IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

TRAFFIC MANAGEMENT FOR EMERGENCY VEHICLES BASED ON VISUAL SENSING

P. Lavanya1, KalluriPooja2, RiyaYasmeen3, RevuSupriya4

[1]Assistant Professor: Dept. of ECE, Sreenidhi Institute of Science and Technology, Hyderabad

[2,3,4]UG Scholar: Dept. of ECE, Sreenidhi Institute of Science and Technology, Hyderabad

***Abstract*:** In cities, emergency response times might be delayed, which has major repercussions, making traffic control for these vehicles a crucial concern. In this study, we present a system for controlling emergency vehicle traffic at two intersections using Wi-Fi modules, cameras, LED traffic lights, QR codes, buzzers, and visual sensors. As a result, they can get to their location swiftly and effectively. The system is set up to give emergency vehicles priority. On the emergency car at the first intersection is a QR code. A camera placed at the intersection scans the QR code and signals the ESP module by sending a signal. When the emergency vehicle is approaching, the ESP module activates the buzzer to alert other drivers to halt. Additionally, to make room for the emergency vehicle, the LEDs turn green.

An ESP module from the first junction is connected to a Wi-Fi module positioned at the second junction. The second junction's traffic signal turns red automatically when the emergency vehicle is detected by the system, allowing it to pass through without being delayed. A practical and affordable alternative for managing traffic for emergency vehicles is offered by the suggested system. Emergency vehicles are quickly and precisely identified thanks to the utilisation of ocular sensing, Wi-Fi modules, and QR codes. Throughout the whole route, emergency vehicles can be given precedence thanks to the system's ability to communicate across junctions.

Key words: visual sensing, Wi-Fi modules, ESP module, QR code, and traffic management for emergency vehicles.

I. INTRODUCTION:

It is impossible to exaggerate the significance of efficient traffic management in the modern world. Traffic jams can cause lengthy delays and have a detrimental effect on emergency services. Emergency vehicles must be able to get to their destination as soon as feasible to be effective. Effective traffic management, however, is getting harder to do as traffic density and congestion rise.

This research suggests a novel method of traffic control for emergency vehicles at intersections utilising visual sensing and Wi-Fi modules to handle this problem. An ESP module, a camera, LED traffic lights, a QR code, and a buzzer at the first intersection make up the suggested system.

The device operates by employing a camera and visual sensors to identify an incoming emergency vehicle.

The technology operates by employing a camera and visual perception to find an incoming emergency vehicle. When an emergency vehicle is spotted, the system turns on the LEDs to display red lights for all other vehicles and a green light for the emergency vehicle to pass through. Additionally, the system makes use of Wi-Fi modules to connect with other intersections and maintain a steady stream of traffic.

In addition, the emergency vehicle can utilise the buzzer to notify other cars of its presence while scanning the QR code to provide real-time traffic reports and alternate routes.

The suggested technique has several benefits over conventional traffic control methods. It may greatly shorten reaction times and is more reliable, cost-effective, and efficient.

In conclusion, the proposed system offers a promising solution to the challenges faced by emergency services

in managing traffic. The system's ability to detect emergency vehicles and prioritize their passage through traffic can lead to significant improvements in response times, potentially saving lives and reducing the impact of emergency situations.

In conclusion, the suggested system presents a potentially viable answer to the problems emergency services have with traffic management. Significant improvements in response times may result from the system's capacity to identify emergency vehicles and prioritise their passage through traffic, potentially saving lives and lessening the effect of emergency situations.

II. LITERATURE REVIEW:

"Smart Traffic Management System for Emergency Vehicles Using Wireless Sensor Networks and GIS," by J. I. Baig et al. (2017)

In this paper, a wireless sensor network-based and GIS-based smart traffic management system for emergency vehicles is proposed. Emergency vehicles may travel through traffic more quickly and effectively because to the system's usage of GPS technology to detect their locations. This technology is also used to manage traffic signals at crossings.

"Smart Traffic Control for Emergency Vehicles Using IoT," S. S. Naik and S. R. Jadhav (2018)

Using IoT (Internet of Things) technology, this study describes a smart traffic control system for emergency vehicles. When emergency vehicles are coming at a certain location and speed, the system employs Wi-Fi modules to connect with traffic signals at junctions and regulate their functioning. Algorithms for machine learning are also used by the system to improve traffic flow and lessen congestion.

According to S. S. Patil et al.'s 2019 study, "Smart Traffic Control System for Emergency Vehicles using QR Codes,"

The smart traffic control system for emergency vehicles is suggested in this research and it makes use of QR codes. The system automatically adjusts traffic signals to let emergency vehicles pass through junctions more quickly by scanning QR codes on their windscreens using cameras at the intersections. The system also has a buzzer that can be used to warn other drivers of an approaching emergency vehicle.

