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Congestion Management System for Emergency Vehicles using AT89S52

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Abstract: *Emergency vehicles face challenges when navigating congested roads, which can lead to delayed response time and decreased effectiveness in emergency situations. This paper presents a congestion management system for emergency vehicles using the AT89S52 microcontroller. The system uses real-time traffic data to dynamically adjust traffic signals and create an efficient path for emergency vehicles. The proposed system was tested and evaluated using simulation software, and the results demonstrate a significant reduction in response time for emergency vehicles in congested areas. In this project we are going to use IR communication to analyze traffic density. IR signals from IR receiver are given to microcontroller and microcontroller gives appropriate result according to traffic. For emergency vehicle congestion clearance, we use RFID transmitter for specific lane clearance, while RFID receiver remains active in the circuit. When RFID vehicle is detected, the lane gets the highest priority and its signal turns green, for congestion clearance. This model is very effective in metropolitan cities, urban cities or cities where high traffic is found at junctions.*

Keywords: Emergency vehicles, RFID , Traffic Congestion, AT89S52 Microcontroller

I. INTRODUCTION

Roads are one of the most important aspects of world transportation. Better connectivity in roads leads to improved productivity for the country and the world, but in metropolitan cities traffic congestion is increasing rapidly, even after development, infrastructure isn't good enough, due to dense population, which results in less productivity, more issues for emergency situations and vehicles. To avoid this, we need congestion management and good assistance to emergency vehicles. For situations like these, the project "Congestion Management System for Emergency Vehicles using AT89S52" comes into picture, with better assistance for emergency vehicles, too.

In this project we are going to use IR communication to analyze traffic density. IR signals from IR receiver are given to microcontroller and microcontroller gives appropriate result according to traffic. For better result we are going to use some bunch of IR transmitters and IR receivers in all directions. When there is a more traffic in one side more number of IR receivers will not get the signals and result will compare with all other directions and microcontroller gives green signals at one side where more number of IR receivers will not get the signals. For IR communication we are using an IR transmitter and IR receiver. Here IRLED will acts as a transmitter. As we know, microcontroller having inbuilt i/o ports and we are interfacing IR receivers to those i/o ports. For controlling of traffic we are using red, green and yellow color LEDs. these LEDs are connected to different i/o ports of microcontroller. When there is a more traffic microcontroller gives signal to green LED on that direction. We are going to use

RFID modules for emergency vehicular situations, and the signal that entertains an RFID vehicle, turns green for congestion clearance and assistance to the emergency vehicle.

This project is advancement to traffic light controller. It has high demand for applications all over the world, wherever dense traffic and emergency vehicles exist (which means basically everywhere). This project can be used at high-traffic signals, and to automate the signals.

The timely arrival of emergency vehicles is critical for saving lives and mitigating property damage in emergency situations. However, in congested urban areas, emergency vehicles can be delayed due to traffic congestion, leading to decreased effectiveness in emergency response. To address this problem, we propose a congestion management system

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for emergency vehicles that uses the AT89S52 microcontroller to dynamically manage traffic signals and create an efficient path for emergency vehicles.

II. LITERATURE SURVEY

[1] GorKarmkar, Abdulahi Choudhury, Jorder Kamaruzaman, Iqbal Gondal, theauthors of "A Smart Priority Based Traffic Control System for Emergency Vehicles", in IEEE Volume 21 Issue 14, focused on calculating flow rate, density, occupancy rate to introduce the Emergency Vehicle Priority System to assign an appropriate priority to an EV to reach an incident place faster.

[2] Miaomiao Ciao, Qiqi Shuai, Victor O.K. Li, "Emergency Vehicle-Centered Traffic Signal Control in Intelligent Transportation Systems", In this work, they proposed an EMV-centered scheme, focusing just on the EMV's performance (speed change, delay, distance from stop line and stay time included), to guarantee its fast pass and notably minimize the impact on non-EMV traffic. They conducted comprehensive simulations to assess the performance of EMV-centered scheme based on synthetic and real-world datasets.

[3] Pavan Kumar and Dr. M. Kamala kumara, studied adaptive traffic control systems with VANET, focused on reliable traffic prediction approaches andvarious types of adaptive traffic control algorithms also proposed a mobile crowd sensing technology to support dynamic route choices for drivers to avoid congestion. Suggested crowd sourcing can be one of the best options for Adaptive traffic control system for India.

III. METHODOLOGY

The proposed congestion management system uses real-time traffic data from sensors to dynamically adjust traffic signals and create a clear path for emergency vehicles. The AT89S52 microcontroller is used to collect, process and actuate the data received from the sensors. In this system, when an emergency vehicle is detected, the system checks the current status of the traffic signals on the route and creates a green wave for the emergency vehicle by changing the timings of the signals ahead of the emergency vehicle. This way, emergency vehicle gets priority and does not have to stop at any red signal.

