MIT World Peace University

Internet of Things
Second Year B. Tech, Semester 2

Traffic Light Simulation using Raspberry Pi

Assignment 4

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May 2, 2023

Contents

1 Aim

Consider a suitable scenario of traffic signalling considering a crossroad and demonstrate the working of traffic lights using Raspberry Pi.

2 Objectives

- To simulate a traffic signal using Raspberry Pi.
- To demonstrate the working of traffic lights using Raspberry Pi.

3 Component List

Equipment Name	**Quantity**
Raspberry Pi Model 3 B	1
LEDs - Green, Yellow, Red	3

4 Theory

In this project, the Raspberry Pi will be used to control the traffic lights, which will be represented using LEDs. The project will involve programming the Raspberry Pi to alternate the lights in a manner similar to real-world traffic lights. This will require knowledge of programming languages such as Python, as well as knowledge of the GPIO pins on the Raspberry Pi, which are used to interface with external components.

IoT concepts that may be involved in this project include the use of sensors to detect the presence of vehicles or pedestrians, which could be used to control the timing of the traffic lights. For example, if a sensor detects a vehicle waiting at a red light, it could signal the Raspberry Pi to shorten the duration of the red light and increase the duration of the green light to allow the vehicle to proceed. This concept is known as "smart traffic management" and is an example of how IoT can be used to improve transportation infrastructure.

Additionally, the Raspberry Pi could be connected to a network and communicate with other devices in the IoT ecosystem. For example, it could send data about traffic flow to a central server, which could be used to analyze traffic patterns and make decisions about traffic management. This is an example of how IoT can be used to gather and analyze large amounts of data to improve decision-making processes.

Overall, this project is an example of how IoT can be used to create innovative solutions for real-world problems. By simulating traffic lights using a Raspberry Pi, students can learn valuable programming and electronics skills while also gaining a deeper understanding of IoT concepts such as smart traffic management and data analysis.

5 Platform

Operating System: Arch Linux x86-64
IDEs or Text Editors Used: Thonny
Compilers : Python 3.10 in Raspberry Pi.

6 Circuit Diagram

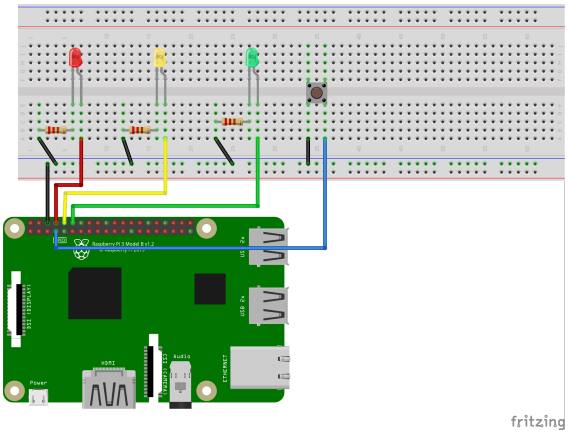

Figure 1: Circuit Diagram for Traffic Signal

7 Code

```
1
2  from gpiozero import LED
3  from gpiozero import Button
4  from gpiozero import TrafficLights
5  import time
6
7  # TrafficLights(red, amber, green)
8  lights = TrafficLights(25, 8, 7)
9  button = Button(21)
10
11
12 def traffic(hour):
13   t = time.localtime()
14   h = t.tm_hour
15   lights.amber.on()
16   time.sleep(2)
17   lights.amber.off()
18   if (21 > h and 6 < h):
19   lights.green.on()
20   time.sleep(5)
21   lights.green.off()
22   else:
23   lights.red.on()
24   time.sleep(5)
25   lights.red.off()
26
27 def wakey(hour, min):
```

```
    cnt = 0
    while cnt < 10:
    if (hour == 6 and min == 40):
      lights.green.on()
      lights.red.on()
      lights.amber.on()
      time.sleep(1)
      lights.green.off()
      lights.red.off()
      lights.amber.off()
      time.sleep(1)
    cnt+=1

  while True:
    w = time.localtime()
    wakey(w.tm_hour, w.tm_min)
    button.when_pressed = traffic
```

8 Conclusion

Thus, we have successfully simulated a traffic signal using Raspberry Pi.

9 FAQ

1. Raspberry Pi Model 3 B:
   The Raspberry Pi has a total of 40 pins, including 26 GPIO (General Purpose Input/Output) pins, 3.3V and 5V power pins, and ground pins. The pinout diagram for the Raspberry Pi 3 B can be found on the official Raspberry Pi website.

   - Pin 1: 3.3V
   - Pin 2: 5V
   - Pin 3: GPIO 2
   - Pin 4: 5V
   - Pin 5: GPIO 3
   - Pin 6: Ground
   - Pin 7: GPIO 4
   - Pin 8: GPIO 14
   - Pin 9: Ground
   - Pin 10: GPIO 15
   - Pin 11: GPIO 17
   - Pin 12: GPIO 18
   - Pin 13: GPIO 27
   - Pin 14: Ground
   - Pin 15: GPIO 22
   - Pin 16: GPIO 23
   - Pin 17: 3.3V
   - Pin 18: GPIO 24
   - Pin 19: GPIO 10
   - Pin 20: Ground
   - Pin 21: GPIO 9
   - Pin 22: GPIO 25
   - Pin 23: GPIO 11
   - Pin 24: GPIO 8
   - Pin 25: Ground
   - Pin 26: GPIO 7
   - Pin 27: ID SD
   - Pin 28: ID SC
   - Pin 29: GPIO 5
   - Pin 30: Ground
   - Pin 31: GPIO 6
   - Pin 32: GPIO 12

- Pin 33: GPIO 13
- Pin 34: Ground
- Pin 35: GPIO 19
- Pin 36: GPIO 16
- Pin 37: GPIO 26
- Pin 38: GPIO 20
- Pin 39: Ground
- Pin 40: GPIO 21

2. LED:

   LEDs are diodes that emit light when an electric current passes through them. They are used as indicator lamps in many devices, and are increasingly used for lighting.

   The LED is based on the semiconductor diode. When a diode is forward biased (switched on), electrons are able to recombine with holes within the device, releasing energy in the form of photons.

   This effect is called electroluminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. LEDs are typically small (less than 1 mm2) and integrated optical components may be used to shape the radiation pattern.

   The Pins are:

   - Anode
   - Cathode