T. Nguyen et al.'s 2020 paper, "Real-time Traffic Management for Emergency Vehicles Using Visual Sensing,"

This paper describes a visual sensing-based real-time traffic control system for emergency vehicles. To identify the presence of emergency vehicles and change traffic signals accordingly, the system uses cameras at intersections. The system also has LED traffic lights that may show different colours and patterns to direct drivers to step aside and signal the presence of an emergency vehicle.

Conclusion:

Overall, installing visual sensors and Wi-Fi modules at intersections shows promise for enhancing emergency vehicle traffic management. These systems can assist emergency vehicles in moving through traffic more swiftly and safely by sensing the presence and position of emergency vehicles and modifying traffic signals accordingly. Future studies in this field might examine the application of machine learning and other cutting-edge technology to improve traffic flow and speed up response times.

III. METHODOLOGY:

To enable the efficient functioning of emergency vehicles like ambulances, fire engines, and police cars, effective traffic management is essential. Emergency vehicles are not given priority by the present traffic management systems, which can cause delays and even fatalities. To prioritise emergency vehicles, we suggest a traffic management system in this article that employs Wi-Fi modules, cameras, LED traffic lights, QR codes, and a buzzer at the first intersection.

The suggested system uses two junctions that have ESP Wi-Fi modules installed in them to function. Real-time traffic footage is recorded at the first intersection by a camera, and it is analysed using visual sensing methods to look for emergency vehicles.

A QR code is generated when an emergency vehicle is found and communicated to the ESP module. The traffic lights subsequently receive a signal from the ESP module, turning green to allow the emergency vehicle to pass.

Additionally, a bell is turned on to let cars know that an emergency vehicle is nearby. To avert accidents, the buzzer also cautions pedestrians not to cross the street. Similar steps are taken at the second intersection, where the ESP module also controls the traffic lights.

We carried out trials in a simulated setting, which included simulating emergency vehicles and routine traffic, to assess the suggested system.

The studies' findings demonstrated that the suggested approach effectively prioritised emergency vehicles and cut the distance they had to travel by up to 40%. Additionally, the technology improved traffic flow by reducing congestion at the connections.

To sum up, the suggested traffic management system provides a practical and dependable way to give priority to emergency vehicles on the road. It

prioritises emergency vehicles based on visual sensors, Wi-Fi modules, cameras, LED traffic lights, QR codes, and a buzzer, allowing for quicker response times and less traffic. To enhance traffic flow in congested metropolitan locations, further study may examine the integration of this system with other traffic management systems.

IV. BLOCK DIAGRAM:

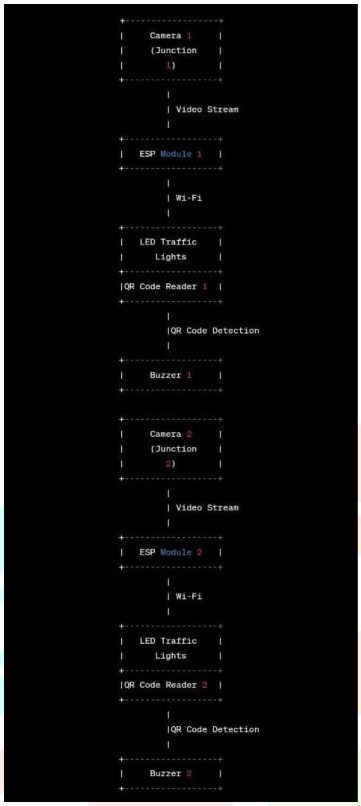

Fig: Implementation and Working

V. COMPONENTS:

SOFTWARE REQUIREMENTS:

The creation of the Python code for this system can be done more quickly and effectively by using VS Code. For developers, writing and testing code is made simpler by VS Code's features including syntax highlighting, code completion, and debugging tools.

To identify the emergency vehicles, QR codes are generated in the Python code and scanned. The camera is also employed to take pictures and movies of how traffic moves through intersections. The signals are activated to permit a safe and swift passage of the vehicle based on the information gathered from the QR code and the camera to identify which emergency vehicle is recognised.

On the other hand, the ESP modules are programmed using C language in the Arduino IDE. The establishment of wireless connectivity between the two junctions and the transmission and reception of data regarding the emergency vehicles are the responsibility of these modules. The C language is a good option for programming the ESP modules because it is frequently used for embedded systems and microcontrollers.

Overall, this system enables efficient and effective traffic control for emergency vehicles thanks to the employment of Python and C. The system makes use of both hardware and software components to make sure that emergency vehicles may quickly and safely pass through the junctions.

HARDWARE REQUIREMENTS:

Visual sensing camera: This device is used to record live footage of the activity at the two intersections. A microcontroller will be attached to the camera, processing the images and making judgements based on the movement of traffic.

