

SMART TRAFFIC MANAGEMENT SYSTEM FOR AMBULANCE USING IoT

A Project Report Phase – II

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in Electronics and Communication Engineering

by

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of **BOMMAREDDY NAGA LAKSHMI (39130305)** and **BOBBURI SRI JAYA LAKSHMI (39130076)** who carried out the project entitled “**SMART TRAFFIC MANAGEMENT SYSTEM FOR AMBULANCE USING IoT**” under our supervision from November 2022 to April 2023

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We, BOMMAREDDY NAGA LAKSHMI (39130305) and SRI JAYA LAKSHMI (39130076) hereby declare that the project report entitled “SMART TRAFFIC MANAGEMENT SYSTEM FOR AMBULANCE USING IoT” done by us under the guidance T. THAJ MARY DELSY, M.E., Ph.D., is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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ABSTRACT

The traffic management is a critical issue faced in many metropolitan cities. There are many problems of congestion with traffic light in many cities especially for emergency vehicles. Lack of efficient traffic control leads to loss of lives because of ambulance delay in case of getting stuck in traffic jams. The evolving problem of traffic problems is an inevitable situation in wide and rising cities worldwide. Population growth has led to a growth in the number of cars leading to absolute congestion development. Life is sacred and cannot be repatriated until lost. The reaction time required by the emergency responders plays a vital role in the face of disasters. This might be a department for medical, disaster, or defence. The greatest challenge they face is congestion from flow. To address this, an intelligent traffic system is needed using a pre-emptive equation that adapts rapidly to environmental conditions. The aim of this article is to identify the emergency call headed back to the location and to monitor the congestion system in order to provide efficient facilities. This journal also sets out a method that uses a Zigbee component and Internet of Things (IoT) to transmit the treatment request from the ambulance to the nearby hospitals, while ambulance attaining the road junction, the smart traffic system which in turn changes the traffic signal cycle. This system can be implemented throughout the city thereby reducing the delay.

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CHAPTER 1

INTRODUCTION

In India, 33% and 99% of people die in road accidents and heart attacks respectively because of the late arrival of or delay in reaching hospitals due to traffic jams. According to the National Crime Records Bureau, nearly 24,012 people die each day due to a delay in getting medical assistance. The first hour after an emergency is the critical hour for medical aid to the patient for saving a life.

Major metro political cities like Mumbai, Delhi, Bangalore, Chennai, Hyderabad, Kolkata, Jaipur, Lucknow and much more advancing cities face the problem of traffic jams in leading hours. For reducing congestion, it requires to observe the intensity of vehicles on one side rather than going for a timing-based system. Necessarily for emergency vehicles, so many IoT and Artificial Intelligence-based systems can be utilized to give Ambulance priority rather any other vehicle as life is very precious can be used to track the vehicles and detect the exact location of Artificial Intelligence. The information on recognizing the emergency vehicle is sent to the traffic system through the RF transmitter and receiver or ZigBee, for adequately controlling the traffic light until the emergency vehicle experiences. The condition of Indian traffic makes it hard for the emergency vehicle to reach the destination on time. So, to decrease the response time of ambulance, a precise traffic control system is used, which turns the traffic signal green for an emergency vehicle.

Traffic congestion reduction is the main goal in the development of efficient traffic control system. Many research works focus in the field of traffic safety control system. In addition, giving priority to the vehicle and changing the traffic signals must be the important functions for all the emergency vehicles to develop the safety measures in the road transportation. Ambulance and police vehicles are the emergency vehicles, must be reach the location without a maximum delay. The principle behind the pre-emption is that an emergency vehicle is detected by the sensor at each intersection, when a RFID analyses an emergency vehicle, it will transmit the control signal to change the traffic lights turn into green. The advanced development in electronics and communication systems provides different traffic control techniques. Internet of Things (IoT) technology to provide real-time traffic

updates to emergency services and helps them to avoid congested areas, thereby reducing response time and saving lives.

The system includes various components such as sensors, GPS, and communication networks that work together to monitor traffic and provide critical information to emergency services. The sensors installed on the roadways can detect the presence of an ambulance and send a signal to the traffic management system to clear the traffic in its path. The GPS helps to track the ambulance's location and speed, allowing emergency services to monitor its progress and provide support if needed. The system also uses communication networks to establish a connection between the ambulance and the traffic management system, enabling the ambulance to receive real-time traffic updates and adjust its route accordingly. This ensures that the ambulance can reach its destination quickly and safely, even during rush hours or congested areas. Overall, a smart traffic management system for ambulance using IoT is an innovative solution that can greatly improve emergency response times and save lives. By utilizing IoT technology to monitor traffic and provide real-time updates, emergency services can navigate through traffic more efficiently and reach their destination quicker than before.

A smart traffic management system for ambulances using IoT (Internet of Things) is a solution that leverages various technologies to help emergency vehicles navigate through traffic efficiently and safely. This system involves equipping ambulances with IoT-enabled devices, such as sensors, cameras, GPS trackers, and other communication technologies, which are connected to a centralized traffic management system. The system uses real-time data and analytics to optimize the ambulance's route, speed, and direction, taking into account factors such as traffic congestion, road conditions, and the location of other emergency vehicles.

Some of the key features of a smart traffic management system for ambulances using IoT include:

- **Real-time tracking:** The system tracks the location of the ambulance in real-time, allowing the traffic management center to monitor its progress and adjust the route as necessary.

- Predictive analytics: The system uses machine learning algorithms to analyze traffic patterns and predict where congestion is likely to occur. This enables the system to route the ambulance around potential traffic hotspots, reducing travel time and improving patient outcomes.
- Traffic signal prioritization: The system can communicate with traffic lights and other traffic management devices to ensure that the ambulance has priority access to intersections and other critical points along its route.
- Communication with other emergency vehicles: The system can communicate with other emergency vehicles to coordinate their routes and ensure that they don't get in each other's way.

Overall, a smart traffic management system for ambulances using IoT has the potential to improve emergency response times, reduce traffic congestion, and ultimately save lives.

CHAPTER 2

LITERATURE SURVEY

Smart traffic management system using IoT enable technology, Wenz he Sun, Fei Richard Yu(2014) considering the current scenario one of the serious concerns for people in smart cities such Delhi, Bangalore, Mumbai, Hyderabad etc. is traffic congestion. This has turned out to be a daily problem in current time. Due to this road congestion accidents in the city have are raised to a great extent so lives lost due to accidents are even more crucial. Due to this congestion on the roads, emergency vehicles such as ambulances, fire-cars and other vehicles cannot reach on time. This results in huge loss of life. To tackle these issues up to a great extent we present a solution in this paper. Through the use of IoT enabled technology we can solve these issues by creating “Green Corridors” for emergency vehicles. This can save their time expansion for reaching the proposed destination and can prevent the loss of human life up to great extent.

IoT provides a method to tackle these issues by providing smart and intelligent traffic management system. The system gives emergency vehicles the benefit of green corridor and reach destination on time. The RFID reader scans the RFID tag applied on the ambulance and updates the upcoming traffic light to switch to green and displays a message to vehicles ahead of ambulance to provide a “Green Corridor” by shifting other lanes. This system comprises whole traffic system and functions for emergency situations in order to reach the destination without any delay. Ahir et al. proposed an android application and hardware module for traffic signal implementation.

The android application has four buttons for four directions. It depends on the route which ambulance driver will select, the ambulance driver will select the appropriate direction and send activate command for the particular signal. In the android application, the patient's information is also stored which consists of name, age, and blood group, besides others. The hardware module for traffic signal has used Arduino for traffic signals. It consists of a Wi-Fi module, with the help of which it captures information from the server and connects the android application directly with the traffic signal. The location is retrieved in the form of longitude and latitude.

The direction of ambulance movement depends on the degree of the ambulance. For detecting the direction and current location of the ambulance a compass is used.

Methods of traffic surveys in cities for comparison of traffic control systems, Jan Siler, Zuzana Blinova, Martin Langar(1999) felt that traffic overload is a pressing problem for many cities nowadays and they are trying to find smart solutions. Therefore, cities are introducing traffic control systems that facilitate a more dynamic transit through the city for transit traffic while optimizing the control of individual junctions equipped with light signalling. Evaluation of traffic control parameters is usually based on processing of data from traffic surveys.

This article describes the design, implementation and verification of alternative methods of traffic surveys for the comparison of traffic control systems in a case study of Huesker Hardest. In this city, an extensive pilot project took place in summer and autumn 2017 to test the new algorithm for adaptive traffic control at selected light-controlled junctions of the city. The aim of the designed traffic surveys was to evaluate the parameters of the newly installed traffic control systems and to compare them with the control parameters of the original system. The hardware used in this system is short-ranged and has low power. Kandhari and Antonov proposed a system, which segments the overall system into three phases, which include counting and detection of vehicles, detection of ambulance and counting and data-based decision making based on data.

