

A Synopsis on

IOT Enabled Traffic Diversion System for Emergency Services

Submitted in partial fulfillment of the requirements
of the degree of

Bachelor of Engineering

in

Information Technology

by

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CERTIFICATE

This is to certify that the project Synopsis entitled ***“IOT Enabled Traffic Diversion System for Emergency Services”*** Submitted by ***“Vatsal Singh, Pushkar Telavane, Shubhangi Tripathi”*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering in Information Technology*** to the University of Mumbai, is a bonafide work carried out during academic year 2022-2023

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Abstract

One of the most profound aftermaths of evolving technologies in this modern era is rapidly increasing vehicular counts, which has become grave in the wake of staggering rise in world population. So the main issue arising here is delay in reaching the destination. The delay is often attributed to delay in reaching a hospital or receiving primary aid. In India, traffic conditions also add to the grimace of the situation. Although the government is taking various measures; a holistic solution is required to minimize the delay at each of the steps like accessing the patient situation, contacting the Medical aid or making available the nearest aid possible. As a result, traffic congestion has become a serious problem in most countries around the world. We are developing a system with the help of IOT to make emergency system like ambulance to reach destination to its earliest. We are developing a mobile application in which driver and traffic controller will be logged in. We would be providing the driver of ambulance with the option to set source and destination location. That selected lane by traffic controller will be displayed on digital screens present near signals. The message being displayed on screen will be seen by other drivers on highway and they will be able to sideline themselves or change the lane before arrival of ambulance.

Lack of efficient traffic control can lead to the loss of thousands of lives due to ambulance not being able to reach the hospital in time. Also, with the current annual growth of vehicles being around 11% while the annual road extension remaining around 4% in developing countries such as India, the problem is further worsening. So, to deal with this problem the paper presents a novel, easy to implement alternative for traffic management during emergency situations.

Introduction

At present, the world is developing at a very high speed. Due to large number of population the usage of vehicles also increased on the roads due to Industrialization and Urbanization. This results in roadblocks in big cities. Traffic-jam causes a lot of severe effects on transportation. The ambulance service is the most affected one in traffic congestion. There may be emergency or critical patients in an ambulance who needs immediate medical care and to be taken to the nearby hospital as early as possible. The appropriate treatment to the patient will be provided as soon as the patient reaches the hospital so that chances of living increase in serious conditions. Many lives will be lost if the time taken by the ambulance to reach the hospital is high. Based on the surveys, the heart attacks can be treated in 95% of the cases, if there is no delay by the ambulance and reaching the hospital without any traffic issues at correct time. It is very essential to provide way for the ambulance. If the ambulance gets stuck in the traffic sometimes, it wastes a lot of time and results in loss of lives by waiting for the traffic to get cleared. We can overcome these problems by the upcoming technology like IoT i.e., Internet of Things. All the components are connected and the internet controls them in IoT. Thus, the influence of IoT in today's world is very significant as it helps in many ways to solve issues. One of the most profound aftermaths of evolving technologies in this modern era is rapidly increasing vehicular counts, which has become grave in the wake of staggering rise in world population. As a result, traffic congestion has become a serious problem in most countries around the world. Moreover, the rate of road expansion is just 1/3rd the vehicular growth rate in countries like India, which further worsens the problem. Due to increased traffic, there has been an increase in traffic jams, which has caused a problem for ambulances in moving patients to the appropriate destinations on time in case of emergency. Statistically, it has been observed that more than 20 percent patients requiring urgent medical attention die on their way to the hospital because of delays. 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 and provide solution to tackle these kind of situations. There are many examples of an ambulance getting stuck in the traffic with no option but to wait for it to get cleared. This wait sometimes exceeds from minutes to hours, leaving the patient to die because of a lack of treatment at the proper time. Keeping in mind the current scenario of emergency services and the traffic system we present to you our solution that broads into three main components

Mobile APP-

This section of our system deals directly with user. Our end client is Driver of Ambulance. Usually drivers won't be able to deal with complex graphic interfaces. Our aim is to provide user friendly interface so that he /she finds it easy to navigate through. Driver would be able to choose source and destination location at the start of the journey.

Digital Screens-

The digital Screens will be wirelessly connected to Mobile App through nodeMCU. The lane selected by the driver through Mobile App will be displayed on digital screens with message like," Ambulance Incoming keep lane XYZ empty."

