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Experiment No: 01

Group No: 02

Section: 07

Name of the Experiment: Controlling an LED with the help of a push button.

Objective:

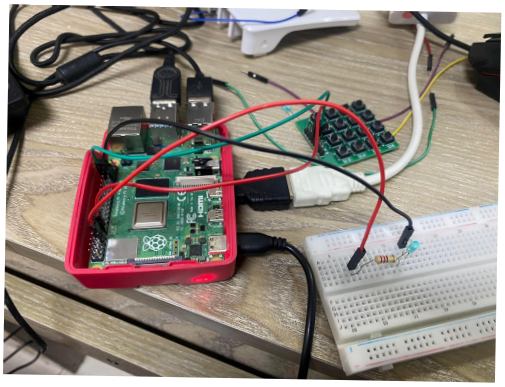
This experiment aims to control the duration of LED illumination by using a switch on the Raspberry Pi 4. The user writes code to detect switch activation, allowing for adjustable LED illumination timing.

Equipment:

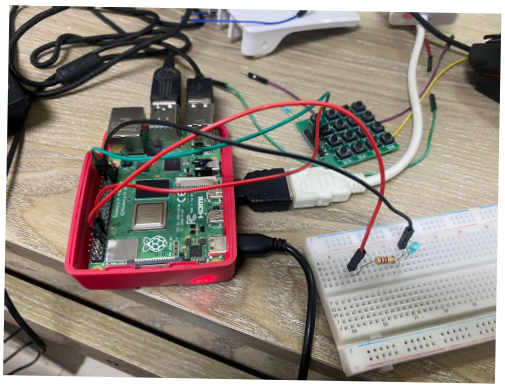
1. Raspberry Pi 4
2. LED
3. 220 ohm resistor
4. Push button
5. Connecting wires

Experimental Setup:

Circuit



LED IS OFF



LED IS ON

Code:

```
from gpiozero import LED     #imports LED functions from gpiozero library

from gpiozero import Button  #imports Button functions from gpiozero library

led = LED(4)                 #declare the GPIO pin 4 for LED output and store it in led variable

button = Button(17)    #declare the GPIO pin 17 for Button output and store it in button variable

while True:                  #initiated an infinite while loop

button.wait_for_press()      #use the built-in function of the button to wait till press

led.on()                     #turn on the led

button.wait_for_release()    #use the built-in function of button to wait till release

led.off()                    #turn off the led
```

Result:

The task involves turning on an LED with a switch by coding a Raspberry Pi. The circuit diagram shows that the switch is connected to a GPIO pin on the Raspberry Pi and the GND pin, not directly to the LED and resistor combination. When the switch is pushed and held, the code running on the Pi detects this event and activates the GPIO pin, which in turn illuminates the LED. When the switch is released, the GPIO pin is deactivated, and the LED turns off. The coding enables more precise control over the LED illumination, allowing the user to adjust the timing and duration of the LED's illumination.

Conclusion & Discussion:

In conclusion, this task taught us how to use a switch to control an LED with a Raspberry Pi by connecting the switch to a GPIO pin and writing code to detect its activation. We also learned about the importance of using the correct resistor value to ensure safe and efficient operation of the LED. This task provided a basic understanding of circuit design and programming with the Raspberry Pi, which can be useful for a variety of future projects and applications.

Explain the following questions:

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

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?

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

1)Ans: In electronic circuits, a 220 Ohms resistor is often placed in series with an LED to prevent damage by limiting the amount of current flowing through it. LEDs are designed to operate at specific voltage and current levels, and too much current or voltage can cause them to fail. The resistor acts as a current limiter by restricting the flow of current in the circuit.

2)Ans: Connecting a push button from a GPIO pin on the Raspberry Pi to the GND pin instead of directly to the LED and resistor combination allows for better control and flexibility in the operation of the circuit. By connecting the push button to a GPIO pin, the software running on the Pi can detect when the button is pressed and released and take specific actions. This allows for more precise control over the duration and timing of the LED illumination. Additionally, using pull-up or pull-down resistors ensures that the GPIO pin is in a stable state when the button is not being pressed, preventing any unwanted triggering of the LED circuit.

3)Ans:Replacing the 220 Ohms resistor with a 1K Ohms resistor in a circuit with an LED would result in the LED appearing dimmer. This is because the higher resistance value of the 1K Ohms resistor would limit the current flowing through the LED more than the 220 Ohms resistor did, which means less current and therefore less brightness. The actual brightness of the LED with the 1K Ohms resistor will depend on the LED and voltage of the power supply. It's essential to choose the appropriate resistor value to ensure the safe and efficient operation of the LED while achieving the desired brightness level.