The system made use of a detection mechanism, which based its decision on images. Therefore, this system does not use electronic sensors. The route is cleared for emergency vehicles stuck in traffic using Bluetooth technology. Bluetooth module and a Bluetooth-enabled phone with Bluetooth state active are required for the detection phase. For this system to work, the ambulance should be near the signal for sending the command for guiding the traffic signal to the Bluetooth module. The range of Bluetooth is very low so there can be a case that the driver sends the command using his phone and it was not received by the Bluetooth module. This system suffers from security-related issues. In order to make it secure the code needs to be changed every 24 hours.

Intelligent traffic control system based single chip microcomputer, Authors of this were Shen Rui Bing ,Hu Shiye (2001). This design is based on single chip microcomputer intelligent traffic control system, function complete two main aspects: normal traffic flow, respectively control the north-south and east-west direction of red, green and yellow lights out, When the north-south intersection traffic is big, can increase the north-south intersection of the green light time, when things intersection traffic is big, can increase the intersection of the green light time, back to normal after the end. This design AT89S51 as the core, to complete the design and implementation of intelligent traffic control system. This design meets the intelligent system, reliability and real-time requirements. The system proposed by Ramani and Jeyakumar makes use of a central server for controlling the traffic controllers. Arduino UNO is used for the implementation of the traffic signal controller. In this system a web application is provided to the ambulance driver. The request for turning the signal light to green is sent to the traffic controller using the web application.

The system is divided into three parts namely, web application, cloud server and traffic signal. The ambulance driver uses the web application for choosing the route and navigating the ambulance. Communication between the ambulance and traffic signal is established using the cloud server. Arduino UNO is interfaced with Wi-Fi module and the Wi-Fi module is used as a traffic signal in this system. This system always requires sending of a signal to turn the traffic signal green, as it is not automatic. There could be a case in which the driver forgets to send the signal because of the time constraints. In that case, the system will not work.

For this system to work properly, Internet should be available to the drivers all the time which is not possible in all areas.

Density based smart traffic density based smart traffic control system using canny edge detection algorithm for congestion, Taqi Tahmid, Ekal's Hossain (2011) proposed that as the problem of urban traffic congestion intensifies, there is a pressing need for the introduction of advanced technology and equipment to improve the state-of-the art of traffic control. The current methods used such as timers or human control are proved to be inferior to alleviate this crisis. In this paper, a system to control the traffic by measuring the real-time vehicle density using canny edge detection with digital image processing is proposed. This imposing traffic

control system offers significant improvement in response time, vehicle management, automation, reliability and overall efficiency over the existing systems. Besides that, the complete technique from image acquisition to edge detection and finally green signal allotment using four sample images of different traffic conditions is illustrated with proper schematics and the final results are verified by hardware implementation. The system used in this paper in manual, neither does it does not give the shortest path to the hospital nor does the signal changes automatically. Parida et al. uses an RF transmitter-receiver module and a Zigbee transmitter-receiver along with Atmega 328 IS's. This system enables emergency vehicles to override current traffic light sequence and reach its destination uninterrupted. The whole system depends on communication between emergency vehicles and traffic signals. The RF transmitter-receiver module and a Zigbee transmitter-receiver are both connected to the microcontroller. There could be a case when there is a traffic jam caused by minor accident or road construction, which will not be known to the emergency vehicle driver. So in that case, this system is of no use to the emergency vehicle driver, as the emergency vehicle will still be stuck in a traffic jam even after having control of traffic light

smart traffic system using traffic flow models, Authors of this were Arihant Kamdar, Dr. Jigarkumar Shah discussed that in today's world, one of the biggest issues faced by transportation is related to roadway traffic. While developments are focused on improving the vehicles and making them more efficient, less focus is given to improve the infrastructure and management of the traffic system on intersections like crossroads and solving the problem of traffic Congestion.

The existing Systems of the traffic management system at junctions are very inefficient as traffic is static in nature. Static nature means the traffic control system/management system is independent of features that changes with time. There are some systems proposed earlier which makes the system more efficient but they are not efficient as they are not fully dynamic. The system proposed here works on the dynamic behaviour of traffic in order to reduce the traffic congestion which is dependent on real-time factors which are dynamic in nature. Another important feature is priority scheduling for Emergencies/Special Vehicles like Ambulance is also implemented.

This method uses computer vision like vehicle detection and vehicle classification for implementing the same. The aim of the proposed system is to help in the reduction of traffic jamming and make the transportation time-efficient at a cost-effective implementation.

Android and cloud based traffic control system, Authors of this were Mpho K. Madisa¹, Meera K. Joseph(2004). Traffic congestion has become a major problem in the urban cities, and it is mainly caused due to an increase in population which causes traffic congestion. It therefore becomes a problem for the emergency vehicles for example, an ambulance, to arrive as early as possible to its destination without appropriate traffic control system. So it was essential to design a traffic control system which will be controlled by an android mobile device via the cloud environment. In this paper we explored other intelligent traffic light systems and other transportation systems. This system has to allow the Android mobile device (emergency vehicle) to override the normal operation of a traffic signal. An efficient and cost-effective system which can solve this problem is an Android and Cloud based traffic control system using the GSM module. The system comprises of five stages which are Android mobile device, GSM module, MQTT (IoT) for Arduino IDE, Arduino Uno microcontroller and traffic signals. The developed system has allowed the Android mobile device (emergency vehicle) to override the normal operation of a traffic signal. The direction of ambulance movement depends on the degree of the ambulance. For detecting the direction and current location of the ambulance a compass is used. The system used in this is manual, neither does it give the shortest path to the hospital nor does the signal changes automatically. Parida et al. uses an RF transmitter-receiver module and a Zigbee transmitter-receiver along with At mega 328 IS's. This system enables emergency vehicles to override current traffic light sequence and reach its destination uninterrupted. The whole system depends on communication between emergency vehicles and traffic signals. The RF transmitter-receiver module and a Zigbee transmitter-receiver are both connected to the microcontroller. There could be a case when there is a traffic jam caused by minor accident or road construction, which will not be known to the emergency vehicle driver.

Smart traffic control system using green energy, Authors of this were Jadhav Shruti, Patil Dipali, Gavage Rani, Kulkarni V.A., Patil Amey, Shinde

Pradip(2013)discussed that now days the rapidly increasing vehicles & large time delays between traffic lights leads to wastage of fuel and time .To overcome this problem, we go through smart traffic control system using green energy. The conventional traffic lights are works on fixed time period allotted to each side of junction which cannot be varied & junction timing allotted are fixed In the smart traffic control system the traffic is controlled according to traffic density within the particular distance. This system is done using Arduino mega interfaced with IR sensors & timing at the junction changes automatically. This system comes under digital India campaign and supports Smart City Concept. So in that case, this system is of no use to the emergency vehicle driver, as the emergency vehicle will still be stuck in a traffic jam even after having control of traffic light. The hardware used in this system [9] is short-ranged and have low power. Kandhari and Antonov proposed a system, which segments the overall system into three phases, which include counting and detection of vehicles, detection of ambulance and counting and data-based decision makings based on data.

The system made use of a detection mechanism, which based its decision on images. Therefore, this system does not use electronic sensors. The route is cleared for emergency vehicles stuck in traffic using Bluetooth technology. Bluetooth module and a Bluetooth-enabled phone with Bluetooth state active are required for the detection phase. For this system to work, the ambulance should be near the signal for sending the command for guiding the traffic signal to the Bluetooth module. The range of Bluetooth is very low so there can be a case that the driver sends the command using his phone and it was not received by the Bluetooth module. This system suffers from security-related issues. In order to make it secure the code needs to be changed every 24 hours. The system proposed by Ramani and Jeyakumar makes use of a central server for controlling the traffic controllers.

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Communication between the ambulance and traffic signal is established using the cloud server. Arduino UNO is interfaced with Wi-Fi module and the Wi-Fi module is used as a traffic signal in this system. This system always requires sending of a signal to turn the traffic signal green, as it is not automatic. There could be a case in which the driver forgets to send the signal because of the time constraints. In that case, the system will not work.