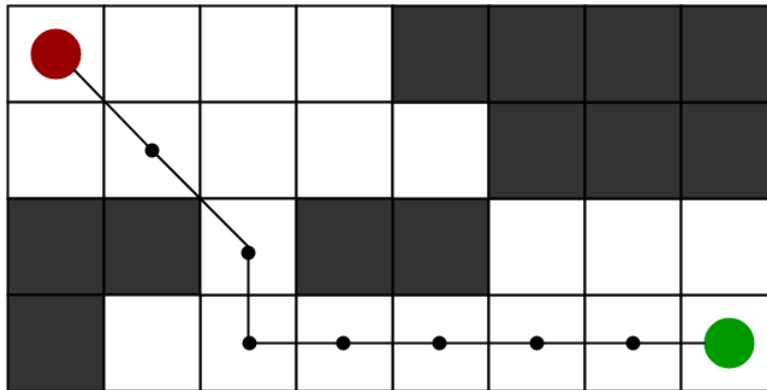
Driver's Feedback-

After the completion of whole service the driver would be given the option to put feedback in form of grading scale , emojis or stars. Our future scope will be analysing the reviews of users and understanding trends through Machine Learning Algorithm.

ALGORITHM USED

A* Algorithm - Motivation

A* Search algorithm is one of the best and popular technique used in path-finding and graph traversals. It helps to approximate the shortest path in real-life situations, like- in maps, games where there can be many hindrances. We can consider a 2D Grid having several obstacles and we start from a source cell (colored red below) to reach towards a goal cell (colored green below) using A* Search Algorithm.



Objectives

1. To make ambulances services faster and efficient by using Google API for finding the shortest route to destination.
2. To guide the traffic controller to manage traffic during peak hours as well as normal hours and make way for ambulance.
3. To help the traffic controller to move traffic in a systematic order by displaying the lane chosen by the ambulance driver.
4. To provide an efficient service to driver by opting for our user-friendly application using Flutter.
5. To get the feedback from the driver of the ambulance about assistance provided through system using grading scale, emoticons or stars.

Literature Review

1. In paper[1] system shows the direction for locating the nearby hospital in the android application. The information fed by the emergency vehicle driver in the android application is sent to the hospital and the controller. If there is any traffic, the controller will clear the traffic and the shortest path will be chosen to reach the nearby hospital.
2. In paper [2] ambulance section, whenever, the accident takes place, ambulance has to come to the accident spot and pick the injured person, IR sensor is used to detect the patient on stretcher, once detected heart rate sensor is used to monitor patient's pulse rate. Through serial monitor the Nurse has to input the type of injury, so that request is continuously send to the near by hospitals.
3. In paper[3] explains ambulance is fitted with a zigbee transmitter to transmit signals and traffic signal which has a zigbee receiver controlled by the micro controller when receives signal and accordingly will clear the path for the vehicle to move.
4. In paper [4]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.
5. Reference paper [5]proposed an IoT based system model to collect,process, and store real-time traffic data. The proposed system uses magnetic sensor nodes to collect real-time vehicle information. The real-time data is processed by WiFi-enabled microcontrollers and sends to an IoT platform for further actions.
6. In paper[6] they developed a Digital notice board that display message sent from the user through mobile phone (SMS) and to design a simple, user friendly system, which can receive and display message/information in a particular manner with respect to date and time which will help the user to easily keep the track of notice board every day and each time he uses the system. System consist of two section called as sender and receiver. Sender is responsible for sending valuable information through the GSM protocol. In order to access Digital notice board the sender must enter into the corresponding mobile number . When the user enter correct mobile number, the message can be typed and get space for the information transmission. To make the proposed system more user friendly we make an android application .By using this application sender can directly enter the message.
7. According to paper[7] proposed a system is though not yet implemented. The system includes a wrist-wearable sensor which captures data along with heartbeat in real time. The data is further analysed on the cloud using algorithms. In the event of a heart attack, the system triggers alert to nearby Hospital, Ambulance, and the emergency contacts of the patient. Additionally, the system aids the ambulance similar to Ola app, guiding it through the fastest route.

8. The paper[8]the feedback management system will correct the institutional weakness there by helps in getting good ranking under NIRF. The Higher education can improve teaching methods, learning process, syllabus, core and soft subjects, skill development, practical's, experiential learning as per the industry expectations through a systematic Feedback Management System.

