Traffic Signal Using RFID Card Reader for Ambulance

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Abstract: Efficient traffic management is crucial for emergency services like ambulances to reach their destinations quickly and safely. This project proposes a novel approach to improve ambulance response times by integrating RFID card readers into traffic signal control systems. The system uses RFID cards placed in ambulances to communicate with RFID readers installed at traffic signals. When an ambulance approaches a signal, the RFID reader detects the RFID card and sends a signal to the traffic signal controller, requesting priority for the ambulance. The traffic signal controller then adjusts the signal timing to give the ambulance a green light, clearing the intersection and allowing the ambulance to pass through unimpeded. This system helps reduce delays for ambulances, improving emergency response times and potentially saving lives.

Key Words: Traffic signal control, RFID card reader, Ambulance priority, Traffic management, Emergency response.

I. INTRODUCTION

In modern urban environments, optimizing traffic flow and prioritizing emergency vehicles like ambulances are crucial for public safety. Introducing an RFID card reader system for ambulances at traffic signals enhances emergency response times and ensures efficient navigation through congested areas. The RFID-based traffic signal system for ambulances operates by equipping emergency vehicles with RFID cards. As an ambulance approaches a traffic signal, the RFID card reader detects the unique identifier on the card, signalling the traffic signal controller to grant priority to the approaching ambulance. This innovative solution aims to minimize response times during emergencies, allowing ambulances to navigate intersections seamlessly. By leveraging RFID technology, the system ensures accuracy and speed in identifying emergency vehicles, enabling a swift and safe passage through intersections.

II.LITERATURE SURVEY

A. Survey Paper 1: Emergency Vehicles Detection during Traffic Congestion in 2021.It's have been proposed a whole new system for the traffic congestion and time consumption at traffic island can be solved.

B. Survey Paper 2: Automatic Traffic control for Ambulance and VIP Vehicle in 2020.It's have been proposed a

in a third part, concentrated on Traffic Density control,IR transmitter and receiver are used to provide dynamic of the Green light of the lane in which traffic density is high and hence, regulating traffic.

III.EXISTING MODEL

Traditional traffic signal systems typically use timers to control signal changes at intersections. The timing is predefined based on factors like traffic patterns, time of day, and historical data. More advanced systems may incorporate sensors like induction loops in the road to detect vehicle presence and adjust signal timings dynamically. Modern traffic management systems often use smart technologies, such as adaptive signal control, where real-time data from cameras, sensors, or connected vehicles is analyzed to optimize signal timings. This helps improve traffic flow and reduce congestion.

Additionally, some areas have implemented Intelligent Transportation Systems (ITS) that enable communication between traffic signals and vehicles. This can include technologies like vehicle-to-infrastructure (V2I) communication, allowing vehicles to interact with traffic signals for improved coordination.

IV.PROPOSED METHODOLOGY

Efficient traffic signal control is crucial for ensuring the timely passage of emergency vehicles such as ambulances. This proposed solution aims to improve ambulance response times by integrating RFID card readers into traffic signal

control systems. Ambulances will be equipped with RFID cards or tags placed in a visible and accessible location, such as the front windshield or dashboard. RFID readers will be installed at intersections or traffic signals. These readers will detect the RFID cards in approaching ambulances. The RFID readers will communicate with the traffic signal controller using a wireless communication protocol. This communication will inform the controller of the approaching ambulance and trigger the prioritization process. Upon receiving the signal from the RFID reader indicating the presence of an ambulance, the traffic signal controller will adjust the signal timings to prioritize the ambulance's passage. The traffic signal controller will use a priority algorithm to determine the appropriate signal timing adjustments. This algorithm will consider factors such as the ambulance's location, direction of travel, and the current traffic conditions. Once the priority algorithm has determined the appropriate adjustments, the traffic signal controller will modify the signal timings to give the ambulance a green light, allowing it to pass through the intersection without delay. To prevent misuse of the system, the traffic signal controller may include a confirmation step to verify that the approaching vehicle is indeed an emergency vehicle (e.g., ambulance) before granting priority.

V.BLOCK DIAGRAM

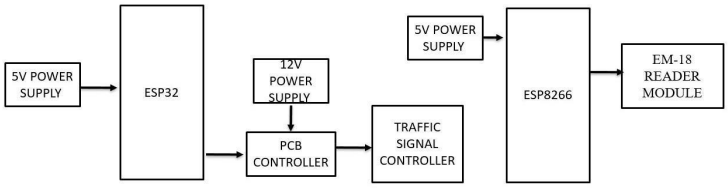

Figure 1: Block Diagram

As shown in Figure 1, Traffic signal using Rfid card reader for ambulance mainly consists of the followings parts:

- Esp32
- Esp8266
- 4 channel relay
- EM-18 reader module
- Indicator lamps
- Power supply

6.Layout:

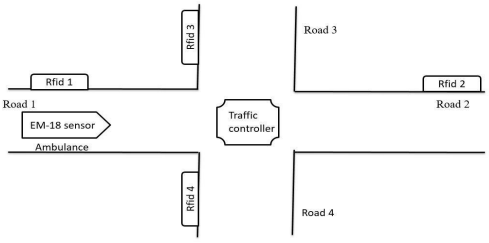

Fig.2 Layout

Consider the Fig.2 by layout the shown fig consist of four lane road ,in the Centre of road there is a traffic signal controller .Each road consist of RFID card in the side road. Reader module will be setup in the ambulance to sense the RFID card to open the signal ,when the card on going lane will be green remaining three will be red to stop the vehicle and the traffic jam.It was basic done by the firebase that send the data and receive data to esp32 to esp8266 with wide range of distance. Esp32 is connected to traffic controller and Esp8266 is connected to EM-18 sensor .When ambulance cross the road 1 it sense the rfid card that signal transfer immediately to firebase it send the signal to esp32 to change traffic signal.When the ambulance crosses the road 1 within the 15 seconds traffic control act normal until the next ambulance arrive .