Smart traffic system using raspberry pi by applying a dynamic color changer algorithm Authors of this were K. Kishore Kumar, S. Durai, M. Thanasi Vadivel and K. Antony Kumar (2000). In our present life situation congestion in traffic is a big problem in faster life style. One of the main reasons for the congestion is large delay or the time fixed for the red light in the signal. The turnover time of corresponding light is already fixed in the traffic system and it is not based on the number of vehicles on the particular direction. In our idea, we proposed the enhancement of traffic system controller in a road junction using microcontroller. This idea tries to reduce the occurrence of congestion caused by traffic lights, to an extent. The proposed idea is based on raspberry-pi. The proposed model contains IR transmitter and IR receiver are fixed at the possible direction on the traffic signal roads. Based on the number of vehicles count, the raspberry decides and controls the traffic signal time duration as a result. The vehicle count produced from raspberry data will be recorded. For correct classification, the record details can be stored to the controller by informing raspberry-pi to the computer system then it will send correct delay of signal into the LED lights. In future this model can be used to giving information to

travellers about different areas and the traffic condition for the same. The system used in this paper in manual, neither does it does not give the shortest path to the hospital nor does the signal changes automatically. Parida et al. uses an RF transmitter-receiver module and a Zigbee transmitter-receiver along with At mega 328 IS's. This system enables emergency vehicles to override current traffic light sequence and reach its destination uninterrupted. The whole system depends on communication between emergency vehicles and traffic signals. The RF transmitter-receiver module and a Zigbee transmitter-receiver are both connected to the microcontroller.

There could be a case when there is traffic jam caused by minor accident or road construction, which will not be known to the emergency vehicle driver. So in that case, this system is of no use to the emergency vehicle driver, as the emergency vehicle will still be stuck in a traffic jam even after having control of traffic light. The hardware used in this system is short-ranged and have low power. Kandhari and Antonov proposed a system, which segments the overall system into three phases, which include counting and detection of vehicles, detection of ambulance and counting and data-based decision makings based on data. The system made use of a detection mechanism, which based its decision on images. Therefore, this system does not use electronic sensors.

Priority based real time smart traffic control system using dynamic background, Sarath S and Deepthi L.R. proposed(2001) that vehicular traffic is increasing rapidly in this world which is resulting in traffic congestion. The emergency vehicles such as ambulances, fire engines and police vehicles are given equal priority over other vehicles and hence get stuck up in this traffic congestion. A methodology for priority-based vehicle detection based on image processing techniques is proposed in this paper. If an emergency vehicle is detected on the road, the lane in which this vehicle is will be given higher priority over all other lanes. The paper proposes an algorithm which will detect whether a vehicle is an emergency one

These IR transmitter and IR receiver will be mounted Diagram of proposed system consists of following elements a power supply, Sensor Node, Microcontroller, LCD,

Traffic lights. By using these elements proposed system works. The operation of these elements is described below.

The android application has four buttons for four directions. It depends on the route which ambulance driver will select, the ambulance driver will select the appropriate direction and send activate command for the particular signal. In the android application, the patient's information is also stored which consists of name, age, and blood group, besides others. The hardware module for traffic signal has used Arduino for traffic signals. It consists of a Wi-Fi module, with the help of which it captures information from the server and connects the android application directly with the traffic signal. The location is retrieved in the form of longitude and latitude. The direction of ambulance movement depends on the degree of the ambulance. For detecting the direction and current location of the ambulance a compass is used

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traffic signal to the Bluetooth module. The range of Bluetooth is very low so there can be a case that the driver sends the command using his phone and it was not received by the Bluetooth module. This system suffers from security-related issues. In order to make it secure the code needs to be changed every 24 hours. The system proposed by Ramani and Jeyakumar makes use of a central server for controlling the traffic controllers. Arduino UNO is used for the implementation of the traffic signal controller. In this system, a web application is provided to the driver.

The request for turning the signal light to green is sent to the traffic controller using the web application. The system is divided into three parts namely web application cloud server and traffic signal. The ambulance driver uses the web application for choosing the route and navigating the ambulance. Communication between the ambulance and traffic signal is established using the cloud server. Arduino UNO is interfaced with Wi-Fi module and the Wi-Fi module is used as a traffic signal in this system. This system always requires sending of a signal to turn the traffic signal green, as it is not automatic. There could be a case in which the driver forgets to send the signal because of the time constraints.

2.1 LITERATURE SUMMARY

According to the literature survey mentioned above, there are systems in place that use a Bluetooth module and a Bluetooth-enabled phone with Bluetooth state active for the detection phase and require sending a signal to turn the traffic signal green because they are not automatic. For this system to function, the ambulance must be close to the signal so that it can send the command to guide the traffic signal to the Bluetooth module. The use of IoT in smart traffic management systems for ambulances has been covered extensively in journals and articles. The shortcomings of the current systems are updated using an 8051 microprocessor and an RFID reader in the proposed smart traffic management system.

CHAPTER 3

SYSTEM DESIGN AND REQUIREMENTS

3.1 EXISTING SYSTEM

Traffic congestion is increase in metro city owing to population. For this reason, number of automobiles increase rapidly which cause traffic jam in metro city. Under current circumstances, traffic control system is achieved by the use of a hand signs by traffic police persons, traffic light signals, and markings. An education program i.e. awareness program is needed through drivelling -license authorities, to make sure that those who operate motor vehicles understand the rules and regulation of the road and advised to need of the obeying traffic rules. Every traffic control system is designed by standard signs which make sure when to move or stop. For example, proceed signs always have a green background which is octagonal in shape. These Standards are allowed a passenger to move quickly and continuous operation. There are three types of traffic light signs are used for controlling the traffic congestion. It contains standard colours and shape used for identification and deciding on the appropriate course of action. A red lamp indicates the vehicles to stop in the lane at allotted time interval, an amber lamp indicates passengers is ready or start to progress in the lane. A green lamp is used for vehicles to move from the lane. In present situation, traffic lights are set on the different directions with fixed time delay, following a particular cycle while switching from one signal to other.

The normal function refers to traffic lights require slight control and coordinate to ensure that traffic and pedestrians to move forward as safely as possible. When heavy traffic condition, the road is crowded with vehicles and go-head time period is short. So, vehicles can't move fast as much as it. But sub lane has few vehicles and go-ahead time interval is relatively long. It is creating unnecessary and wasteful congestion on one lane while the other lanes remain free. In order to rectify this problem, traffic light system has been introduced to change the time delay automatically based on the density of vehicle in a particular lane which is achieved by the use of Sensors. Sensors are placed on each side of the road at a particular distance and interfaced with Microcontroller which sense the traffic system and if

may be traffic congestion in one lane it will go the information from the sensors, microcontroller decides when to open the lane.

3.1.1 Disadvantages

- Human control is required.
- No automatic process.
- Fixed time of traffic signals.

3.2 PROPOSED SYSTEM

The debates on mobility almost exclusively consist of functionalist analyses of how particular mobile technologies can alleviate geographical barriers for human activity. The developed system has allowed the Android mobile device (emergency vehicle) to override the normal operation of a traffic signal. The system comprises of microcontroller 8051 LCD, IR Sensor, RFID and traffic signals. This system will be very essential for the benefit and safety of the people of the society, thereby ensuring that there is no longer a traffic congestion that is experienced currently. By using this type of a system, many lives can be saved by being taken to the hospital as soon as possible and also unnecessary traffic jams can be avoided in traffic junctions by making use of this kind of a system.

Smart traffic management system for ambulance using IoT is a system designed to reduce the time taken by ambulances to reach hospitals during emergencies. This system uses IoT technology to gather real-time traffic data and provide ambulances with the fastest and most efficient routes to reach their destinations. The system consists of a network of sensors and cameras placed throughout the city to collect traffic data, which is transmitted to a central hub. This system not only helps in reducing the response time of the ambulance but also ensures the safety of the patient by providing real-time updates on the ambulance's location and status. In addition, the system provides alerts to drivers on the road to pull over and give way to the ambulance.

The implementation of this system has several benefits, including reducing the mortality rate of patients during emergencies and reducing the stress and workload on emergency responders. A smart traffic management system for ambulances using IoT can greatly improve emergency response times and save

lives.. Overall, the Smart traffic management system for ambulance using IoT is a promising solution to improve emergency response services and save lives.