9. In paper[9] shows output of the system will be the location of the Ambulance which will be displayed in the Google maps based on which the hospital management can redirect the ambulance to the location of the nearest patient. Hospital can use GSM technology to send the message to the ambulance regarding the location of patient.

10. Inference from paper [10] is that the infrared sensors will be used to collect data from the lane and fetch the collected data to the microcontroller. In each road, there will be four infrared sensors which will be placed at a certain distance from the intersection, placed on either side of the roads in pair dividing the considered length of the road from the intersection into two zones—a high density zone and low density zone. The presence of vehicles in each region is sensed by two proximity infrared sensors placed at either side of the road in the opposite direction. The sensors are placed by keeping a certain distance so that they do not have an intersection point. The use of two sensors eliminates the factor if “vehicles are present along one side only,” i.e., it gives us the real view in what manner the vehicles are aligned along the road. The sensors are connected to the analog pins of the microprocessor and the traffic lights to the digital pins. While placing the sensors, it is to be kept in mind that the 13 range of the sensors does not intersect, which will result in erroneous data read

Problem Definition

Problem Identified :

The evolving problem of traffic 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. The reaction time required by the emergency responders plays a vital role in the face of disasters. To address this, an intelligent traffic system is needed using a pre-emptive equation that adapts rapidly to environmental conditions.

Solution Proposed :

To facilitate the emergency services with dedicated lanes on highways for fast travel and reduced time to reach to the hospital and to manage the traffic on highways for providing fastest routes to emergency services.

