

Intelligent Traffic Monitor

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21BPS1615
Cognitive Robotics D2+TD2 Slot
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Experiment 1

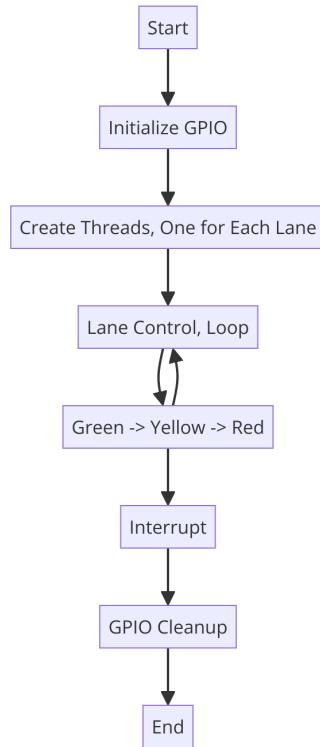
1 Aim

To design and simulate a three-lane traffic monitoring system using Raspberry Pi.

2 Materials Required

- Raspberry Pi
- Power Supply
- Breadboard
- LEDs
- Connection Wires

3 Architecture Flowchart



4 Working Principle

The system uses LEDs to simulate traffic lights for the three lanes, controlled by the traffic monitoring system running on the Raspberry Pi. The program manages the timing and sequence of the traffic signals to simulate real-world traffic flow.

5 Python Program

Listing 1: Traffic Light Simulation

```
import RPi.GPIO as GPIO
import time
import random
import threading

# GPIO pin configuration
RED_PINS = [17, 27, 22, 10]
GREEN_PINS = [5, 6, 13, 19]
YELLOW_PINS = [26, 21, 20, 16]

# Setup GPIO
GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)
for pin in RED_PINS + GREEN_PINS + YELLOW_PINS:
    GPIO.setup(pin, GPIO.OUT)
    GPIO.output(pin, GPIO.LOW)

def turn_on_light(color_pins):
    for pin in color_pins:
        GPIO.output(pin, GPIO.HIGH)

def turn_off_light(color_pins):
    for pin in color_pins:
        GPIO.output(pin, GPIO.LOW)

def control_lane(lane):
    while True:
        # Generate random waiting times and number of vehicles
        green_time = random.randint(5, 10)
        yellow_time = random.randint(2, 4)
        red_time = random.randint(10, 20)
        vehicles = random.randint(1, 20)

        # Display information to console
        print(f"Lane{lane+1}:")
        print(f"  Number of vehicles: {vehicles}")
        print(f"  Green light duration: {green_time} seconds")
        print(f"  Yellow light duration: {yellow_time} seconds")
        print(f"  Red light duration: {red_time} seconds")

        # Turn on Green light
        turn_on_light([GREEN_PINS[lane]])
        time.sleep(green_time)
```

```

turn_off_light([GREEN_PINS[lane]])

# Turn on Yellow light
turn_on_light([YELLOW_PINS[lane]])
time.sleep(yellow_time)
turn_off_light([YELLOW_PINS[lane]])

# Turn on Red light
turn_on_light([RED_PINS[lane]])
time.sleep(red_time)
turn_off_light([RED_PINS[lane]])

if __name__ == '__main__':
    try:
        # Create and start threads for each lane
        threads = []
        for lane in range(4):
            t = threading.Thread(target=control_lane, args=(lane,))
            t.start()
            threads.append(t)

        # Join threads to wait for them to finish (they run indefinitely)
        for t in threads:
            t.join()
    except KeyboardInterrupt:
        GPIO.cleanup()

```

6 Output

Below are the images showing the output of the traffic light simulation system.