3.2.1 Advantages

- No human required to control.
- Ambulances need not to be waited in the traffic congestion.
- Whole is automatic

3.3 BLOCK DIAGRAM

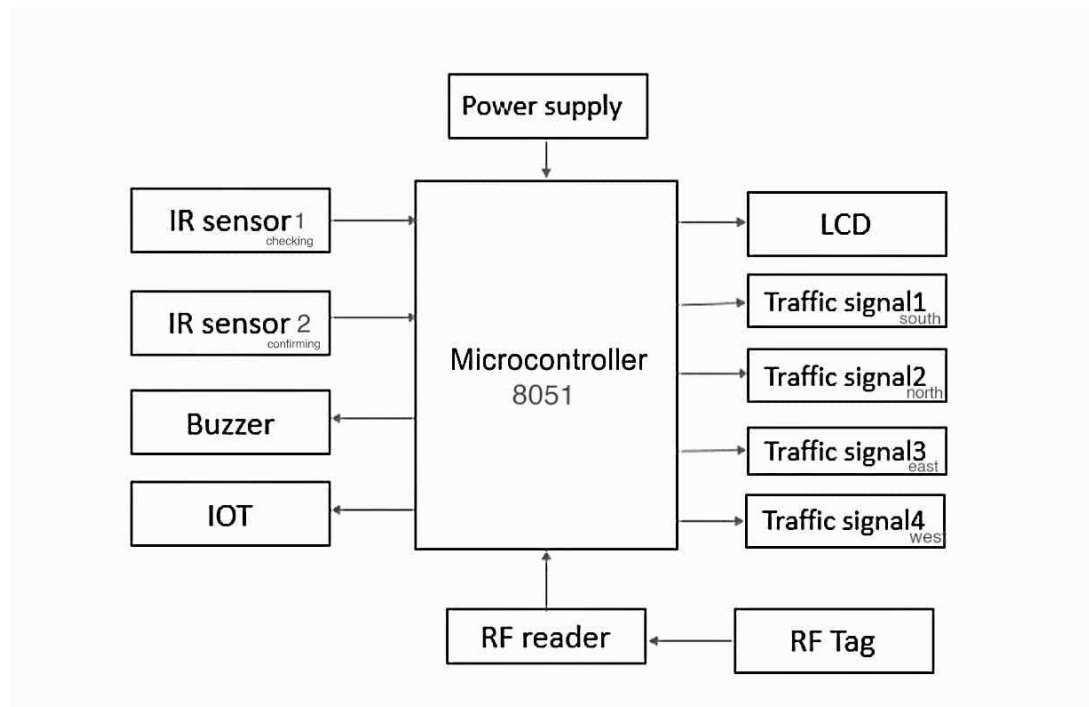


Fig : 3.1 : Block diagram of the proposed system

In this RFID reader, RFID tag, microcontroller, traffic signals, IR sensors and LCD are used. Four RFID tags were used to detect the vehicle on four sides at the junction. When an RFID tag (which will be attached to an ambulance) is detected by the RFID reader. After detection, it sends signals to the 8051 Micro Controller. Here on the entry side and exit side there are two IR sensors. One IR sensor determines whether an ambulance is on Road 1, Road 2, Road 3, or Road 4 while another IR sensor verifies that the ambulance is indeed on Road 1, Road 2, Road 3, or Road 4.

Depending upon the RFID tag(which will be attached to an ambulance), if an ambulance is detected on road 1, then the green led will glow on road 1 then an ambulance starts moving without waiting in the congestion. Buzzer is also used to get people alert from an ambulance. If the signal is detected from the transmitter side, then it sends a notification to the traffic police's mobile. LCD is also used to display the particular road on which the emergency vehicle is coming.

3.4 HARDWARE REQUIREMENTS

3.4.1 Microcontroller 8051

The 8051 is a popular 8-bit microcontroller that was first introduced by Intel in the early 1980s. It is a versatile and widely used microcontroller in the embedded systems industry due to its ease of use, low power consumption, and low cost. The 8051 microcontroller has a Harvard architecture, which means it has separate memories for program and data, and it can directly access I/O ports, making it suitable for a wide range of applications such as control systems, automation, robotics, and communication devices.

The 8051 microcontroller has 4KB of on-chip program memory, 128 bytes of on-chip RAM, and 128 bytes of on-chip data memory. It also has four 8-bit I/O ports and two 16-bit timer/counters, which can be used for a variety of timing and control tasks. The 8051 microcontroller is a popular choice for hobbyists, students, and professionals alike, and there are many resources available online for learning and programming with the 8051 microcontroller.

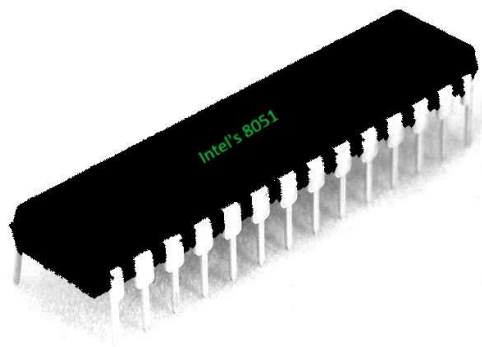


Fig : 3.2 : Microcontroller 8051

3.4.1.1 Function of microcontroller 8051

The microcontroller 8051 can be a crucial component in a smart traffic management system for ambulance using IoT. The 8051 microcontroller can control and coordinate the traffic signals based on the ambulance's real-time location data collected through IoT sensors. This allows the traffic signals to automatically adjust and prioritize the ambulance's movement through the traffic.

Moreover, the 8051 microcontrollers can also communicate with other devices in the smart traffic management system, such as cameras and sensors, to monitor and analyse traffic patterns and adjust the traffic signals accordingly. This enables the system to optimize traffic flow and reduce congestion, making it easier for the ambulance to navigate through the traffic and reach its destination faster.

Additionally, the 8051 microcontroller can be used to control the LED displays on the traffic signals, displaying relevant information to the drivers and pedestrians. For example, it can display a message to the drivers to pull over and make way for the ambulance. This can significantly reduce the time it takes for the ambulance to reach the hospital and potentially save lives.

In conclusion, the microcontroller 8051 can be a critical component in a smart traffic management system for ambulance using IoT. It can help optimize traffic flow, prioritize the ambulance's movement, and improve the overall efficiency of the system.

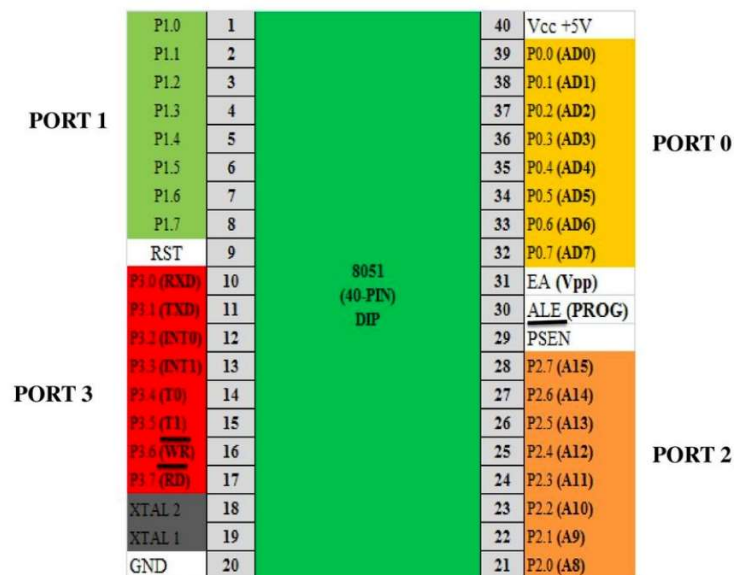


Fig : 3.3 : 8051 Pin Out

3.4.1.2 Specifications of microcontroller 8051

- Architecture: Harvard architecture with a Von Neumann bus interface.
- Instruction Set: The 8051 microcontroller has 111 instructions in its instruction set.
- Data bus width: 8-bit.
- Address bus width: 16-bit.
- ROM size: The 8051 microcontroller can address up to 64KB of ROM.
- RAM size: The 8051 microcontroller can address up to 64KB of RAM.
- Clock speed: The 8051 microcontroller has an internal oscillator that can be configured to run at different speeds up to 33 MHz.
- I/O Ports: The 8051 microcontroller has four 8-bit I/O ports, each of which can be configured as either input or output.
- Timers: The 8051 microcontroller has two 16-bit timers/counters.
- Serial Communication: The 8051 microcontroller has a built-in UART for serial communication.
- Interrupts: The 8051 microcontroller has five interrupt sources, each with its own interrupt vector.
- Power Consumption: The 8051 microcontroller has low power consumption, making it ideal for use in battery-powered devices.
- Operating Voltage: The 8051 microcontroller operates at a voltage range of 2.7V to 5.5V.
- Package: The 8051 microcontroller is available in a range of packages, including DIP, PLCC, and QFP.
- Development Tools: There are a variety of development tools available for the 8051 microcontroller, including compilers, assemblers, simulators, and debuggers.

3.4.1.3 Applications of microcontroller 8051

The microcontroller 8051 can be used in a smart traffic management system for ambulances using IoT to provide efficient and safe transportation for emergency medical services. Here are some applications of the 8051 microcontroller in this system:

- Traffic light control: The 8051 microcontroller can be used to control the traffic lights in a way that gives priority to ambulances. By using sensors placed in

the road or in the ambulance, the system can detect the presence of an ambulance and change the traffic light accordingly.

- GPS tracking: The 8051 microcontroller can be used to track the location of the ambulance using GPS technology. This information can be used to direct the ambulance to the shortest and fastest route to the hospital.
- Emergency notification: The 8051 microcontroller can be used to send an emergency notification to the traffic management system when an ambulance is approaching. This will alert the system to clear the traffic for the ambulance.
- Remote monitoring: The 8051 microcontroller can be used to remotely monitor the traffic management system using IoT technology. This will enable the system to identify and respond to traffic congestion, accidents, or other obstacles that may impede the progress of the ambulance.
- Data storage and analysis: The 8051 microcontroller can be used to store data on the traffic patterns and ambulance movement in the system. This data can be analyzed to improve the efficiency and effectiveness of the traffic management system.

