



CSE461 Lab Report

Lab Number: 1

Title: Interfacing LEDs and Push button switches with Raspberry Pi.

Group Number: 4

Section: 4

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1. Description:

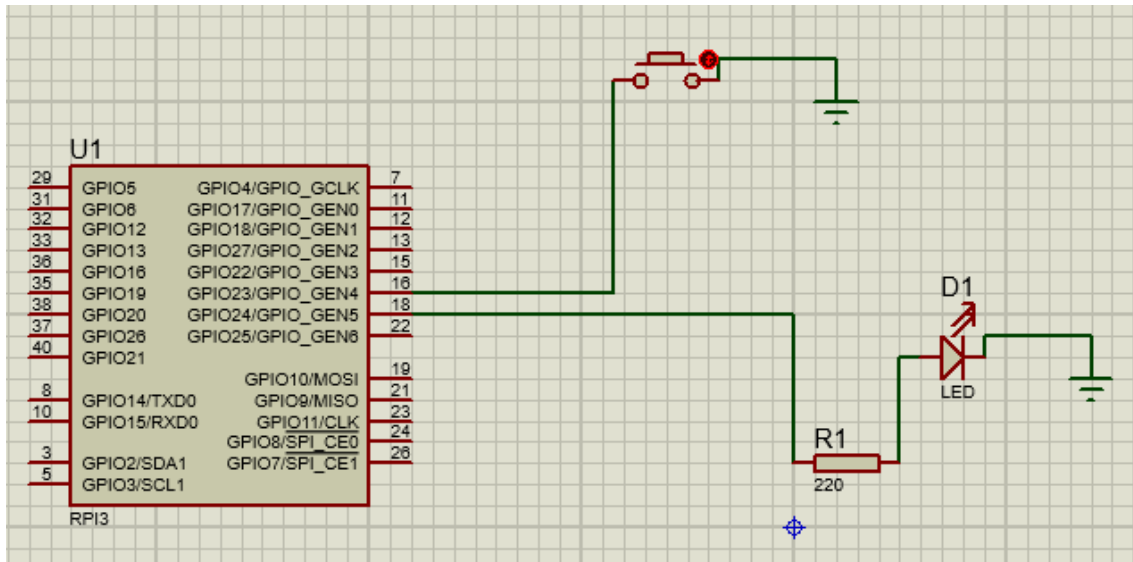
The main purpose of this project is to get acquainted with the various pins associated with Raspberry Pi 4 and its interface. In this lab, we began our lab experiment by setting the monitor with the HDMI port of Raspberry Pi 4, the keyboard and mouse in the USB port of Raspberry Pi 4, and inserting the SD card in the SD card slot. The main motive of this experiment is to get accustomed to how the Raspberry Pi operates with GPIO devices and how we can code in the interface to control the GPIO devices. In this experiment, we tried to control the LED light with a push button. We used the push button to control the LED light via Raspberry Pi 4. We ran the code for the LED to turn ON if we press the button and the LED to turn OFF when we release the push button.

In the second experiment, the task was to turn ON the LED after pressing and releasing the push button twice and the LED will turn off after pressing and releasing the LED twice again. We made some changes to the code to perform this code.