7 Verification

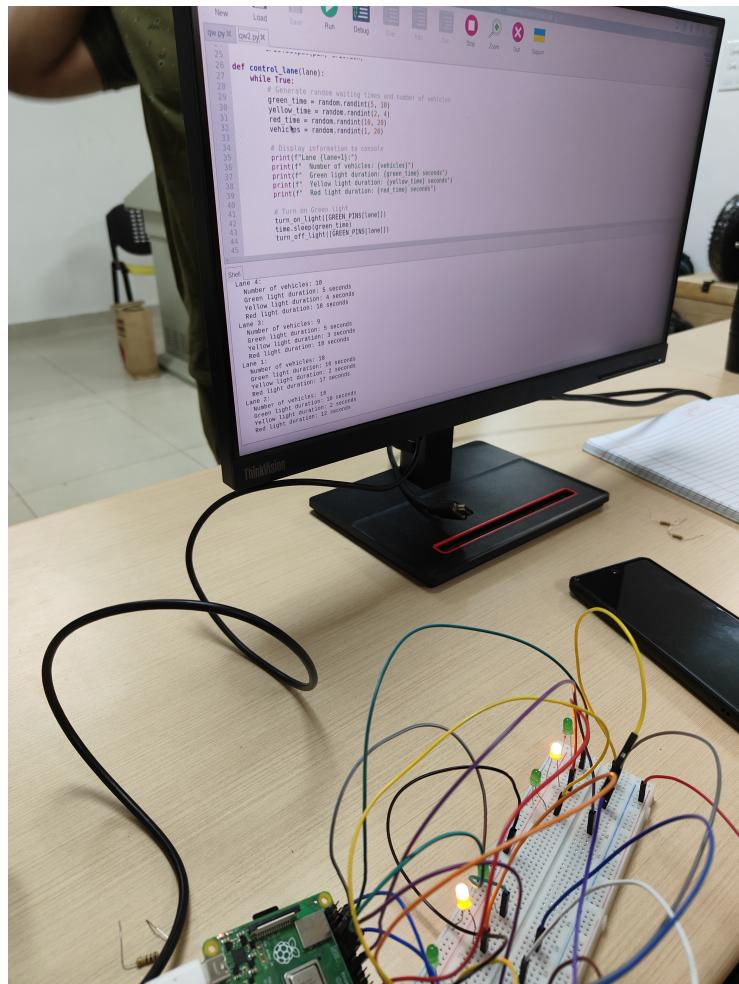


Figure 1: Traffic Light System in Action - Image 1

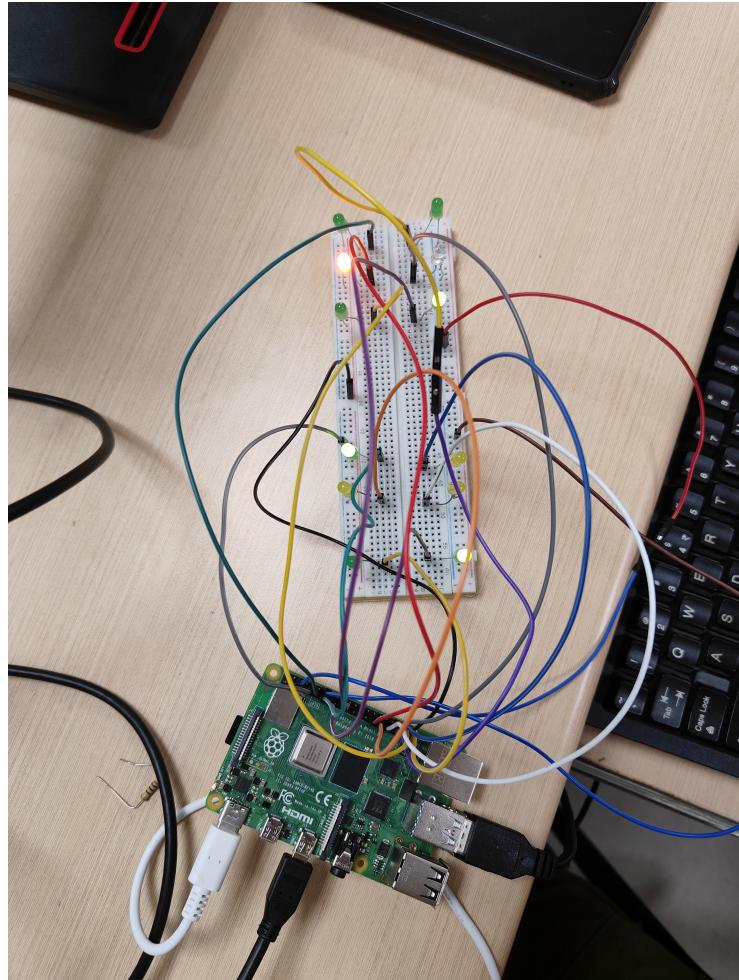


Figure 2: Traffic Light System in Action - Image 2

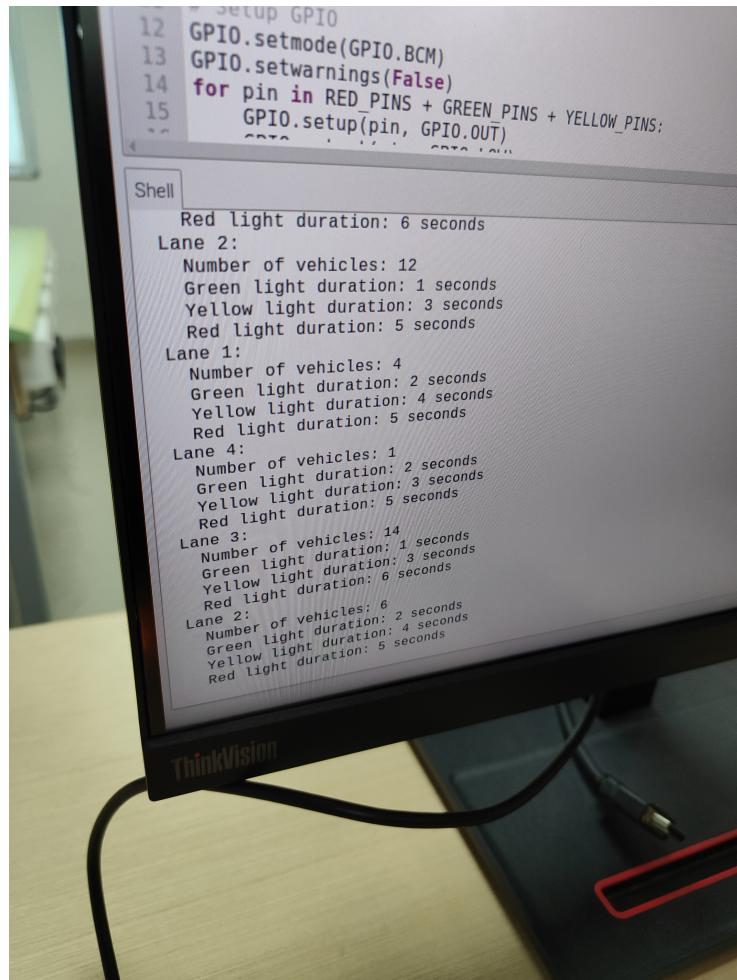


Figure 3: Traffic Light System in Action - Image 3

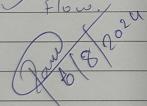
Exp 1 Intelligent traffic Monitor	
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Materials Required : Raspberry Pi Power Supply Breadboard LEDs Connection Wires	
Working Principle : The system uses LEDs to simulate traffic lights for the three lane, controlled by the traffic monitoring system running on raspberry pi.	
The program may manages the timing & sequence of the traffic signals to simulate real world traffic & traffic flows.  21BPS1615 21BPS1628 21BRS1477.	

Figure 4: Verification done in lab