By using the microcontroller 8051 in a smart traffic management system for ambulances, emergency medical services can be provided more efficiently and safely. The system can reduce response time, improve the accuracy of the ambulance location, and ensure safe passage through traffic.

3.4.2 IR Sensor



Fig : 3.3 : IR sensor

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

An IR sensor can be used in a smart traffic management system for ambulances as a part of an IoT (Internet of Things) solution. The system would use the IR sensor to detect the presence of the ambulance and communicate this information to the traffic lights in the area. The ambulance is equipped with an IR sensor that emits a signal when it is within a certain distance of an intersection. The signal is received by a nearby IoT device, which relays the information to the traffic lights. The traffic lights are programmed to recognize the signal and give priority to the ambulance by changing to green in the direction of the ambulance's travel. Other vehicles in the area are notified of the ambulance's presence through the use of signs or signals, and are directed to pull over to the side of the road to allow the ambulance to pass. The system would continue to monitor the ambulance's location and adjust traffic signals as necessary to ensure it can quickly and safely reach its destination. Overall, the use of an IR sensor in a smart traffic management system for ambulances can help to reduce response times and improve the efficiency of emergency services. By integrating IoT technology into traffic management systems, cities and communities can improve the safety and well-being of their residents.

3.4.2.1 IR Sensor Circuit Diagram and Working Principle

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real time. This circuit comprises of the following components

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo ohms.
- Variable resistors.
- LED (Light Emitting Diode).

IR (infrared) sensors play a crucial role in smart traffic management systems that are designed to prioritize emergency vehicles, such as ambulances, during their journeys. In such systems, IR sensors are typically used to detect the presence of an emergency vehicle and to communicate this information to the traffic lights along its route. This allows the traffic lights to automatically change to green, providing a clear path for the ambulance to travel through the intersection without any delays or obstacles.

In addition to this, IR sensors can also be used to monitor traffic congestion levels and adjust traffic signals accordingly. By detecting the density of vehicles at a given intersection, the sensors can communicate with the traffic management system to optimize the timing of traffic lights and ensure that the emergency vehicle is given priority.

The integration of IR sensors into a smart traffic management system that uses IoT (Internet of Things) technology can greatly enhance the effectiveness of emergency vehicle response times. By providing real-time data on traffic flow and prioritizing emergency vehicles, such systems can save crucial minutes in critical situations, potentially leading to saved lives. Overall, IR sensors are a crucial component in creating a more efficient and effective traffic management system that can help to improve emergency response times and keep roadways safe for everyone. In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analysed as such, therefore this output can be fed to a comparator circuit. Here an operational amplifier (op-amp) of LM 339 is used as comparator circuit. When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM339). Thus the output of the comparator goes low, but the LED does not glow.

When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator (LM 339) goes high and the LED starts

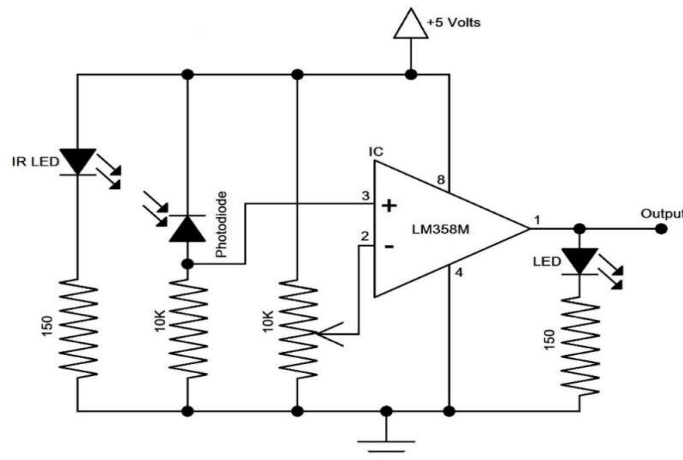


Fig : 3.4 : Circuit diagram of IR sensor

Resistor R1 (100 Ω), R2 (10k Ω) and R3 (330 Ω) are used to ensure that minimum 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively. Resistor VR2 (pre-set=5k) is used to adjust the output terminals. Resistor VR1 (pre-set=10k) is used to set the sensitivity of the circuit Diagram.

The IR LED is used to emit infrared light, which is reflected by an object and detected by the IR photodiode. The photodiode produces a voltage proportional to the intensity of the infrared light detected. This voltage is amplified by an operational amplifier (Op-Amp) and the output signal is taken across the output terminal. The resistor R1 is used to limit the current flow through the IR LED, and the resistor R2 is used to limit the current flow through the IR photodiode. The Op-Amp is used to amplify the voltage signal produced by the photodiode. The output of the circuit can be connected to a microcontroller or other control circuit to activate an alarm, turn on a light, or perform other tasks based on the detection of the object.

3.4.2.2 Applications of IR sensor

- Traffic signal prioritization: IR sensors can detect the presence of an approaching ambulance and communicate this information to the traffic

signals at intersections. The traffic signals can then give priority to the ambulance by turning green for its direction and red for others.

- Traffic monitoring: IR sensors can be used to monitor the flow of traffic on the road. This information can be used to optimize the timing of traffic signals and ensure that there are no bottlenecks in the system.
- Route optimization: Using GPS technology, IR sensors can help to optimize the route taken by an ambulance to reach its destination in the shortest possible time.
- Emergency vehicle detection: IR sensors can detect the presence of emergency vehicles on the road and alert other drivers to their presence. This can help to prevent accidents and ensure that emergency vehicles are able to reach their destination quickly and safely.
- Speed detection: IR sensors can be used to detect the speed of vehicles on the road. This information can be used to enforce speed limits and ensure that drivers are following the rules of the road.

Overall, the use of IR sensors in a smart traffic management system for ambulance using IoT can help to improve the efficiency and safety of emergency response services, and reduce the response time for emergencies.

3.4.3 RFID Reader

RFID stands for Radio Frequency Identification, which is a technology that uses radio waves to automatically identify and track objects or people. An RFID reader is a device that is used to read RFID tags, which contain information about the object or person they are attached to. RFID readers emit a radio signal, which is picked up by the RFID tag. The tag then responds with its unique identification number, which is sent back to the reader. The reader can then interpret the information contained in the tag, such as the product type, manufacturer, or location.

An RFID (Radio-Frequency Identification) reader is a device that is used to read the information stored on RFID tags or transponders, which are small electronic devices that can be attached to or embedded in objects. In the context of a smart traffic management system for ambulance using IoT (Internet of Things), RFID readers can be placed at various points along the road network to detect the

presence of RFID tags on the ambulance. When an ambulance with an RFID tag passes through an area where an RFID reader is installed, the reader captures the unique identifier of the tag and sends it to a central system using the IoT technology. The central system can then use this information to track the location of the ambulance and optimize traffic flow to ensure that the ambulance reaches its destination as quickly as possible.

By using RFID readers in a smart traffic management system for ambulance using IoT, emergency services can reduce response times and save more lives. The system can also be used to monitor and track the movement of other emergency vehicles, such as fire trucks and police cars, to improve their response times as well.

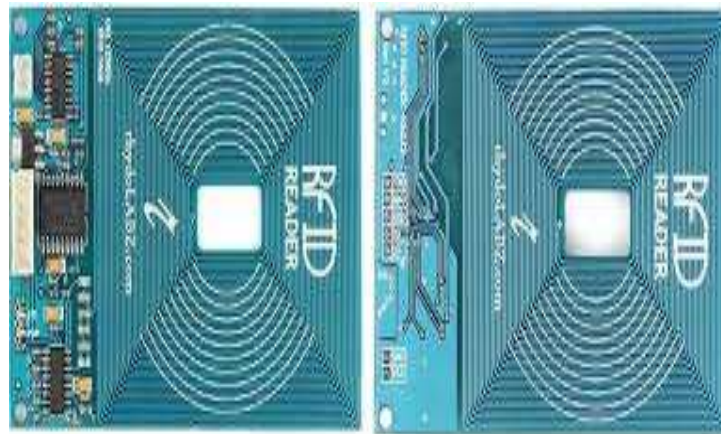


Fig : 3.5 : RFID reader

3.4.3.1 RF transmitter and receiver

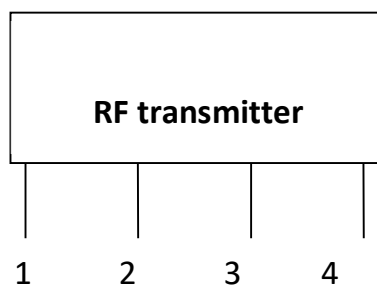


Fig : 3.6 : RF transmitter

Functional block of Tx section where 1,2,3,4 are the pins

- Antenna
- Data input
- Ground
- VCC

In this transmitting section the 1st pin is the antenna pin where we can able to fix the antenna for transmitting the data in the Radio Frequency, the 2nd pin is the data input pin in which the output of the encoder is given; the 3rd pin is the ground and the 4th pin is the VCC which is given to operate the transmitter section.