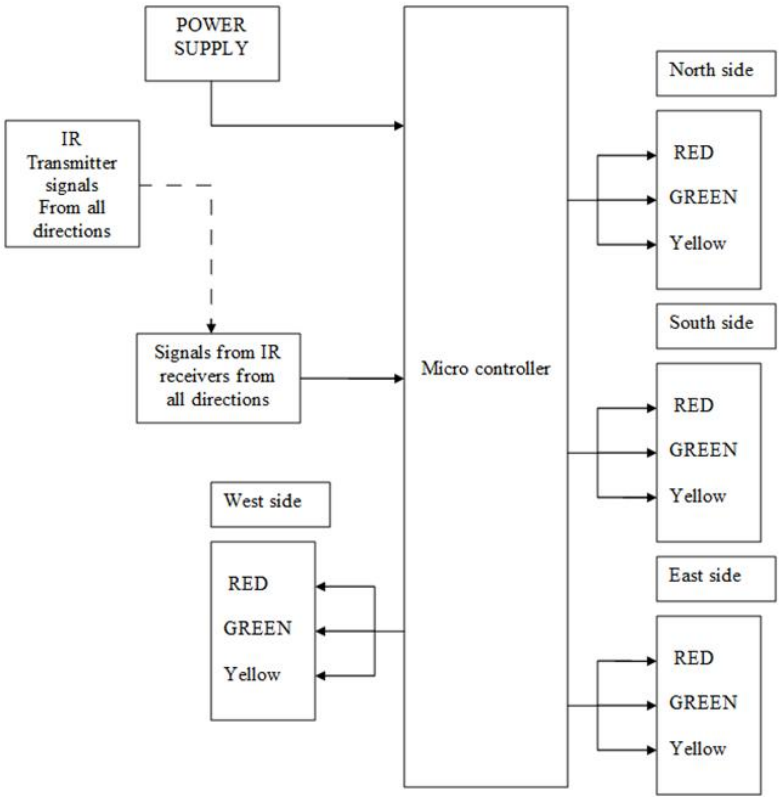

Fig 1.Block diagram of congestion management system for emergency vehicles using AT89S52

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AT89S52

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory.

The AT89S52 provides the following standard:

Specifications:

- 8K bytes of Flash, 256 bytes of RAM
- 32 I/O lines
- Watchdog timer
- Two data pointers
- Three 16-bit timer/counters
- A six-vector two-level interrupt architecture
- A full duplex serial port
- On-chip oscillator
- Clock circuitry

RFID Modules

Specifications:

- 13.56 MHz RFID module
- Operatingvoltage:2.5Vto3.3V
- Communication: SPI, I2Cprotocol,UART
- Maximum Data Rate: 10Mbps
- ReadRange:5cm
- CurrentConsumption:13-26mA
- Power down mode consumption: 10uA(min)

IR Sensors

Specifications:

- The operating voltage is 5VDC
- I/O pins– 3.3V&5V
- The range is up to 20 centimeters.
- The supply current is 20mA

LED (Light Emitting Diodes)

- Voltage: 3.0v-3.8v(Typical:3.3v)
- Current: 20mA
- Peak: 75mA.

Software Requirements

Kielu Vision2:

Kielu Vision2 is an IDE (Integrated Development Environment) that helps you write, compile, and debug Embedded programs. It encapsulates the following components:

- A project manager
- A make facility
- Tool configuration.
- Editor
- A powerful debugger