Proposed System Architecture/Design Prototype

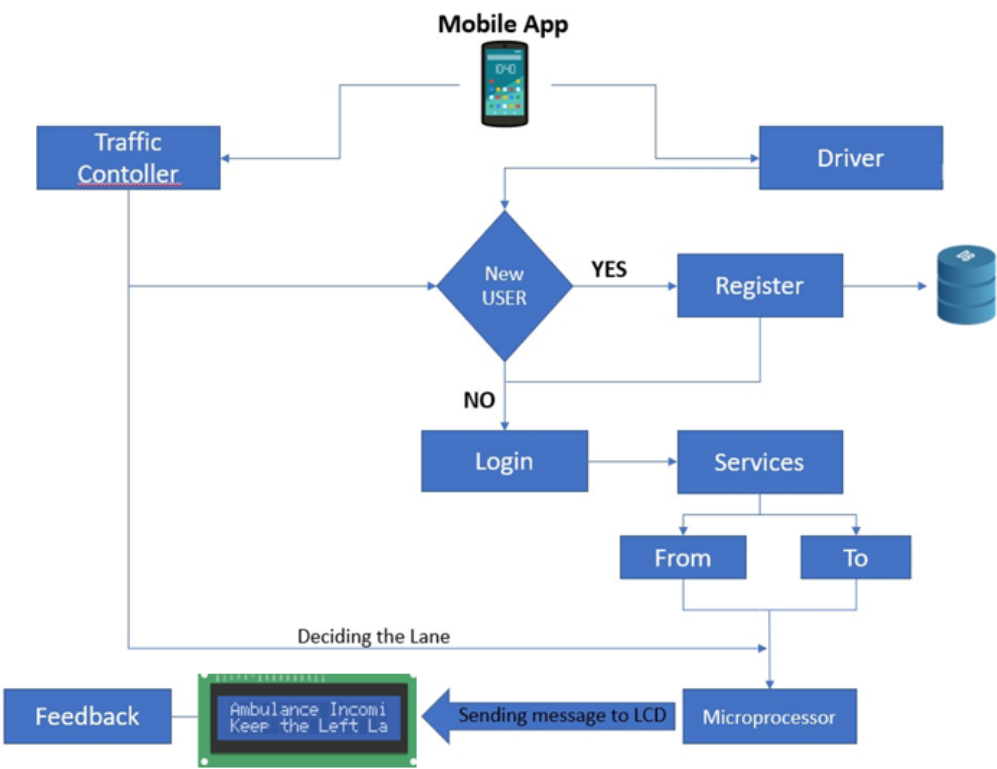


Fig: Flowchart of System

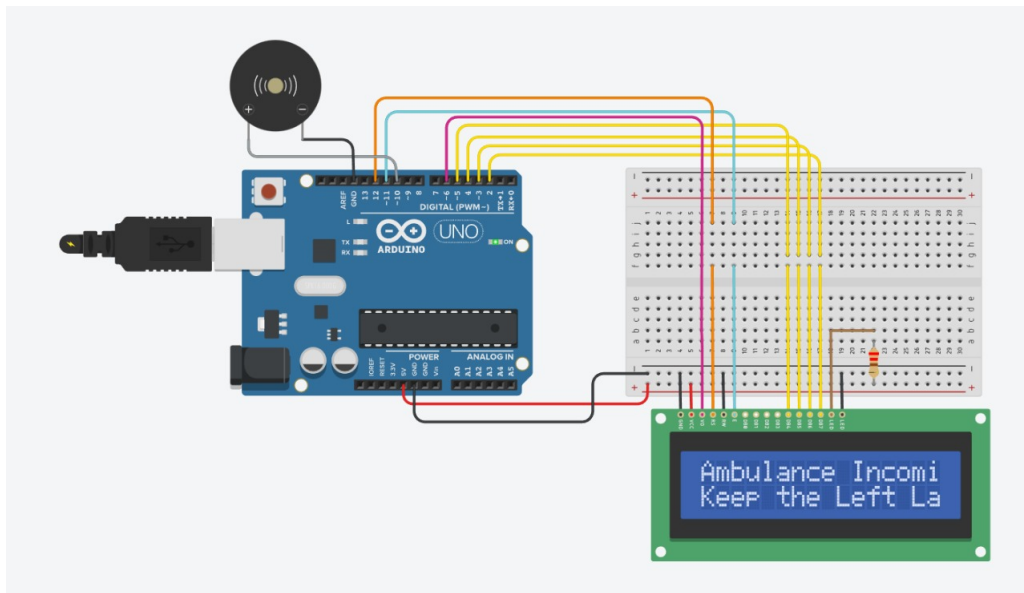
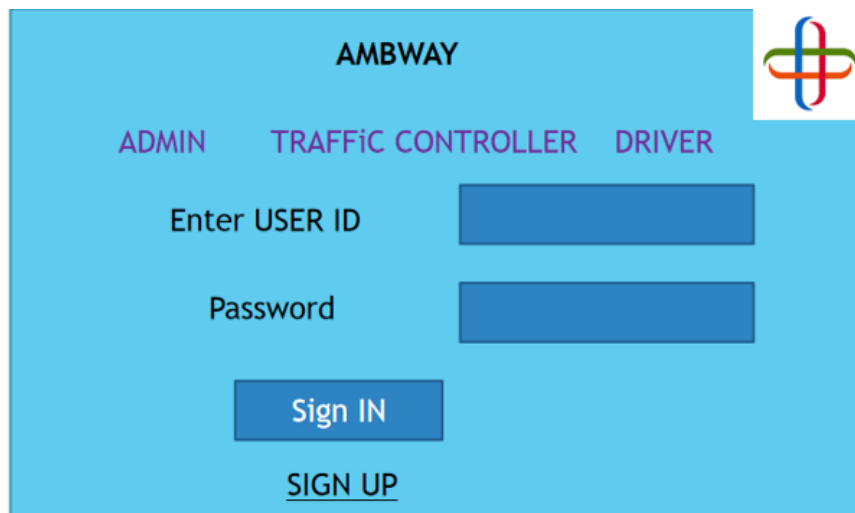


