# Teachers Assessment Activity
# MICROCONTROLLERS AND INTERFACING
# ECP353
## 5th Semester B.Tech. Session 2023-24

**Project Report**
**On**
**The Topic**

# "TRAFFIC SIGNAL MANAGEMENT SYSTEM USING 8051 MICROCONTROLLER"


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**PROJECT TITLE**

# "TRAFFIC SIGNAL MANAGEMENT SYSTEM USING 8051 MICROCONTROLLER"

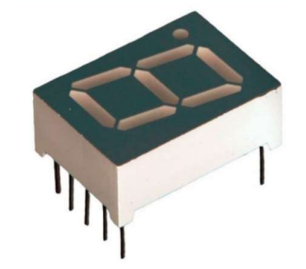
## INTRODUCTION

Traffic control is the big issue in today's era. Traffic jam is one of the major problems in densely populated cities whereas their population and number of running vehicles are much more than their capacity. Faulty traffic signaling systems, inadequate manpower, narrow road spaces and overtaking tendency of drivers create pro-longed traffic jams. Due to traffic jam a substantial portion of working hours have to be left on streets which indirectly put adverse impact on economy and unavoidable road accident which results loss of lives. The number of vehicles is ever increasing while the city infrastructures are developing at a much slower rate. The management of traffic is also a tough job and only manual efforts can't stop this kind of problem so we need machines. Today's traffic control system is able to handle such a situation. We need a system which is dynamic in nature so that it can handle traffic smoothly and such a system called Automatic Traffic Control System. Here we are creating the same dynamic traffic control system which has the ability to control the traffic as well as avoid the congestion of roads. Traffic Light system was one of the fascinating applications of Embedded systems and have been using the same till this day. This is the four-way traffic light system using embedded systems which was bit simple in nature as we need to consider the traffic flow in four different directions providing appropriate timings to each of the lights. This system uses 8051 microcontroller, Seven Segment Display and LEDs for indication. This is the simplest and cheapest model of automatic traffic light controller using microcontroller 8051.

## COMPONENTS USED WITH SPECIFICATIONS

1. Seven Segment Display

| | |
|---|---|
| Device Type | Seven-segment |
| Display Type | LED Display |
| Digit Height | 0.56 inch |
| Design | Common Anode |
| Pin number | 10 |
| Pin Type | DIP |

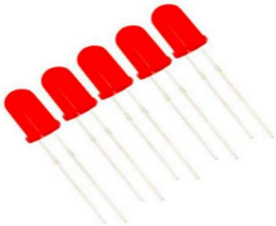


2. Microcontroller AT89C51

| Specification | Description |
|---|---|
| Microcontroller Family | 8051 |
| CPU Clock Frequency | Up to 24 MHz |
| Program Memory (Flash) | 4 KB |
| Data Memory (RAM) | 128 bytes |
| I/O Ports | 4 I/O Ports with 32 Pins |
| Timers | 2 Timers (Timer 0 and Timer 1) |
| Serial Communication | UART (Serial Port) |
| Interrupt Sources | 5 External and 3 Internal |
| Voltage Range | 2.7V to 6V |
| On-chip Oscillator | Yes |
| Packages | 40-pin DIP, 44-lead PLCC, etc. |
| Special Features | 8-bit Microcontroller |

3. Red LED – 4

| | |
|---|---|
| Diameter | 5 mm |
| Glow Color | Red |
| Forward voltage | 2.2 V to 2.4 V |
| Peak Reverse Voltage | 5 volts |
| Lens Color | Red |
| Wavelength | 630-635nm |



4. Green LED – 4

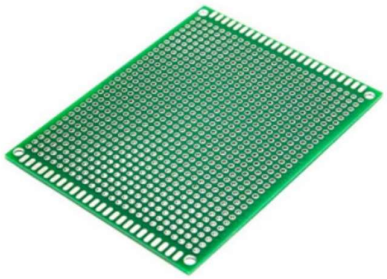
| | |
|---|---|
| Diameter | 5mm |
| Color | Green |
| Forward voltage | 1.8 V to 2.2 V |
| Peak Reverse Voltage | 5 volts |
| Lens Color | Green |