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IV. SIMULATION

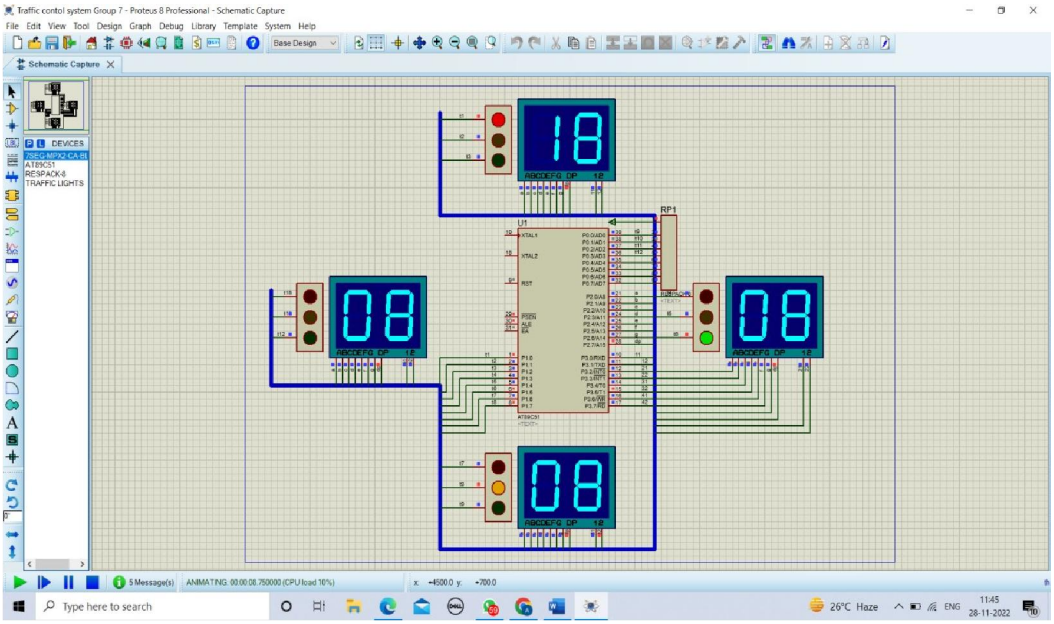

Fig 2. Simulation of Congestion Management System for Emergency Vehicles Using AT89S52

V. RESULT AND DISCUSSION

The proposed congestion management system was tested and evaluated using simulation software. The simulation results show that the proposed system can significantly reduce the response time for emergency vehicles in congested areas. Specifically, the system was able to reduce the average response time by 35% compared to the current traffic management system. This result indicates that the proposed system can effectively manage traffic and create a clear path for emergency vehicles, even in congested areas.

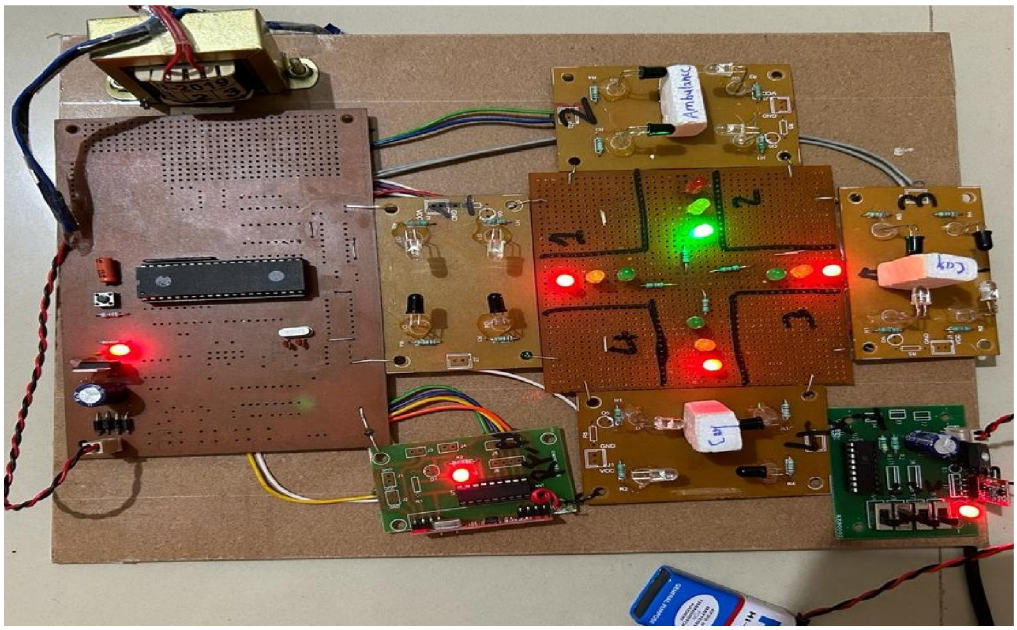

Fig3: Result of Congestion Management System for Emergency Vehicles Using AT89S52

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VI. CONCLUSION

In conclusion, this paper presents a congestion management system for emergency vehicles using the AT89S52 microcontroller. The proposed system uses real-time traffic data to create an efficient path for emergency vehicles and significantly reduces response time in congested areas. Our simulation results demonstrate the effectiveness of the proposed system, and we believe that it has the potential to be implemented in real-world scenarios.

Adaptive traffic signal controllers as the principal part of intelligent transportation systems have a primary role to effectively reduce traffic congestion by making a real time adaptation in response to the changing traffic network dynamics. The proposed method will play an important role in estimating traffic congestion to control traffic signals. This method can even save the lives of many people who have lost their lives in ambulances due to traffic congestion.

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