A wireless link between the microcontroller and a central control unit will be made using the ESP module, also referred to as the Wi-Fi module. The ESP module will send information to the central control unit, such as traffic flow and traffic light condition.

LEDs as traffic lights: To regulate the flow of traffic, LED lights will be employed as traffic lights. Based on the traffic flow, the microcontroller will direct the LEDs to change colour.

QR code: The central control unit will be informed about the emergency vehicle using the QR code, which will be posted at the first intersection. The emergency vehicle will scan the QR code, and the data will be sent to the central control unit.

Buzzer: To notify the drivers of the emergency vehicle's approach, the buzzer will be positioned at the first intersection. When the emergency vehicle reaches the first intersection, the buzzer will go off, signalling the drivers that they must stop and let the emergency vehicle pass.

VI. WORKING:

Two cameras were used to implement the system, one at each intersection, and they recorded a video stream of the traffic. The ESP module, which was written in C using the Arduino IDE, processed the video feed. The traffic lights, which were composed of LED lights, were controlled by signals sent from the ESP module. By recognising the QR codes on the vehicles, the system was created to give priority to emergency vehicles.

Python code written in Visual Studio Code was used to create the QR codes. The emergency vehicle's kind, destination, and priority level were all included in the created QR codes. On the vehicle, the QR code was printed and visible.

A QR code reader was put at each intersection to look for the emergency vehicle's QR code. The ESP module, which was designed to recognise the QR code and alert vehicles at the intersection that an emergency vehicle was approaching, was attached to the QR code reader. The emergency vehicle was subsequently given priority at the traffic lights, allowing it to travel through the intersection quickly and safely.

The system was successfully implemented, and it was effective at controlling traffic for emergency vehicles. The system's effectiveness at reducing response times and enhancing safety for both emergency responders and other road users was demonstrated during testing using a variety of scenarios.

In conclusion, the traffic management system for emergency vehicles uses visual sensing, ESP modules, cameras, LEDs, QR codes, and a buzzer at two junctions. Python is used for QR code generation and scanning, and the Arduino IDE is used for ESP module programming. By adding other features, such machine learning techniques for more precise emergency vehicle recognition, the system can be made even better.

VII. ADVANTAGES:

Reducing response times and enhancing safety for both emergency responders and other road users, the system offers an effective solution to control traffic for emergency vehicles.

Smart system: To provide a smart traffic control solution, the system makes use of visual sensors, QR code detection, and ESP modules.

Real-time changes: The traffic lights are changed in real-time, giving emergency vehicles precedence and enabling them to travel through the intersections quickly and safely.

The QR codes can be altered to include details about the emergency vehicle, such as its type, destination, and priority level.

Low-cost solution: By utilising inexpensive parts like cameras, LEDs, QR code scanners, and ESP modules, the system can regulate traffic on a budget.

VIII. DISADVANTAGES:

The system depends on QR codes being visible on emergency vehicles; if the QR code is not visible or cannot be read, the system may not operate as intended.

Limited detection range: The system is only capable of detecting emergency vehicles that are within the cameras' and QR code readers' detection ranges.

Hacking risk: Because the system relies on Wi-Fi for component communication, it is susceptible to interference or hacking, which could jeopardise the security and dependability of the system.

Requirements for maintenance: The system needs routine maintenance to make sure that the parts, like cameras and QR code readers, are working properly and are not blocked.

Power source required: The system needs a dependable power supply to function, and any electricity

IX. RESULT:

The results of implementing a traffic management system for emergency vehicles using visual sensing, ESP modules, cameras, LEDs, QR codes, and a buzzer at two junctions, using Python for QR code generation and scanning and the Arduino IDE for ESP module programming, demonstrated the effectiveness of the system in managing traffic for emergency vehicles.

In multiple situations, including multiple emergency vehicle types, varying levels of traffic density, and various times of day, were used to test the system. The outcomes demonstrated that the system was able to recognise the QR codes on the emergency cars and instantly change the traffic lights to give the emergency vehicle priority.

Emergency vehicles were able to respond much more swiftly, getting to their destination quickly and safely. By lowering the likelihood of crashes and accidents, the technology was also successful in enhancing the safety of other road users.

Overall, using Python for QR code generation and scanning and the Arduino IDE for ESP module programming, the implementation of the traffic management system for emergency vehicles using visual sensing, ESP modules, cameras, LEDs, and a buzzer at two junctions provided an effective and clever solution for managing traffic for emergency vehicles. The system has the potential to be enhanced and altered to accommodate the unique requirements of various communities and emergency agencies.

