SPECIAL ASSIGNMENT MCI

Implement Traffic light controller using 8051 Microcontroller

PARIN PATEL

22BEC090

And

YASH PATEL

22BEC093

Department of Engineering, Nirma University, Ahmedabad, Gujarat, India

E-mail: 22BEC090@nirmauni.ac.in

22BEC093@nirmauni.ac.in

1. Introduction:

Traffic management at road intersections is crucial for ensuring the smooth and safe flow of vehicles and pedestrians. An efficient traffic light system helps regulate traffic, minimizing the risk of accidents and congestion. Traditionally, traffic light systems were manually controlled, but with advancements in technology, automatic traffic light systems have become more prevalent.
This report discusses an automatic traffic light system using an 8051 microcontroller. The 8051 microcontroller is a versatile and widely used microcontroller that offers an efficient way to control the traffic lights at an intersection. By programming the microcontroller, the sequence and timing of the traffic lights can be adjusted according to the needs of the intersection, improving traffic flow and safety.

2. Diagram:

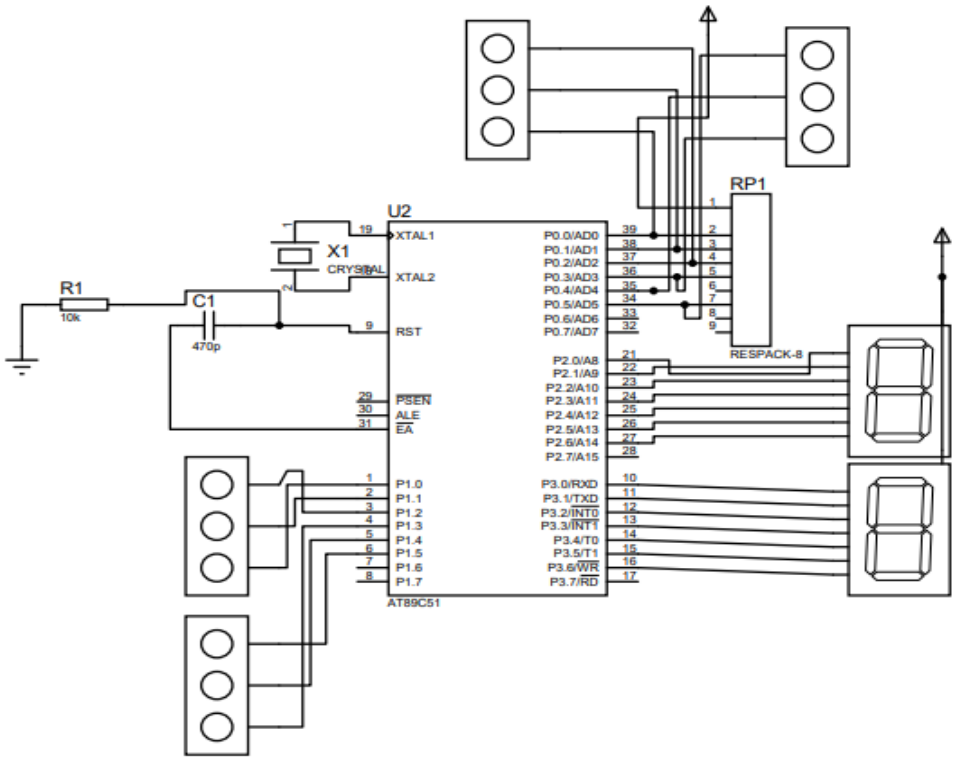

Fig 1. Automatic Traffic light system using 8051

3. Working:

Initialization:
The program starts by initializing various ports (P0, P1, P2, P3) to control the traffic lights and 7-segment display. The main routine begins at 30H.