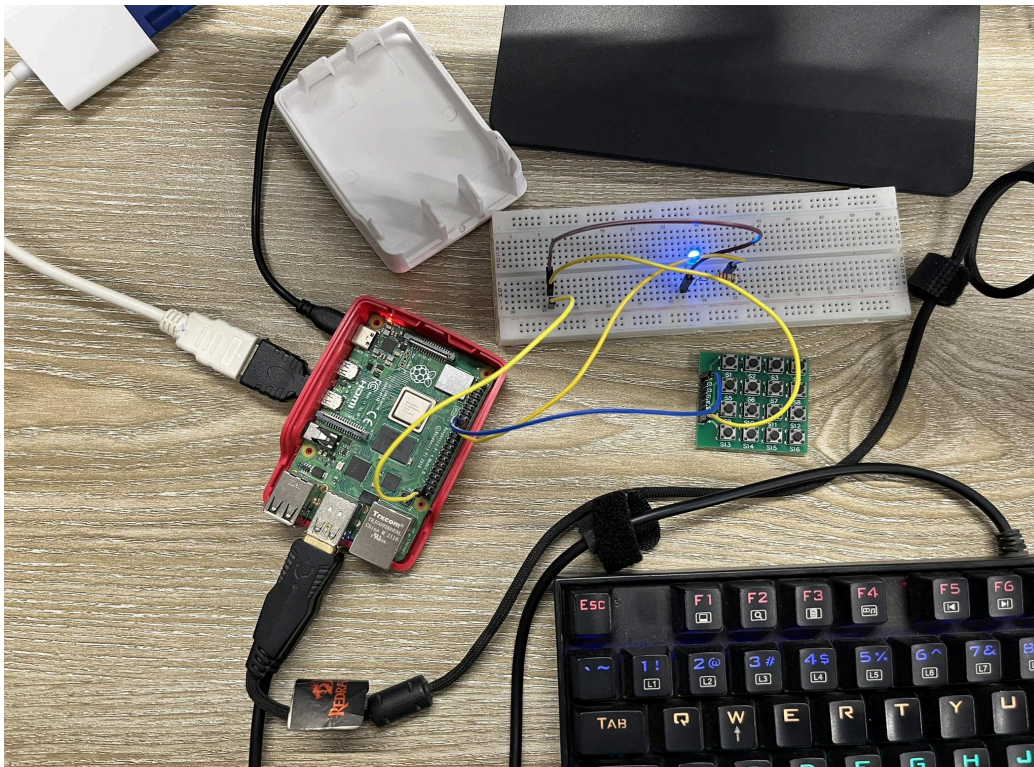
2. Components:

- Raspberry Pi 4
- Breadboard
- LED light
- 4x4 Push button
- 220-ohm resistor
- Male-to-Female jumper wire
- Male-to-Male jumper wire
- Female-to-Female jumper wire

3. Circuit Diagram:



4. Circuit Setup:



5. Explanation:

LED and push buttons are GPIO devices connected to the GPIO Pins. LED is connected to GPIO24 and the push button is connected to GPIO23 via the male-to-female wire. A male-to-female wire is connected from the 39-number pin of Raspberry Pi 4 to a portion of the breadboard to make it ground. Wire extending from the GPIO24 is connected to a 220-ohm resistor and the resistor is also connected to the positive terminal of the LED. The negative terminal of the LED is connected to the ground. For the push button, we connected a female-to-female wire from GPIO23 to column 4 (C4) of the push button. A male-to-female wire is used to connect row 4 (R4) of the push button to the ground. By pressing switch number 16 (S16) of the push button we were able to control the LED.

6. Code:

a) Task-1

```
from gpiozero import LED

from gpiozero import Button

led= LED(24)
button= Button(23)

while True:
    button.wait_for_press()

    led.on()

    button.wait_for_release()

    led.off()
```

b) Task-2

```
from gpiozero import LED
```

```
from gpiozero import Button
```

```
led= LED(24)
```

```
button= Button(23)
```

```
while True:
```

```
    button.wait_for_press()
    button.wait_for_release()
    button.wait_for_press()
    button.wait_for_release()
    led.on()
    button.wait_for_press()
    button.wait_for_release()
    button.wait_for_press()
    button.wait_for_release()
    led.off()
```

7. Question- Answer:

- 1) Why is there a 220 Ohms resistor in series with the LED?

Answer:

When an active high signal goes out from the GPIO pin of Raspberry Pi 4, it usually carries a high voltage. So if the LED receives such high voltage, it can get hot and burst. To prevent this from happening, 220 Ohms resistor is used to reduce the voltage the LED will get.

- 2) Why is the push button connected from a GPIO pin on the RPI to the GND pin of the RPI instead of being connected directly to the LED and the resistor combination?

Answer:

Connecting the push button to the GPIO pin and GND allows the RPI to detect button presses or releases by monitoring the GPIO pin voltage as it creates a basic digital input circuit. This feature enables us to carry out activities using our code based on the button's status. If we connected the push button directly to the LED and resistor combination without using the GPIO pin and GND, we would not be able to detect button presses or releases. When the button is pressed, the LED would light up. However, there would be no digital input capabilities for collaborating with the RPI or trigger activities depending on its status.

- 3) What would happen if the series 220 Ohms resistor was replaced with a 1KOhms resistor? What visual change would you see?

Answer:

1 KiloOhms resistor will reduce the voltage more than 220 Ohms resistor. So the LED will light dimly or not light up at all. So if we used a 1 KiloOhms resistor, the change in brightness of the LED would be less and we cannot make any clear observation as we are uncertain whether it is ON or OFF. This is why 220 Ohms is the best choice.