:

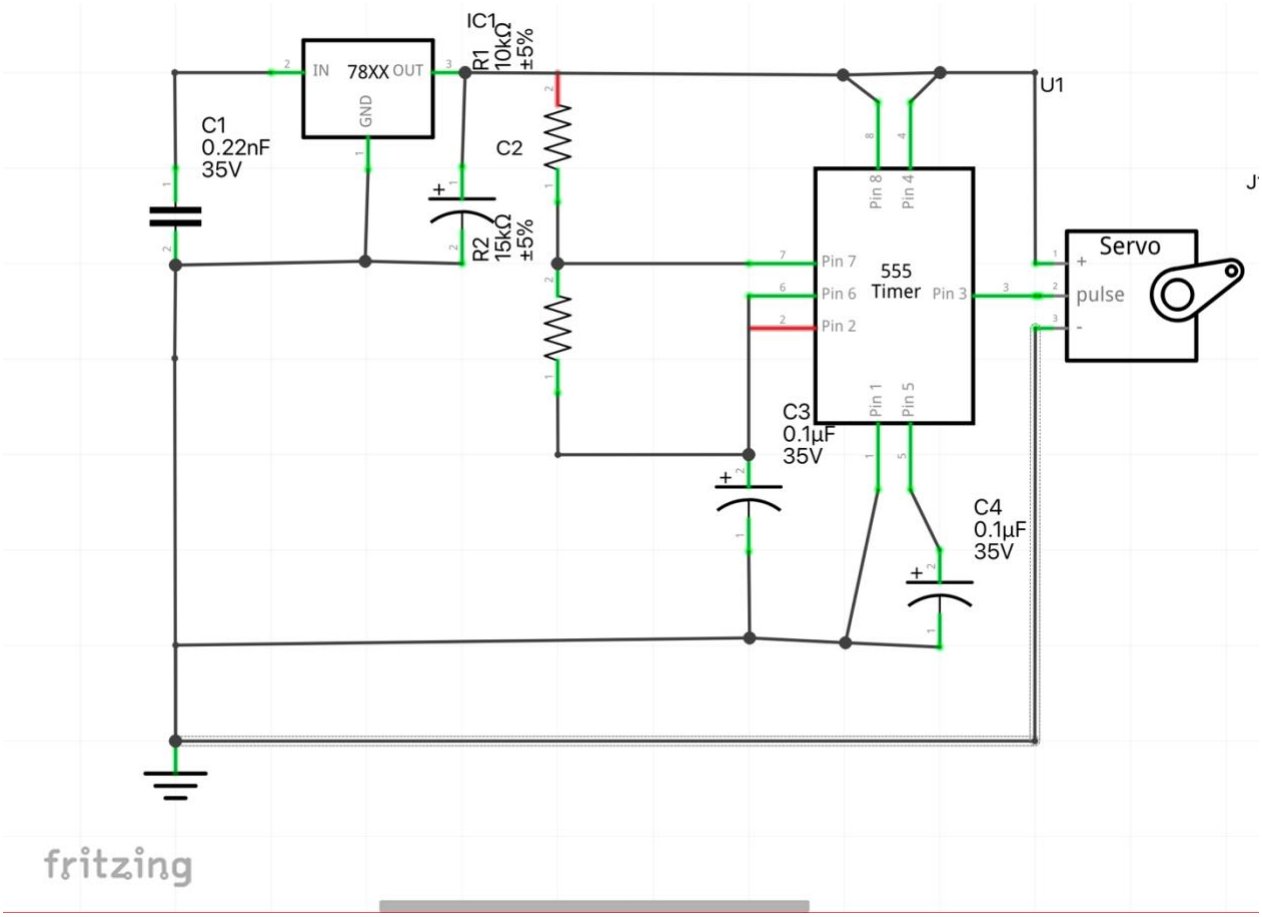


2. Servo Motor:

- More complex
- More expensive
- The direction would be on a specific angle
- Suitable for precise position
- Needs timing pulses so it can be connected to astable 555 timer

- Circuit Design:

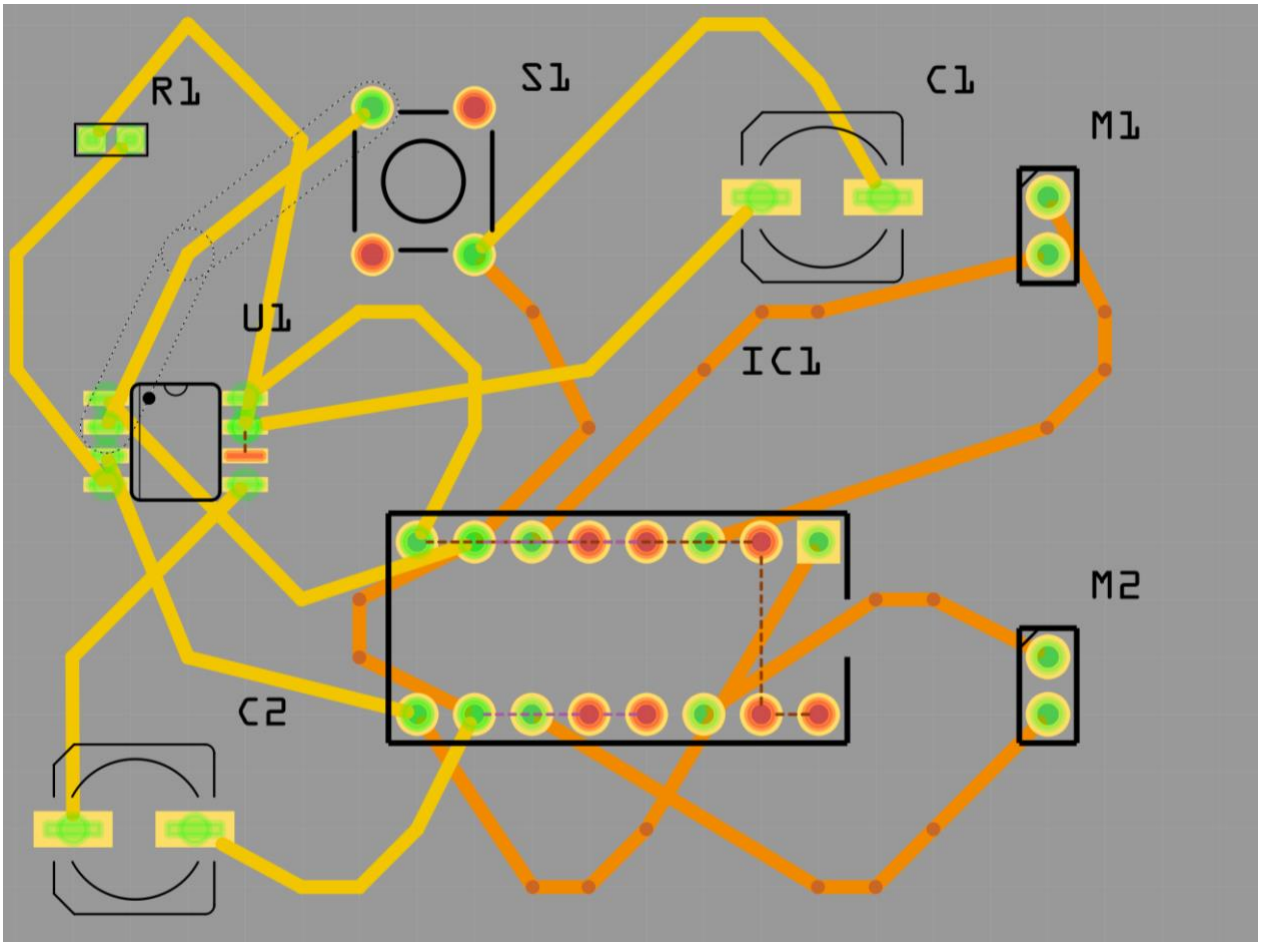
$$ton = 0.693(R1 + R2) =$$
$$0.693\left((15 + 10)x10^{3}\right)x\ 0.1x10^{-6})$$
$$= 1.7325\ msec$$