Main Loop:
The program consists of multiple sections (**A1**, **B1**, **C1**, and **D1**) that represent different traffic light sequences. The program will go through each section sequentially and control the traffic lights accordingly.
Traffic Light Control:
Each section (**A1**, **B1**, **C1**, **D1**) contains instructions to control the state of the traffic lights.
The program uses different values for the ports (P0, P1, P2, P3) to control the red, yellow, and green lights and to control the display on 7 7-segment display.
For each state change, there is a delay (**ACALL DELAY**) to keep the lights on for a predefined duration.
Traffic Light Sequences:
Each section represents a particular phase in the traffic light cycle.
For example, in **A1**, the program controls the lights to show red and green lights on different roads, and it transitions between states using the delay.
Similar operations occur in other sections (**B1**, **C1**, **D1**) for different phases of the traffic light cycle.
Loop:
After completing the traffic light sequence, the program loops back to the beginning to continue the cycle (**LJMP MAIN**).
This looping behavior ensures the traffic light system continues to operate indefinitely.

4. Flowchart:

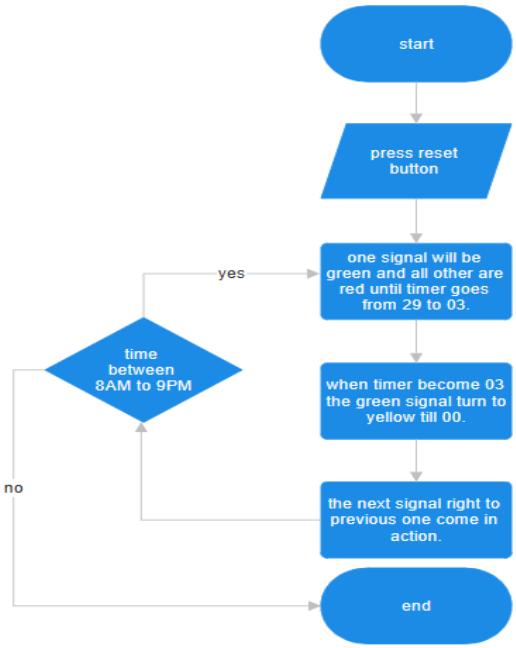

Fig 2. Flowchart of the circuit

5. Code :

```
        ORG 00H
       LJMP MAIN
       ORG 30H
MAIN:  MOV P1,#00H
       MOV DPTR,#200H
A1:    MOV P1,#24H
       MOV P0,#21H
       MOV P2,#0A4H
       MOV P3,#90H
       ACALL DELAY
       MOV P3,#80H
       ACALL DELAY
       MOV P3,#0F8H
       ACALL DELAY
       MOV P3,#82H
       ACALL DELAY
       MOV P3,#92H
       ACALL DELAY
       MOV P3,#99H
       ACALL DELAY
       MOV P3,#0B0H
       ACALL DELAY
       MOV P3,#0A4H
       ACALL DELAY
       MOV P3,#0F9H
       ACALL DELAY
       MOV P3,#0C0H
      ACALL DELAY
       MOV P2,#0F9H
       MOV P3,#90H
       ACALL DELAY
       MOV P3,#80H
       ACALL DELAY
       MOV P3,#0F8H
       ACALL DELAY
       MOV P3,#82H
       ACALL DELAY
       MOV P3,#92H
       ACALL DELAY
       MOV P3,#99H
       ACALL DELAY
       MOV P3,#0B0H
       ACALL DELAY
       MOV P3,#0A4H
       ACALL DELAY
       MOV P3,#0F9H
       ACALL DELAY
       MOV P3,#0C0H
       ACALL DELAY
       MOV P2,#40H
       MOV P3,#90H
       ACALL DELAY
       MOV P3,#80H
       ACALL DELAY
       MOV P3,#0F8H
       ACALL DELAY
       MOV P3,#82H
       ACALL DELAY
       MOV P3,#92H
       ACALL DELAY
       MOV P3,#99H
       ACALL DELAY
       MOV P3,#0B0H
       ACALL DELAY
       MOV P3,#0A4H
       ACALL DELAY
       MOV P3,#0F9H
       ACALL DELAY
       MOV P3,#0C0H
       ACALL DELAY
       MOV P0,#22H
      MOV P3,#0A4H
       ACALL DELAY
       MOV P3,#0F9H
       ACALL DELAY
       MOV P3,#0C0H
       ACALL DELAY
       ACALL DELAY
       ACALL DELAY
B1:    MOV P1,#24H
       MOV P0,#0CH
       MOV P2,#00H
       MOV P3,#00H
       MOV P2,#0A4H
       MOV P3,#90H
       ACALL DELAY
       MOV P3,#80H
       ACALL DELAY
       MOV P3,#0F8H
       ACALL DELAY
       MOV P3,#82H
       ACALL DELAY
       MOV P3,#92H
       ACALL DELAY
       MOV P3,#99H
       ACALL DELAY
       MOV P3,#0B0H
       ACALL DELAY
       MOV P3,#0A4H
       ACALL DELAY
       MOV P3,#0F9H