5. Power Supply - (Lithium Polymer) Lipo Rechargeable Battery Model KP-401020

| | |
|---|---|
| Voltage | 3.7V |
| Capacity | 160mAh |
| Size | 20x10x4 (in mm) |

6. Zero PCB

| Dimension: 8 x 12 CM |
|---|
| Base Material FR4 |
| Copper Thickness 1-4 OZ |
| Board Thickness 1.6 |
| Min. Hole Size 0.3mm |
| Min. Line Width 6mil |
| Min. Line Spacing 6mil |
| Surface Finishing HASL |



7. Connecting Wires
8. 40 Pin IC Socket
9. Soldering Iron, Soldering Wire and Flux (Soldering Paste)

## LITERATURE SURVEYS

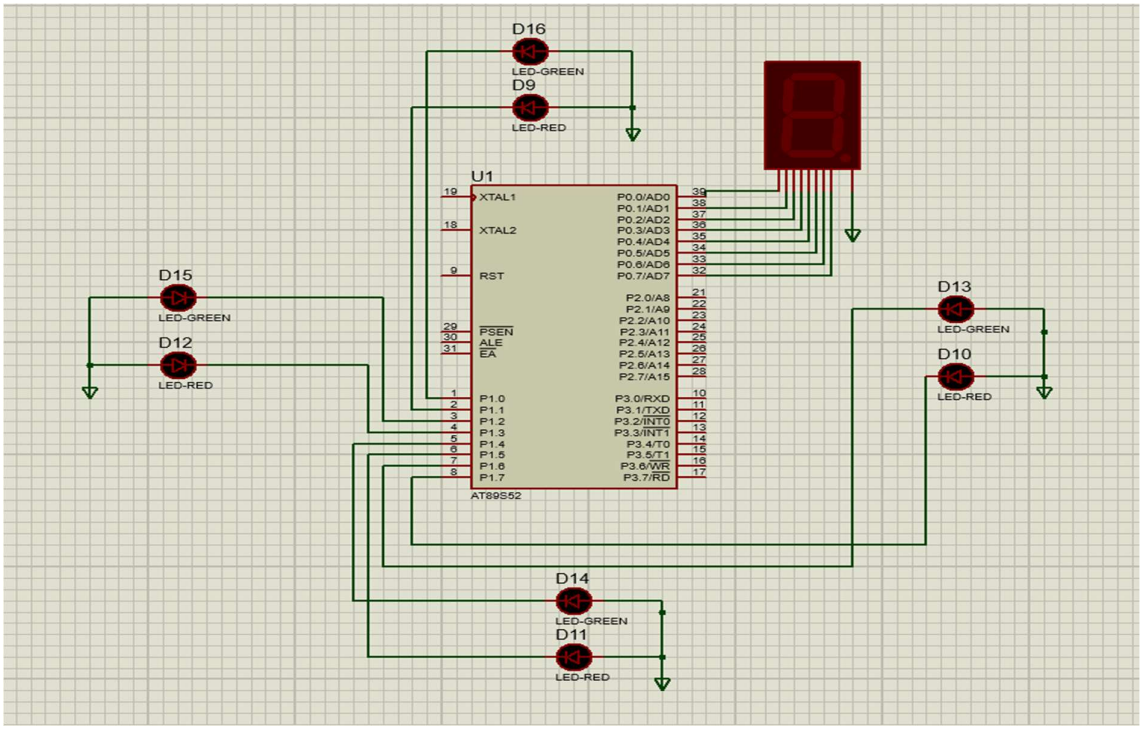
Automatic traffic light control systems, driven by the versatile 8051 microcontroller, have transformed urban traffic management. In the realm of traffic control, this literature survey explores the historical progression and highlights key components, control algorithms, and real-world applications. Early traffic systems were based on simplistic timers, but the advent of the 8051 microcontroller paved the way for more sophisticated and adaptive solutions.