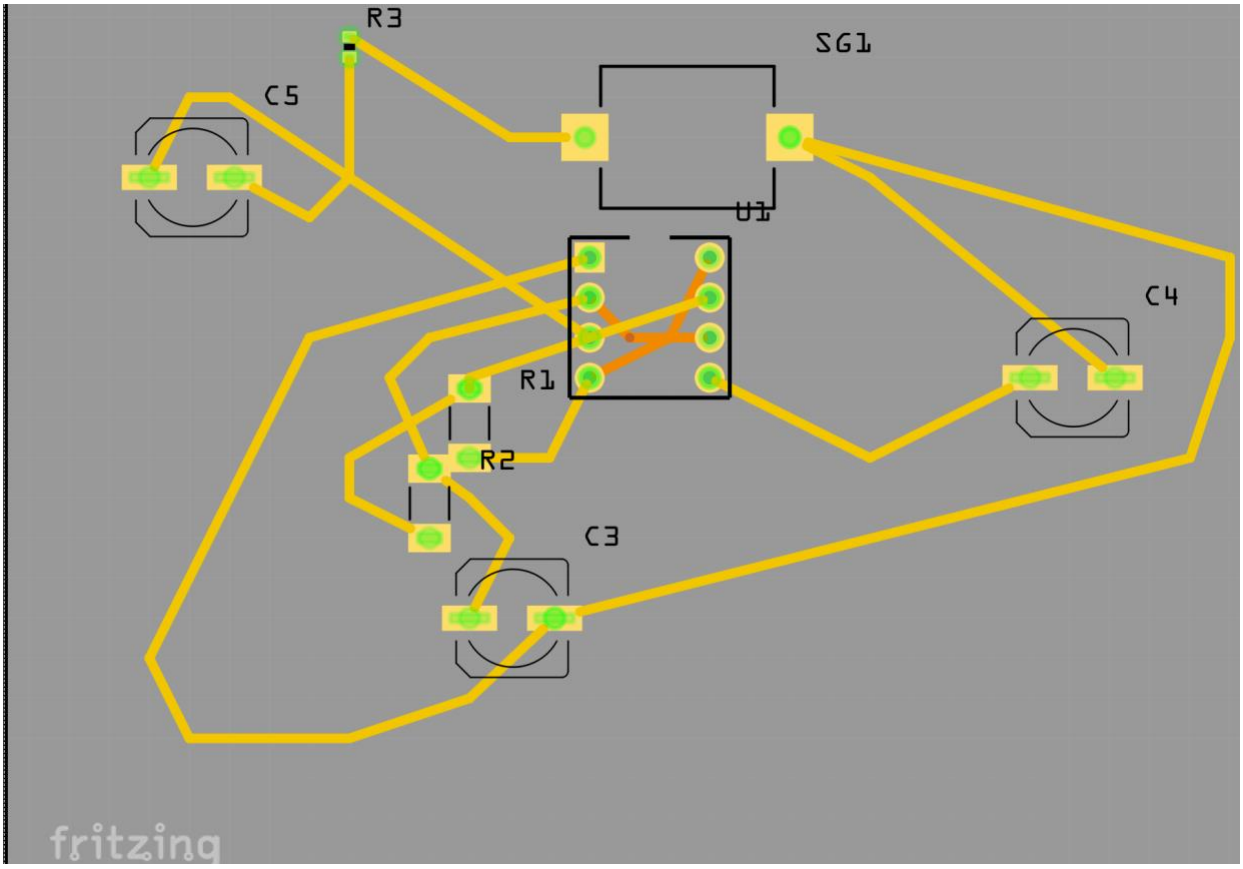
Therefore, The Dc motor was used instead of the servo motor to implement the project.

Fritzing PCB Design:

DC Motor Circuit:



Buzzer Circuit:



Conclusion

To sum up, the aim of the project was met throughout the sections of this report where we have applied almost all the main topics that were covered and well explained during the lab. This includes the use of power supplies, regulators, soldering, 555 timers, and motors. We have applied four functionalities of the Technurse device using 3 circuits shown in the prototype figures such as a passkey using D flip-flops,

sequential timer for DC motors using a 555 timer and h-bridge with a proximity sensor and 555 timer audio amplifier.