       ACALL DELAY
       MOV P3,#0C0H
      ACALL DELAY
       MOV P2,#0F9H
       MOV P3,#90H
       ACALL DELAY
       MOV P3,#80H
       ACALL DELAY
       MOV P3,#0F8H
       ACALL DELAY
       MOV P3,#82H
       ACALL DELAY
       MOV P3,#92H
```

```
        ACALL DELAY
        MOV P3,#99H
        ACALL DELAY
        MOV P3,#0B0H
        ACALL DELAY
        MOV P3,#0A4H
        ACALL DELAY
        MOV P3,#0F9H
        ACALL DELAY
        MOV P3,#0C0H
        ACALL DELAY
        MOV P2,#40H
        MOV P3,#90H
        ACALL DELAY
        MOV P3,#80H
        ACALL DELAY
        MOV P3,#0F8H
        ACALL DELAY
        MOV P3,#82H
        ACALL DELAY
        MOV P3,#92H
        ACALL DELAY
        MOV P3,#99H
        ACALL DELAY
        MOV P3,#0B0H
        ACALL DELAY
        MOV P0,#14H
        MOV P3,#0A4H
        ACALL DELAY
        MOV P3,#0F9H
        ACALL DELAY
        MOV P3,#0C0H
        ACALL DELAY
       ACALL DELAY
      ACALL DELAY
C1:   MOV P1,#0CH
      MOV P0,#24H
      MOV P2,#0A4H
      MOV P3,#90H
      ACALL DELAY
      MOV P3,#80H
      ACALL DELAY
      MOV P3,#0F8H
      ACALL DELAY
      MOV P3,#82H
      ACALL DELAY
      MOV P3,#92H
      ACALL DELAY
      MOV P3,#99H
      ACALL DELAY
      MOV P3,#0B0H
      ACALL DELAY
      MOV P3,#0A4H
      ACALL DELAY
      MOV P3,#0F9H
      ACALL DELAY
      MOV P3,#0C0H
      ACALL DELAY
      MOV P2,#0F9H
      MOV P3,#90H
      ACALL DELAY
      MOV P3,#80H
      ACALL DELAY
      MOV P3,#0F8H
      ACALL DELAY
      MOV P3,#82H
      ACALL DELAY
      MOV P3,#92H
      ACALL DELAY
      MOV P3,#99H
      ACALL DELAY
      MOV P3,#0B0H
      ACALL DELAY
      MOV P3,#0A4H
      ACALL DELAY
      MOV P3,#0F9H
      ACALL DELAY
      MOV P3,#0C0H
      ACALL DELAY
      ACALL DELAY
      MOV P2,#40H
      MOV P3,#90H
      ACALL DELAY
      MOV P3,#80H
      ACALL DELAY
      MOV P3,#0F8H
      ACALL DELAY
      MOV P3,#82H
      ACALL DELAY
      MOV P3,#92H
      ACALL DELAY
      MOV P3,#99H
      ACALL DELAY
      MOV P3,#0B0H
      ACALL DELAY
      MOV P1,#14H
      MOV P3,#0A4H
      ACALL DELAY
      MOV P3,#0F9H
      ACALL DELAY
      MOV P3,#0C0H
      ACALL DELAY
      ACALL DELAY
D1:   MOV P1,#21H
      MOV P0,#24H
      MOV P2,#0A4H
      MOV P3,#90H
      ACALL DELAY
      MOV P3,#80H
      ACALL DELAY
      MOV P3,#0F8H
      ACALL DELAY
      MOV P3,#82H
      ACALL DELAY
```

```
MOV P3,#92H
ACALL DELAY
MOV P3,#99H
ACALL DELAY
MOV P3,#0B0H
ACALL DELAY
MOV P3,#0A4H
ACALL DELAY
MOV P3,#0F9H
ACALL DELAY
MOV P3,#0C0H
ACALL DELAY
MOV P2,#0F9H
MOV P3,#90H
ACALL DELAY
MOV P3,#80H
ACALL DELAY
MOV P3,#0F8H
ACALL DELAY
MOV P3,#82H
ACALL DELAY
MOV P3,#92H
ACALL DELAY
MOV P3,#99H
ACALL DELAY
MOV P3,#0B0H
ACALL DELAY
MOV P3,#0A4H
ACALL DELAY
MOV P3,#0F9H
ACALL DELAY
MOV P3,#0C0H
ACALL DELAY
MOV P2,#40H
MOV P3,#90H
ACALL DELAY
MOV P3,#80H
ACALL DELAY
MOV P3,#0F8H
ACALL DELAY
MOV P3,#82H
ACALL DELAY
MOV P3,#92H
ACALL DELAY
MOV P3,#99H
ACALL DELAY
MOV P3,#0B0H
ACALL DELAY
MOV P1,#22H
MOV P3,#0A4H
ACALL DELAY
MOV P3,#0F9H
ACALL DELAY
MOV P3,#0C0H
ACALL DELAY
ACALL DELAY
ACALL DELAY
LJMP MAIN
DELAY:  MOV R4,#50
H3:     MOV R5,#20H
H2:     MOV R6,#0FFH
H1:     DJNZ R6,H1
        DJNZ R5,H2
        DJNZ R4,H3
        RET
END
```