Several theories have contributed to the development of traffic light control algorithms. Notably, the "Traffic Adaptive Control System" by Michal Masa-Bote and "Fuzzy Logic Control for Intelligent Traffic Light" proposed by K. M. Raghuwanshi have demonstrated the potential for adaptive and fuzzy logic-based traffic control. These theories use real-time data from sensors to dynamically adjust traffic light timings, optimizing traffic flow. Real-world case studies provide practical insight, showcasing the applicability and effectiveness of these systems in diverse scenarios.

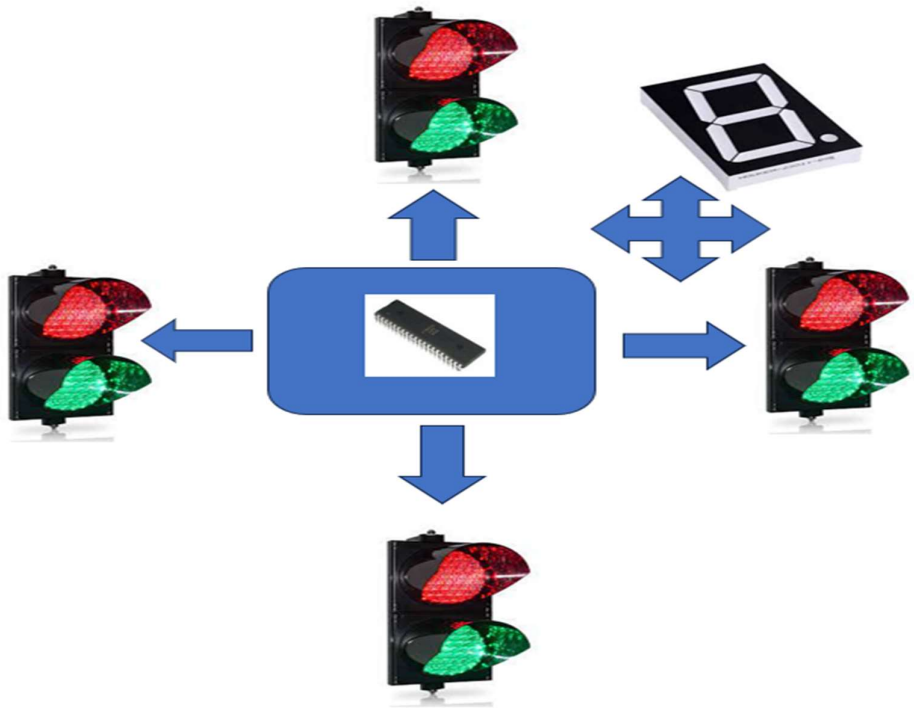
Challenges in this field include interfacing with modern technologies for integration into smart city infrastructure, optimizing energy efficiency to ensure sustainability, and addressing security concerns. The 8051 microcontroller remains a pivotal tool for efficient and adaptable traffic light control systems. In conclusion, this survey emphasizes the importance of research theories in advancing traffic control technologies, and the ongoing work to meet contemporary urban transportation challenges.

The ever-increasing urbanization and the proliferation of vehicles on the roads underscore the need for continuous research and innovation in traffic management. As technology advances and urban centers expand, the role of the 8051 microcontrollers in traffic control systems will remain significant. Further interdisciplinary research and collaboration with experts in fields like AI, data science, and infrastructure development promise a brighter, more efficient, and safer future for urban transportation.