In a smart traffic management system for ambulance using IoT, an RF transmitter plays a crucial role in enabling communication between the ambulance and the traffic management system. The RF transmitter is a device that uses radio waves to transmit data wirelessly from the ambulance to the traffic management system. The transmitter is typically integrated into the IoT-enabled devices, such as sensors or GPS trackers, which are installed on the ambulance.

When an ambulance approaches an intersection or a congested road, the RF transmitter sends a signal to the traffic management system, informing it of the ambulance's location and the urgency of its journey. This data is then processed by the traffic management system, which can take appropriate action, such as adjusting the traffic signals or notifying other drivers to make way for the ambulance. The RF transmitter is a critical component of the smart traffic management system for ambulances, as it allows for real-time communication and response, ensuring that the ambulance can reach its destination as quickly and safely as possible.

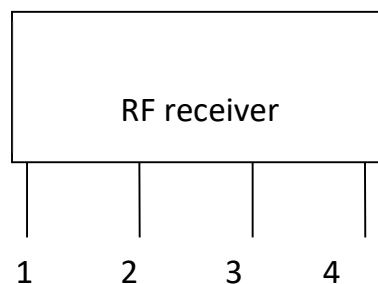


Fig : 3.7 : RF receiver

Functional block of Rx section where 1,2,3,4 are the pins

- Antenna
- Data input
- Ground
- VCC

In this receiving section the 1st pin is the antenna pin where we can able to fix the antenna to receive the data in the Radio Frequency, the 2nd pin is the data output pin to the decoder circuit, the 3rd pin is the ground and the 4th pin is the VCC which is given to operate the receiver section.

In a smart traffic management system for ambulances using IoT, an RF (Radio Frequency) receiver can play a crucial role. The system typically involves equipping ambulances with IoT devices that transmit real-time data, such as location, speed, and destination, to a centralized control system. The control system then analyses this data and communicates with traffic signals and other vehicles on the road to ensure the ambulance can quickly and safely reach its destination.

The RF receiver serves as a communication interface between the ambulance's IoT device and the centralized control system. It receives the data transmitted by the IoT device and relays it to the control system, allowing the system to track the ambulance's location, speed, and other vital information. The RF receiver can also receive signals from the control system, which can be used to adjust traffic signals and other vehicles' movement to clear the path for the ambulance.

In summary, the RF receiver serves as a critical component in the smart traffic management system for ambulances using IoT. It enables real-time communication between the ambulance's IoT device and the centralized control system, allowing for efficient and safe traffic management to ensure that the ambulance can quickly reach its destination.

3.4.4 LCD

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.

An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. On each polariser is pasted outside the two glass panels. These polarisers would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarisers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarisers, which would result in activating / highlighting the desired characters.

The LCD's are lightweight with only a few millimetres thickness. Since the LCD's consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. The LCD's don't generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD's have long life and a wide operating temperature range. Changing the display size or the layout size is relatively simple which makes the LCD's more customer friendly.

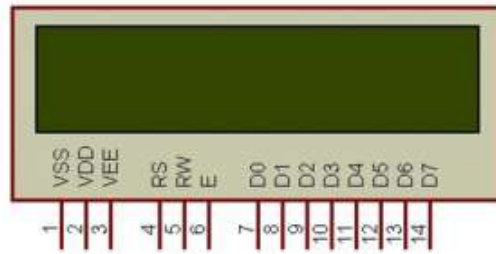


Fig : 3.8 : LCD

3.4.4.1 Role of LCD

The LCD (Liquid Crystal Display) plays a crucial role in a smart traffic management system for ambulance using IoT (Internet of Things) technology. In such a system, ambulances equipped with IoT devices can communicate with traffic signals and other devices on the road network. The LCD can display real-time information about the ambulance's location, speed, and direction of travel, which can help traffic management systems to make informed decisions about traffic flow and signal timing.

Here are some specific ways that LCDs are important in a smart traffic management system for ambulance using IoT:

- Real-time information display: LCDs can display real-time information about the ambulance's location, which can help traffic management systems to prioritize the ambulance's path and optimize traffic signals to clear the path for the ambulance.
- Traffic updates: LCDs can also display traffic updates and alerts, such as congestion or accidents, which can help the ambulance avoid these areas and take alternative routes.
- Communication with drivers and pedestrians: LCDs can also be used to communicate with drivers and pedestrians. For example, the LCD can display messages to drivers, instructing them to clear the way for the ambulance, or to pedestrians, instructing them to stay clear of the road.
- Data collection: LCDs can also be used to collect data on traffic patterns, such as traffic volume and congestion, which can be used to optimize traffic signals and improve traffic flow.

3.4.4.2 16x2 LCD Pinout Configuration

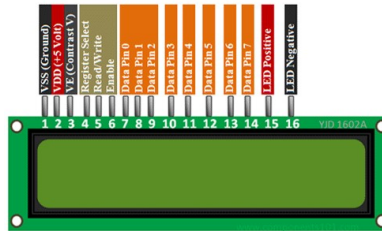


Fig : 3.9 : 16X2 LCD

- Vss (Ground): Ground pin connected to system ground.
- VE (Contrast V): Decides the contrast level of display. Grounded to get maximum contrast.
- Register Select: Connected to Microcontroller to shift between command/data register
- Read/Write: Used to read or write data. Normally grounded to write data to LCD
- Enable: Connected to Microcontroller Pin and toggled between 1 and 0 for data acknowledgement.
- Vdd (+5 Volt): Powers the LCD with +5V (4.7V – 5.3V)
- Data Pin 0-7: Data pins 0 to 7 forms a 8-bit data line. They can be connected to Microcontroller to send 8-bit data. These LCD's can also operate on 4-bit mode in such case Data pin 4,5,6 and 7 will be left free.
- LED Positive: Backlight LED pin positive terminal
- LED Negative: Backlight LED pin negative terminal

In summary, the LCD is an important component of a smart traffic management system for ambulance using IoT technology. It provides real-time information display, traffic updates, communication with drivers and pedestrians, and data collection, which are all critical for ensuring the safe and timely arrival of ambulances to their destinations.

3.4.5 RFID Tag

RFID, or radio-frequency identification, is a technology that uses radio waves to identify and track objects. An RFID tag is a small electronic device that can be attached to an item, which stores and transmits information using radio waves. The tag consists of an integrated circuit and an antenna, which work together to communicate with an RFID reader. RFID tags can be used in a wide range of applications, including inventory management, supply chain management, asset tracking, and access control. They are often used in retail stores to track inventory and prevent theft, as well as in warehouses and distribution centres to manage shipments and inventory.

There are two main types of RFID tags: passive and active. Passive tags do not have a power source and rely on the energy from the RFID reader to power the integrated circuit and transmit data. Active tags, on the other hand, have their own power source and can transmit data over a longer range than passive tags. RFID tags can also be categorized based on their frequency. Low-frequency (LF) tags typically operate at 125-134 kHz and have a short read range. High-frequency (HF) tags operate at 13.56 MHz and have a slightly longer range than LF tags. Ultra-high-frequency (UHF) tags operate at 860-960 MHz and have the longest range of all RFID tags.



Fig : 3.10 : RFID tag

3.4.5.1 Features RFID tag

RFID (Radio Frequency Identification) tags are small electronic devices that use radio waves to transmit data wirelessly. The features of RFID tags vary depending on their type and application, but here are some common features:

- **Size:** RFID tags come in various sizes, ranging from as small as a grain of rice to as large as a credit card.
- **Frequency:** RFID tags operate at different frequencies, depending on the application. Common frequencies include low-frequency (LF), high-frequency (HF), and ultra-high-frequency (UHF).
- **Read range:** The read range of an RFID tag is the distance at which it can be read by an RFID reader. The read range can vary from a few centimetres to several meters.
- **Memory:** RFID tags can store varying amounts of data, depending on their type and application. Some tags have only a few bits of memory, while others can store several kilobytes of data.
- **Durability:** Some RFID tags are designed to withstand harsh environments and extreme temperatures, while others are more fragile and may not be suitable for certain applications.
- **Passive vs. active:** RFID tags can be either passive or active. Passive tags do not have their own power source and rely on the energy transmitted by the RFID reader to power them. Active tags, on the other hand, have their own power source and can transmit data over longer distances.
- **Cost:** The cost of RFID tags varies depending on their features and application. Some tags are very inexpensive, while others can be quite expensive.

