

Writing an application using Raspberry-Pi board to control the operation of hardware simulated traffic signal.

Aim/Objectives:

- To simulate the 4 lane Traffic signal working using Raspberry Pi board model

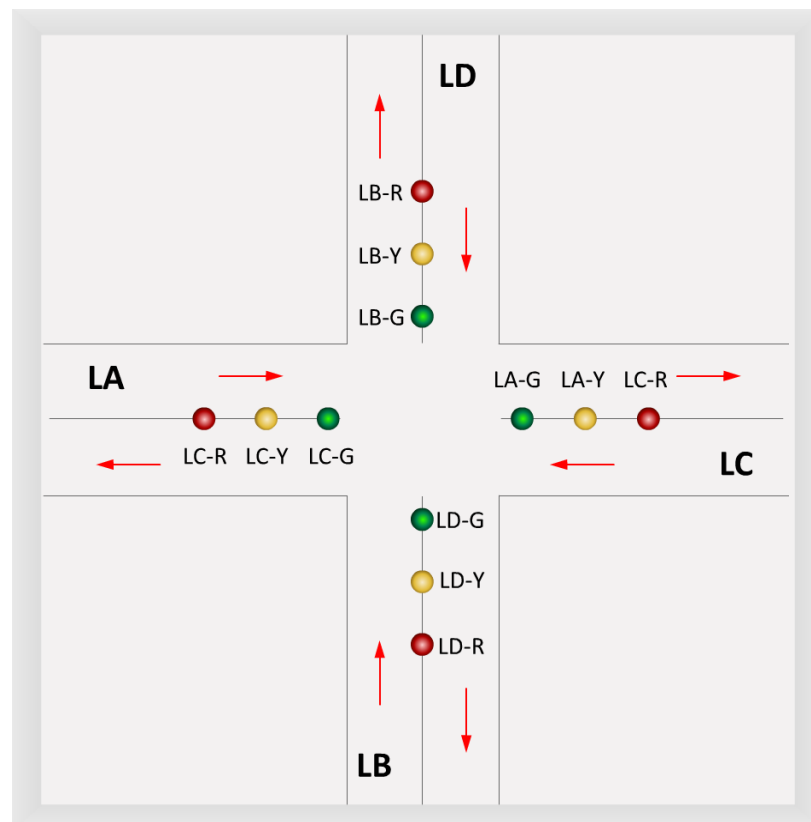
Software:

- Raspbian OS (IDLE)

Hardware Modules:

- Raspberry Pi Board module
- Red Leds (qty. 4)
- Yellow Leds (qty. 4)
- Green Leds (qty. 4)

Theory:



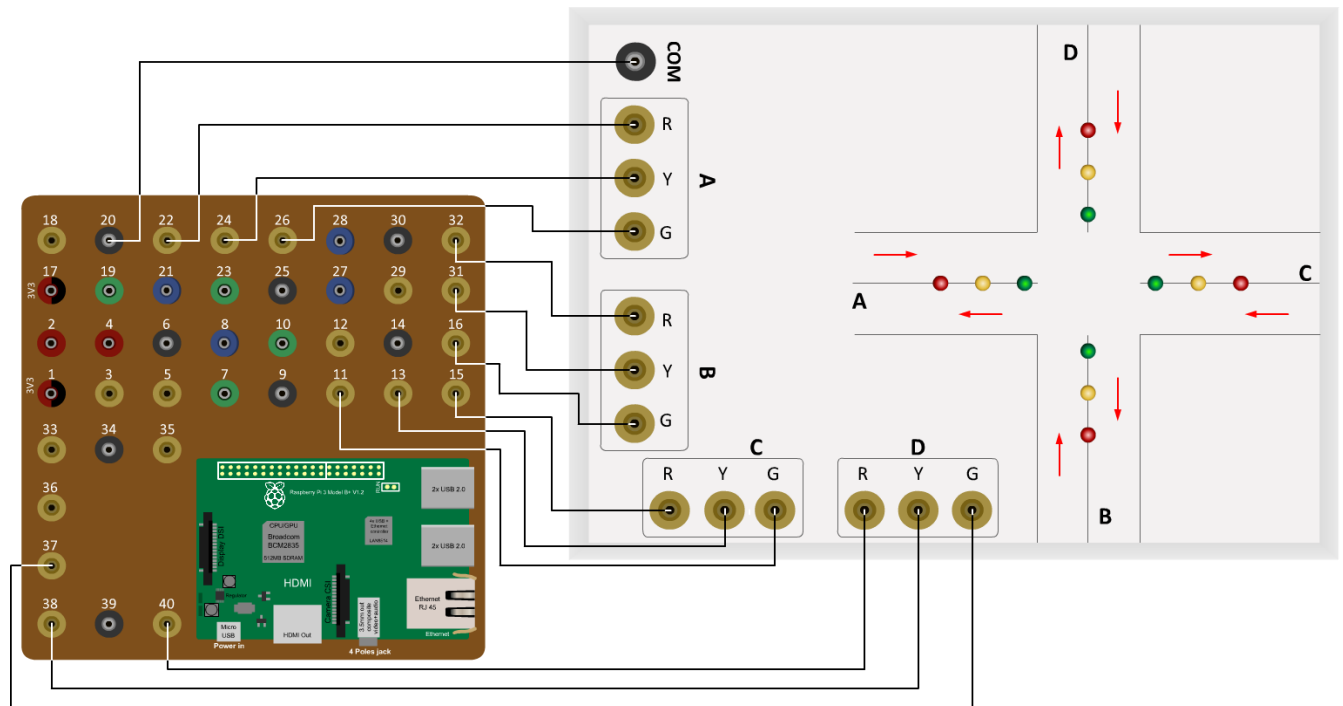
- A simple traffic light system for a 4 way intersection is implemented using Raspberry pi where the traffic is controlled in a pre-defined timing system.
- There are 4 lanes LA, LB, LC and LD going towards the signal.
- At the cross road there are 4 sets of Traffic lights opposite to each lane.
- These sets are LA(LA-G, LA-Y, LA-R), LB(LB-G, LB-Y, LB-R), LC(LC-G, LC-Y, LC-R), LB(LD-G, LD-Y, LD-R),
- Traffic from any lane moves when its corresponding Green light is ON.
- "ON time" of any Red light is dependent on the "ON time" of Yellow light and Green light of other 3 signal lights.