## CIRCUIT DIAGRAM




## BLOCK DIAGRAM



## PROGRAM CODE

```
ORG 00H
SJMP MAIN
ORG 300H
TBL: DB 90H,80H,0F8H,82H,92H,99H,0B0H,0A4H,0F9H,0C0H

MAIN:MOV DPTR,#300H
   MOV R3,#0AH
        MOV A,#56H
   MOV P1,A
BACK:CLR A
        MOVC A,@A+DPTR
        MOV P0,A
        ACALL DELAY1
        INC DPTR
        DJNZ R3,BACK

   MOV DPTR,#300H
   MOV R3,#0AH
        MOV A,#59H
   MOV P1,A
BACK1:CLR A
        MOVC A,@A+DPTR
        MOV P0,A
        ACALL DELAY1
        INC DPTR
        DJNZ R3,BACK1

        MOV DPTR,#300H
   MOV R3,#0AH
```

```
 MOV A,#65H
    MOV P1,A
BACK2:CLR A
          MOVC A,@A+DPTR
          MOV P0,A
          ACALL DELAY1
          INC DPTR
          DJNZ R3,BACK2

           MOV DPTR,#300H
    MOV R3,#0AH
          MOV A,#95H
    MOV P1,A
BACK3:CLR A
          MOVC A,@A+DPTR
          MOV P0,A
          ACALL DELAY1
          INC DPTR
          DJNZ R3,BACK3
    SJMP MAIN

DELAY1:MOV TMOD,#10H
           MOV R0,#14H
REPEAT:MOV TL1,#0B0H
           MOV TH1,#3CH
           MOV TCON,#40H
WAIT:JNB TF1,WAIT
           MOV TCON,#00H
           DJNZ R0,REPEAT
           RET
END
```

## WORKING

This automatic traffic light control system operates as an open-loop control system, meaning it doesn't rely on feedback for adjustment. Instead, it's equipped with several key components that work harmoniously to ensure the efficient management of traffic signals. At its core, the system employs an 8051 microcontroller, which acts as the central control unit, overseeing the entire operation. To communicate timing information to vehicle users and pedestrians, a 7-segment display is employed, while LEDs are used to indicate stop and go signals.

Upon system initialization, a 10-second countdown sequence is initiated and presented on the 7-segment display, counting down from 9 to 0. Simultaneously, the traffic signals are activated, with three sides displaying red signals and one side showing a green signal. What sets this system apart is its precision in timing. The program is meticulously designed to ensure a 30-second duration for the red signal and a 10-second window for the green signal before seamlessly transitioning to the next phase of the traffic light cycle.

The inclusion of the 7-segment display serves a dual purpose. First, it enhances the convenience of road users by providing real-time information about the time remaining before the traffic signal changes. Secondly, the system's countdown feature contributes to improved road safety by alerting drivers and pedestrians to signal changes in advance.

In summary, this intelligently engineered system operates as an efficient and highly reliable automatic traffic light controller, ensuring the systematic and safe regulation of vehicular and pedestrian traffic. Its open-loop design, precise timing, and user-friendly features collectively contribute to enhanced road safety and effective traffic management.

## ADVANTAGES

- Efficiency: Optimizes traffic flow and reduces congestion.
- Safety: Enforces orderly traffic patterns and pedestrian safety.
- Energy Efficiency: Uses LED lighting for reduced energy consumption.
- Adaptability: Adjusts to changing traffic conditions and events.
- Reduced Idle Time: Minimizes vehicle idling, saving fuel and reducing emissions.
- Lower Maintenance Costs: Requires less maintenance compared to mechanical systems.

## FUTURE SCOPE

As the systems take care of few drawbacks of the existing system, there is scope for further improvement and expansion of this work.

The system can be expanded with smart traffic light control and congestion avoidance system during emergencies, emergency cars such as fire engines and ambulance and have priority over other traffic.

The future scope of automatic traffic light controllers also includes smart and adaptive systems using AI and connectivity for real-time traffic management, enhanced energy efficiency with LED and solar technology, integration with environmental and urban planning initiatives, improved safety for pedestrians and cyclists, and the use of data analytics for traffic insights and urban development.

In terms of future developments, there is potential to transform this system into a closed-loop mechanism that dynamically adjusts signal timings based on real-time traffic conditions. This adjustment could optimize the flow of traffic on individual sides of the intersection. Additionally, incorporating solar energy sources can be explored to enhance the system's sustainability and reduce power consumption.

## REFERENCE


- The 8051 Microcontroller and Embedded systems book by Muhammad Ali Mazidi
- 8051 microcontroller by V Udayashankar and and MalikarjunaSwamy
- https://www.researchgate.net/publication 338919777_Automatic_Traffic_Light_Control_System
- www.micocontroller.com
- www.wikipedia.org