3.5 SOFTWARE REQUIREMENTS

3.5.1 Arduino IDE

Arduino IDE (Integrated Development Environment) is a software platform used to program Arduino boards. Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are programmed

using a simplified version of the C++ programming language. The Arduino IDE provides an editor with basic features like syntax highlighting, automatic code completion, and the ability to upload code to the board. It also includes a library of prewritten code, called "sketches," that users can use as a starting point for their own programs.

The IDE is compatible with a wide range of operating systems, including Windows, Mac, and Linux. It is also free and open-source, which means that users can modify the code and contribute to its development. Overall, the Arduino IDE is a powerful tool that allows anyone, regardless of their programming experience, to create and develop projects using Arduino boards.

In a smart traffic management system for ambulance using IoT, the Arduino IDE can play an important role in controlling the sensors and actuators used in the system. The system can be designed to monitor the traffic flow and detect the presence of an ambulance. When an ambulance is detected, the system can dynamically adjust the traffic lights to provide a green light for the ambulance to pass through quickly. The Arduino IDE can be used to program the microcontroller in the traffic light system and the sensors used to detect the presence of the ambulance. The IDE can also be used to create the logic for dynamically adjusting the traffic lights to ensure the ambulance can reach its destination as quickly as possible.

Additionally, the Arduino IDE can be used to integrate other features into the system, such as GPS tracking of the ambulance, remote monitoring, and real-time data analysis. These features can help to optimize the overall performance of the system and ensure that it is functioning at its best. Therefore, the Arduino IDE can be a crucial tool in the development and implementation of a smart traffic management system for ambulances using IoT technology. It can help to program the microcontrollers, sensors, and actuators used in the system, and integrate various features to enhance its performance.

3.6 IoT

IoT stands for Internet of Things, and it refers to a system of interconnected devices that are embedded with sensors, software, and network connectivity, allowing them to collect and exchange data over the internet without the need for

human intervention.

In the context of smart traffic management systems for ambulances, IoT technology can be used to improve emergency response times and reduce traffic congestion. By installing IoT-enabled sensors and devices on the roads, traffic lights, and ambulances themselves, the system can collect real-time data on traffic flow, road conditions, and the location and status of ambulances. This data can be analysed and used to optimize traffic patterns, prioritize ambulance routes, and provide real-time updates to drivers and emergency responders.

In a smart traffic management system for ambulances using IoT, various IoT devices such as sensors, cameras, and GPS are used to gather real-time data on traffic conditions, road infrastructure, and weather conditions. This data is then analysed and processed using advanced algorithms and machine learning techniques to optimize traffic flow and provide a clear path for ambulances to reach their destination as quickly and safely as possible.

3.6.1 Role of IoT

IoT can play a significant role in improving smart traffic management for ambulances. Some of the uses of IoT in a smart traffic management system for ambulance include:

- Real-time traffic monitoring: IoT sensors can be installed on roads and intersections to monitor real-time traffic flow. This data can be analysed to determine the best route for an ambulance to take to reach the destination quickly and safely.
- Predictive maintenance of vehicles: IoT sensors can be installed in ambulances to monitor their condition and predict when maintenance is required. This ensures that ambulances are always in good condition and ready to respond to emergency calls.
- Traffic signal priority: IoT sensors can be used to detect the approach of an ambulance and give it priority at traffic signals. This can reduce response times and improve patient outcomes.
- Emergency response coordination: IoT can facilitate coordination between emergency response services such as ambulances, police, and fire

departments. Real-time communication and data sharing can ensure that emergency response teams are informed and prepared to respond quickly and efficiently.

- Patient tracking and monitoring: IoT sensors can be used to track the location and condition of patients being transported in ambulances. This data can be shared with hospitals to ensure that the appropriate medical resources are available when the patient arrives.
- Road safety monitoring: IoT sensors can be used to monitor road conditions and alert emergency responders to any hazards or accidents. This information can help emergency responders to plan the best route to reach the patient and ensure their safety while en route.

Overall, IoT can play a critical role in improving the efficiency and effectiveness of smart traffic management for ambulances, ensuring that patients receive timely and high-quality care during emergencies.

3.6.2 Applications of IoT

IoT has the potential to transform the way we manage traffic and emergency services, including ambulance services. Here are some possible applications of IoT in a smart traffic management system for ambulances:

- Real-time traffic monitoring: IoT sensors can be installed on roads and highways to collect real-time traffic data. This data can be analysed to identify congested areas and recommend alternative routes for ambulances to reach their destination faster.
- Vehicle tracking and communication: IoT-enabled devices can be installed in ambulances to track their location and speed in real-time. This information can be communicated to the traffic management system to ensure that ambulances are given priority in traffic signals and allowed to pass through congested areas without delay.
- Intelligent traffic signals: Traffic signals can be equipped with sensors that detect the presence of emergency vehicles like ambulances. The signals can then be programmed to change to green in the direction of the emergency vehicle, allowing it to pass through without stopping.
- Predictive maintenance: IoT sensors can be installed in ambulances to

monitor the health of the vehicle and its components in real-time. This data can be used to predict when maintenance is needed, reducing downtime and ensuring that the ambulance is always in good working condition.

- Emergency response coordination: IoT can facilitate communication between ambulances, hospitals, and emergency response teams. By sharing real-time information on the location of the ambulance, the severity of the patient's condition, and the availability of hospital resources, emergency response teams can better coordinate their efforts to save lives.

Overall, IoT has the potential to revolutionize the way we manage traffic and emergency services. By using real-time data and intelligent algorithms, we can ensure that ambulances reach their destinations quickly and safely, saving precious time and lives in the process.

CHAPTER 4

RESULTS AND DISCUSSION

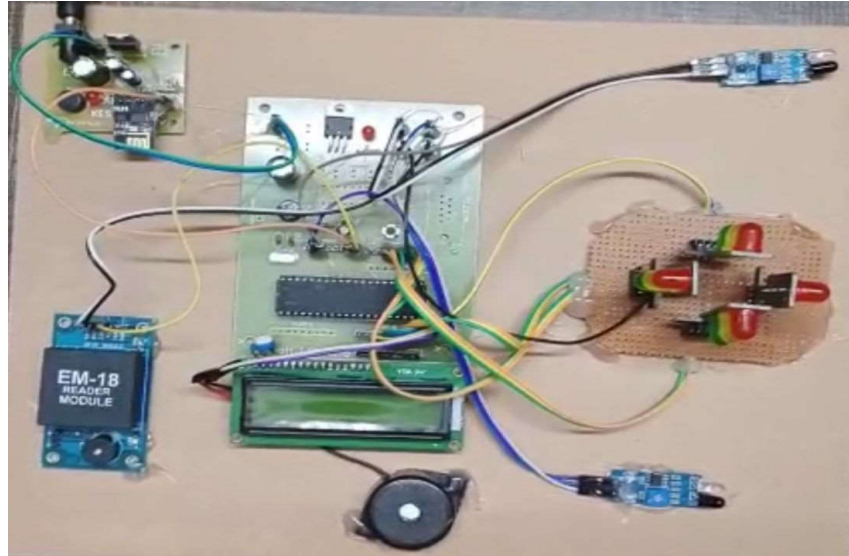


Fig : 4.1 : Complete project integration

The 8051 microcontrollers, an RFID reader, an RFID tag, an LCD, two IR sensors, traffic lights, and a buzzer are all employed in the aforementioned Fig:4.1. RFID reader, Traffic signals, Two IR sensors, Buzzer, and LCD are connected to the 8051 Microcontroller.

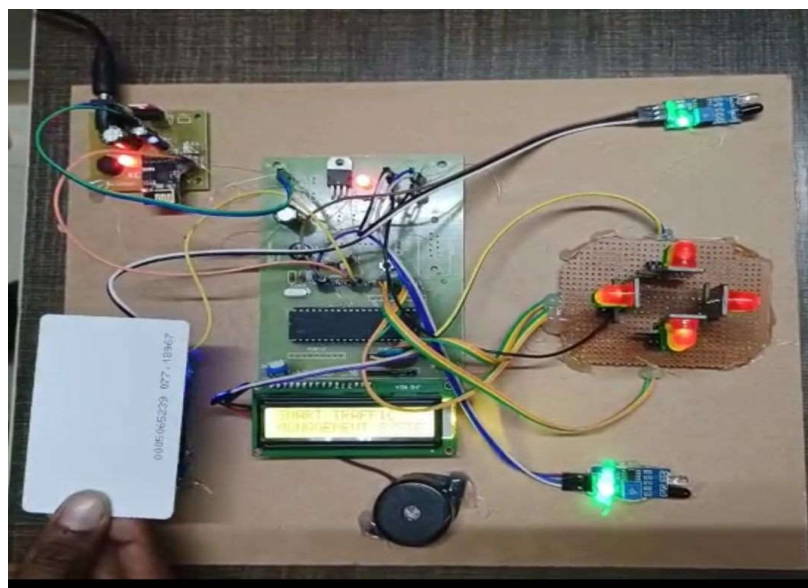


Fig : 4.2 : RFID reader detection

In the above Fig: 4.2 explains that when an ambulance arrives, the RFID reader will recognize it because of the RFID tag that was attached to it.