6. Bill of materials:

Components	Quantity	Price
AT89C51 IC	1	100
Traffic light	4	40
Resistors	20	6
Crystal	1	15
7-segment	2	20

7. Application:

- Traffic lights regulate the flow of vehicles at intersections, controlling when vehicles from different directions can proceed or stop.
- They enhance safety by reducing the likelihood of collisions between vehicles.
- Traffic lights are crucial for managing traffic congestion, ensuring smoother traffic flow during peak hours.
- Traffic lights play a vital role in urban planning, influencing road design and infrastructure development to accommodate traffic flow efficiently.

8. Summary:

In conclusion, the implementation of an automatic traffic light system using an 8051 microcontroller is an effective and efficient solution for managing traffic flow at intersections. By leveraging the capabilities of the 8051 microcontroller, the system can control the traffic lights according to predetermined timings, ensuring smooth and orderly traffic movement. This automated approach helps reduce traffic congestion, enhance safety for both drivers and pedestrians and improve overall efficiency at intersections. Additionally, the use of an 8051 microcontroller provides a cost-effective and reliable means of controlling traffic lights, as it is a widely available and well-documented microcontroller with ample support and resources for implementation. With proper calibration and programming, the system can adapt to varying traffic conditions and improve traffic management across different urban settings.

9. Questions:

1. How to interface 7 segments with the 8051 microcontroller?
2. Why do we need pull-up resistors in 8051 if we are working with port 0?
3. How we can generate a 1-second delay without using a timer?
4. Made a look-up table for a 7-segment common anode.
5. Made a look-up table for a 7-segment common cathode.
6. How to multiplex two 7 segments display to 8051?
7. What is the requirement of reset circuitry in 8051 and roll of EA in 8051?