- “ON time” of Yellow light is same for all lanes.
- User can specify and change the “ON time” of the Green light and Red light of each signal separately.
- The Traffic light pattern keeps on repeating till the next change made by the user.

Safety precautions:

- Raspberry-Pi provides 3.3V and 5V VCC pins
- Raspberry-Pi operates on 3.3V.
- Various sensors and actuators operate on different voltages.
- Read datasheet of a given sensor or an actuator and then use appropriate VCC pin to connect a sensor or an actuator.
- Ensure that signal voltage coming to the Raspberry-Pi from any sensor or actuator does not exceed 3.3V.
- If signal/data coming to Raspberry-Pi is greater than 3.3V then use voltage level shifter module to decrease the incoming voltage.
- The Raspberry-Pi is a costly device, hence you should show the circuit connections to your instructor before starting your experiment.

Interface diagram:



Steps for assembling circuit:

- Connect the R, Y, G pins of “Lane A” to 22, 24, 26 pins of Raspberry Pi module respectively.
- Connect the R, Y, G pins of “Lane B” to 32, 31, 16 pins of Raspberry Pi module respectively.
- Connect the R, Y, G pins of “Lane C” to 11, 13, 15 pins of Raspberry Pi module respectively.
- Connect the R, Y, G pins of “Lane D” to 40, 38, 37 pins of Raspberry Pi module respectively.
- Connect the “COM” pin of the Traffic Signal module to the GND pin of Raspberry Pi module.

Procedure:

- Write the program as per the algorithm given.
- Save the program
- Run code using Run module.

Algorithm:

- Import RPi.GPIO library
- Import Time library
- Declare all the LED pins which is connected to the GPIO pins of Raspberry pi board
- Set mode i.e. GPIO.BOARD
- Take delay time from user for each lane
- Set all the LED pins as Output
- Define 4 functions to control the traffic light as
 - a. trafficState1
 - b. trafficState2
 - c. trafficState3
 - d. trafficState4
- In main loop,
 - a. Firstly for the LA, the signal becomes Green.
 - b. Hence, for all other Lanes (LB,LC,LD), the corresponding Red signal is on.
 - c. After a time delay, as a warning indicator, the Yellow light in LA signal is turned on indicating that the red light is about to light up.
 - d. After a time delay for the Lane 3, the signal becomes Green. So at the same time the signal for Lane 1 becomes Red.
 - e. Second time for the LB, the signal becomes Green.
 - f. Hence, for all other Lanes (LA,LC,LD), the corresponding Red signal is on.
 - g. After a time delay, as a warning indicator, the Yellow light in LB signal is turned on indicating that the red light is about to light up.
 - h. Third time for the LC, the signal becomes Green.
 - i. Hence, for all other Lanes (LA,LB,LD), the corresponding Red signal is on.
 - j. After a time delay, as a warning indicator, the Yellow light in LC signal is turned on indicating that the red light is about to light up.
 - k. Fourth time for the LD, the signal becomes Green.
 - l. Hence, for all other Lanes (LA,LB,LC), the corresponding Red signal is on.
 - m. After a time delay, as a warning indicator, the Yellow light in LD signal is turned on indicating that the red light is about to light up.
 - n. The process mentioned above will be repeated all over again.

Observation:

- Observe the output on LEDs and Seven Segment Display.