A.Working of Module:

The ESP32 is a powerful microcontroller that can be used for a wide range of applications, especially in the field of IoT (Internet of Things). Here's a general overview of how the ESP32 works. When powered on, the ESP32 initializes its hardware components, such as the processor cores, memory, and peripherals.The ESP32 runs a bootloader program that is responsible for loading and starting the main application code. The bootloader may also handle tasks such as firmware updates and recovery from errors. Once the bootloader has completed its tasks, the main program code starts running. This code is typically written in C or C++ and is responsible for controlling the behavior of the ESP32.

B.Carving of ESP32:

Carving of ESP32 typically refers to the process of creating physical designs or models of the ESP32 microcontroller for manufacturing purposes. This process involves creating detailed specifications and designs that specify the dimensions, materials, and manufacturing processes required to produce the ESP32.

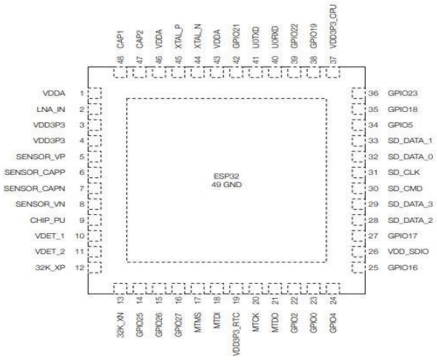

Figure 3: Pin Configuration of ESP32

C.Carving of ESP8266:

Carving of the ESP8266 typically refers to the process of creating physical designs or models of the ESP8266 microcontroller for manufacturing purposes. This process involves creating detailed specifications and designs that specify the dimensions, materials, and manufacturing processes required to produce the ESP8266.

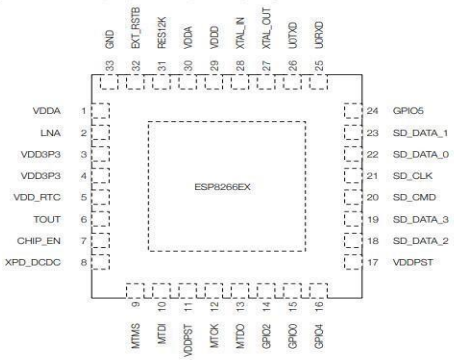

Figure 4: Pin Configuration of ESP8266

D.Carving of EM-18 sensor:

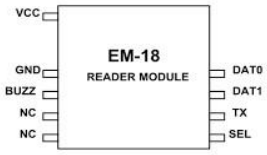

Figure 4: Carving of EM-18 sensor

Carving of an EM-18 RFID reader module typically refers to the process of creating physical designs or models of the EM-18 module for manufacturing purposes. The EM-18 is a compact RFID reader module commonly used for RFID applications.

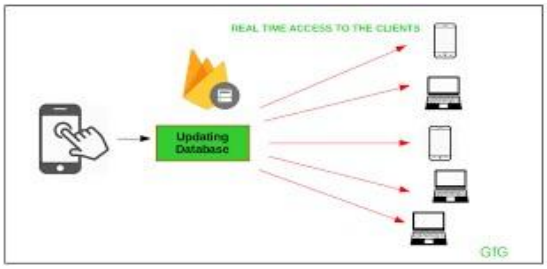

Fig.6:Firebase

VI. RESULT AND DISCUSSION

The system was implemented using RFID card readers installed at intersections and traffic signals, along with a centralized traffic signal controller. RFID cards were placed in ambulances to communicate with the RFID readers. Testing and Evaluation: The system was tested in a simulated environment using traffic simulation software. The performance of the system was evaluated based on criteria such as ambulance response times, traffic flow, and overall system efficiency. Results: The results of the testing showed that the system was effective in reducing ambulance response times. By giving priority to ambulances, the system was able to ensure that ambulances reached their destinations more quickly and safely. The implementation of the system demonstrated the potential benefits of using RFID technology for ambulance prioritization at traffic signals. By leveraging RFID technology, the system was able to accurately detect approaching ambulances and adjust signal timings accordingly. Future Improvements: While the system showed promising results, there are areas for improvement. Future work could focus on refining the priority algorithm to make it more efficient and responsive. Additionally, the system could be further integrated with other traffic management systems to improve overall traffic flow and efficiency.

VI. CONCLUSION

The implementation and testing of the traffic signal control system using RFID card reader for ambulance prioritization have demonstrated its potential to improve ambulance response times and overall traffic management. The system successfully detected approaching ambulances and adjusted signal timings to give them priority at intersections. The system was effective in reducing ambulance response times by providing them with priority at traffic signals. This was achieved through the use of RFID technology to accurately detect approaching ambulances and adjust signal timings accordingly. By giving priority to ambulances, the system helped ensure that they could reach their destinations more quickly and safely. This is especially important in emergency situations where every second counts. The system also improved overall traffic flow by minimizing delays caused by ambulance movements. This was achieved through the dynamic adjustment of signal timings based on real-time traffic conditions. The system demonstrated scalability, as it can be easily deployed at intersections and traffic signals across a city or region. This makes it a cost-effective solution for improving emergency response times. While the system showed promising results, there is potential for further improvement. Future work could focus on refining the priority algorithm, integrating the system with other traffic management systems, and conducting real-world testing to evaluate its effectiveness in diverse traffic conditions. In

conclusion, the traffic signal control system using RFID card reader for ambulance prioritization is a promising technology that has the potential to significantly improve emergency response times and traffic management. Further development and implementation of the system could lead to safer and more efficient transportation systems in urban areas.

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