Fig : 4.3 : IR sensor 1 checks whether an ambulance is on road 1.

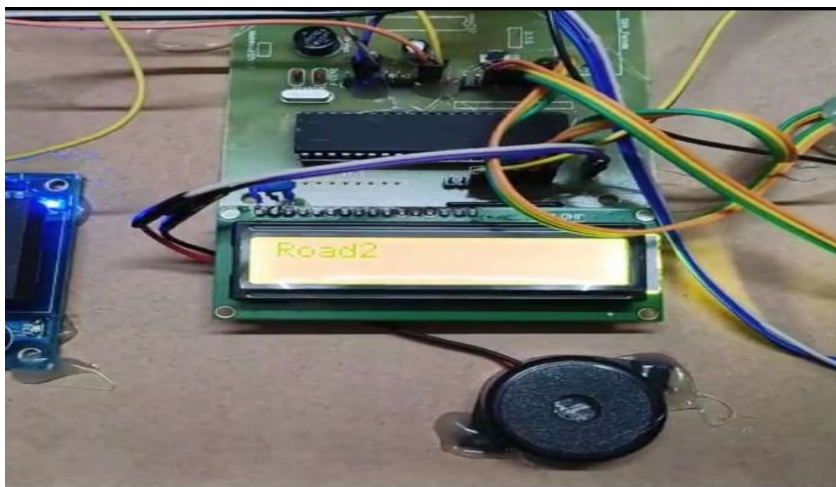


Fig : 4.4 : IR sensor 1 checks whether an ambulance is on road 2.

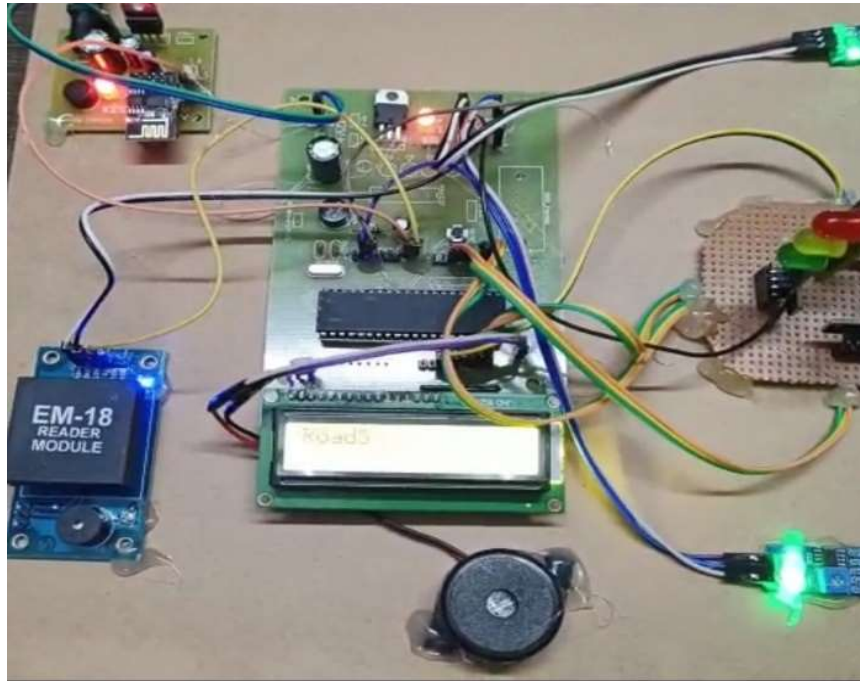


Fig : 4.5 : IR sensor 1 checks whether an ambulance is on road 3.

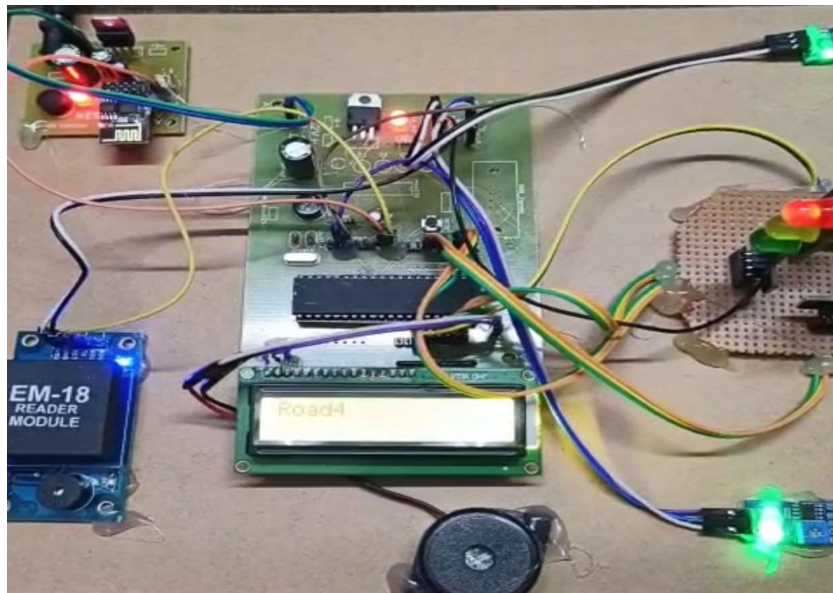


Fig : 4.6 : IR sensor 1 checks whether an ambulance is on road 4.

In the above Fig: 4.3, Fig: 4.4, Fig 4.5, Fig: 4.6 Infrared sensor 1 determines whether an ambulance is on Road 1, Road 2, Road 3, or Road 4.

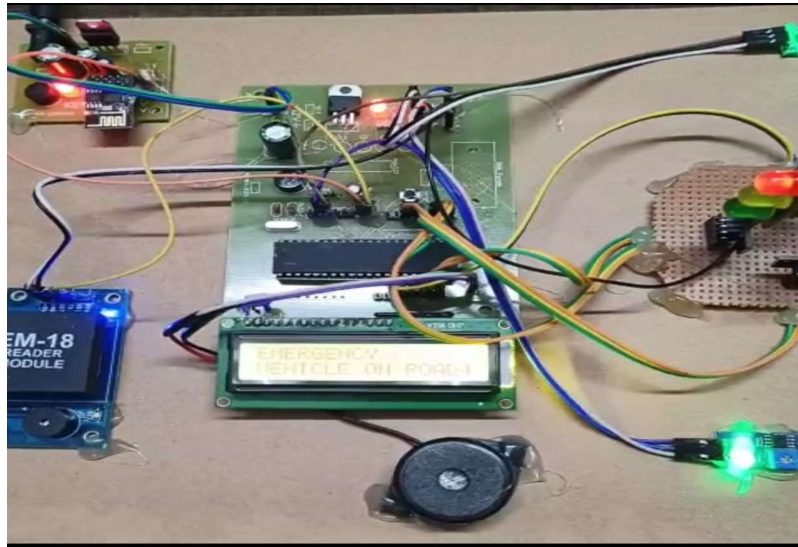


Fig : 4.7 : IR sensor verification of an ambulance

Infrared sensor 2 confirms that the ambulance is in fact on Roads 1, 2, 3, or 4. According to the RFID tag, if an ambulance is located on road 1, the green led will glow and the ambulance will begin to move without stopping in the traffic. An ambulance can also utilise a buzzer to inform nearby individuals. If the transmitter detects a signal, a message is sent to the traffic police officer's mobile device. Moreover, an LCD is used to show the specific road that the emergency vehicle is travelling on.

CHAPTER 5

CONCLUSION

This project proposed an approach for efficient management of traffic for smart ambulances based on technologies like IoT, cloud computing, RFID, etc., for providing an efficient and real-time solution for traffic management for ambulances and other emergency vehicles. A smart traffic management system for ambulances using IoT has the potential to significantly improve emergency medical response times and save lives. By leveraging IoT sensors and data analysis, the system can provide real-time information to ambulance drivers about the most efficient and safest routes to take, while also coordinating with traffic signals to prioritize the ambulance's passage. In addition to improving emergency response times, a smart traffic management system for ambulances using IoT can also reduce the likelihood of accidents involving emergency vehicles and other vehicles on the road. By providing real-time information to drivers, the system can help them avoid potential hazards and safely navigate through traffic. Overall, a smart traffic management system for ambulances using IoT has the potential to revolutionize emergency medical response and make our roads safer for everyone.

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