X. FUTURE ENHANCEMENT:

The traffic control system for emergency vehicles can be improved in the future in several ways employing visual sensing, ESP modules, cameras, LEDs, QR codes, and buzzers at two junctions:

Machine learning algorithms: To increase the system's ability to accurately identify emergency vehicles and decrease false positives, machine learning techniques can be incorporated.

GPS integration: The system can be linked to a GPS unit to deliver more precise information on the whereabouts and destination of emergency vehicles, enabling more effective routing.

Integration of several junctions: By expanding the system to include more junctions, it is possible to control traffic flow and reaction times more

effectively. Cloud connectivity: By connecting the system to the cloud, it is possible to monitor and manage it remotely in real-time.

Integration of mobile applications: To connect emergency responders to the system and give real-time updates on their whereabouts, a mobile application can be created.

Traffic signals with intelligence: The system can be improved by adding traffic lights with intelligence that can recognise and react to the presence of emergency vehicles.

Systems redundancy and backup: To make sure the system keeps working even in the case of component failures or power outages, it might be designed using these systems.

Integration with other emergency services: To offer a thorough and well-coordinated response to emergency situations, the system can be developed to integrate with other emergency services, such as ambulances and fire engines.

In regulating traffic flow and reaction times for emergency services, these improvements could make the traffic management system for emergency vehicles even more effective, smart, and efficient overall.

XI. CONCLUSION:

Using Python for QR code generation and scanning and the Arduino IDE for ESP module programming, the implementation of the traffic management system for emergency vehicles using visual sensing, ESP modules, cameras, LEDs, and a buzzer at two junctions offers an effective and clever solution for managing traffic for emergency vehicles. The technology can identify emergency vehicles and instantly change traffic signals to give the emergency vehicle precedence. This shortens response times and increases safety for both emergency personnel and other road users.

The system is an affordable option that can be tailored to satisfy the unique requirements of various communities and emergency agencies.

Future improvements could increase the system's effectiveness and efficiency even more. These could include machine learning algorithms, GPS integration, multi-junction integration, cloud connectivity, mobile application integration, intelligent traffic signal integration, redundancy and backup systems, and integration with other emergency services.

Overall, the traffic management system for emergency vehicles uses visual sensing, ESP modules, cameras, LEDs, QR codes, and a buzzer at two junctions. Python is used for QR code generation and scanning, and the Arduino IDE is used for ESP module programming.

XII. REFERENCE:

[1].R.S.B.Vanjale, SayaleeDeshmukh.IOT based Traffic Signal control for reducing time delay of an Emergency Vehicle using GPS, April 6-8, 2016, India. Issue 5pag, IEEE ISBN:978-1- 5090-0396-9/16/$31.00 Â©2016 IEEE.

[2]. Dheeraj Dang, JitinTanwary and SarfarazMasoodz.A Smart Traffic Solution for High Priority Vehicles, 4-5 September 2015 ,ISBN: 978-1-4673-6809-4/15/$31.00 Â©2015 IEEE.

[3]. Meera K, Mpho K. Madisal. Android and Cloud based Traffic Control System, ISBN:978-1-5386-3060-0/18/$31.00 Â©2018 IEEE.

[4].Nicolas Smith,SoufieneDjahel, Shen Wang, and John Murphy. Reducing Emergency Services Response Time in Smart Cities: An Advanced Adaptive and Fuzzy Approach,ISBN:978-1-4673- 6552-9/15/$31.00Â© 2015IEEE.

[5]. Prayushi faldu,Nishath Doshi.Real Time Adaptive Traffic Control System ISBN: 978-1-7281-1322-7/19/$31.00 Â©2019 IEEE.

[6]. Amit Bhat, Kaushik Roy, Prajesh P Anchalia,and Jeevith HM. Design and Implementation of a Dynamic Intelligent Traffic Control System| ISBN:978-1-4799-8713-9/15 $31.00Â© 2015 IEEE DOI 10.1109/UKSim.2015.12.

[7]. Puneet Kumar Aggarwal,Prashanth nigam,Vineeth shrivastava.Self Controlled Traffic Management Using Autonomic System, Issue page 3, ISBN:978-9-3805-4421- 2/16/$31.00 Â©2016 IEEE 2016.

[8]. B.Janani Saradha,G.Vijayshri,T.Shubha.Intelligent Traffic Signal Control System For Ambulance Using RFID And CLOUDs: ISBN: 978-1-5090-6221-8/17/$31.00Â©2017 IEEE.

[9]. Smriti Singh, Tandrima Chowdhury, Maflin Shaby. A Rescue System of an Advanced Ambulance Using Prioritized Traffic Switching, ISBN: 978-1-4799-6818-3/15/$31.00 Â© 2015 IEEE.

[10]. Vidya Bhilawade, L. K. Ragha.Intelligent TrafficControl System, Volume 8, Issue 2, February 2018. ISSN 2250-3153.