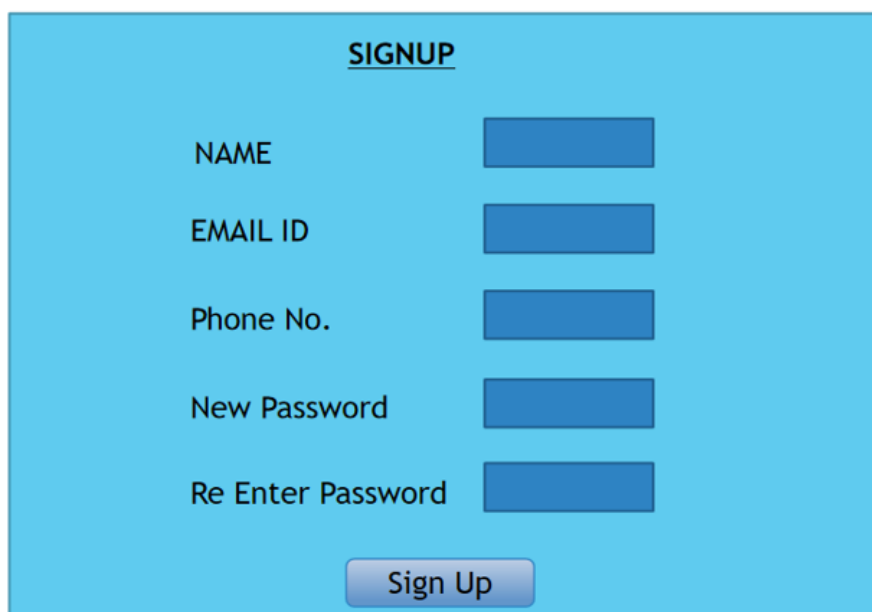
Fig: Tinkercad Simulation

Expected Prototype



The image shows a prototype of the main page for a system named 'AMBWAY'. The page has a light blue background. At the top center, the word 'AMBWAY' is written in bold black text. To the right of the text is a logo consisting of four interlocking loops in blue, red, green, and yellow. Below the header, there are three navigation links: 'ADMIN', 'TRAFFIC CONTROLLER', and 'DRIVER', all in purple text. The main content area contains a login form with two input fields: 'Enter USER ID' and 'Password'. Below these fields is a blue button labeled 'Sign IN'. At the bottom of the form, there is a link labeled 'SIGN UP' in blue text.

Fig:Main Page



The image shows a prototype of the 'SIGNUP' page. The page has a light blue background. At the top center, the word 'SIGNUP' is written in bold black text and underlined. Below the header, there are five input fields arranged vertically: 'NAME', 'EMAIL ID', 'Phone No.', 'New Password', and 'Re Enter Password'. Each input field is a blue rectangle. At the bottom of the form, there is a blue button labeled 'Sign Up'.

Fig: Signup Page

VERIFICATION

ENTER VERIFICATION CODE

A 6 digit code is sent to yopur registered mail.

Fig:Verification Page

ADMIN

Welcome to your Dashboard

Total Patients	Total Drivers	Total Cars
<input style="width: 100px; height: 20px;" type="text"/>	<input style="width: 100px; height: 20px;" type="text"/>	<input style="width: 100px; height: 20px;" type="text"/>

Patients Statistics	<input style="width: 100px; height: 20px;" type="text"/>
Latest Patients	<input style="width: 100px; height: 20px;" type="text"/>
Drivers(LATEST)	<input style="width: 100px; height: 20px;" type="text"/>
Drivers Enroute	<input style="width: 100px; height: 20px;" type="text"/>

Fig:Admin Page

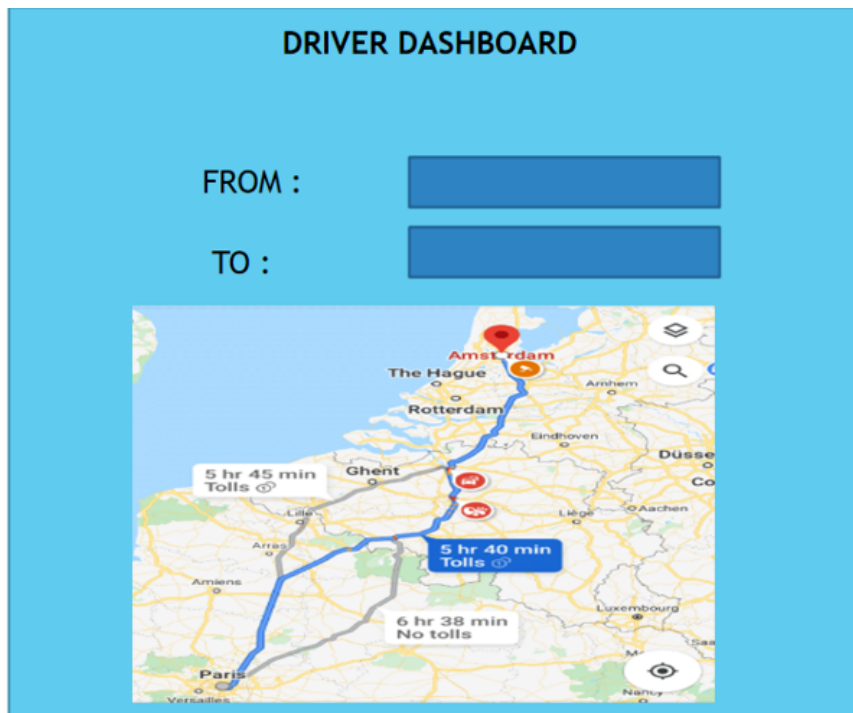


Fig:Driver Dashboard

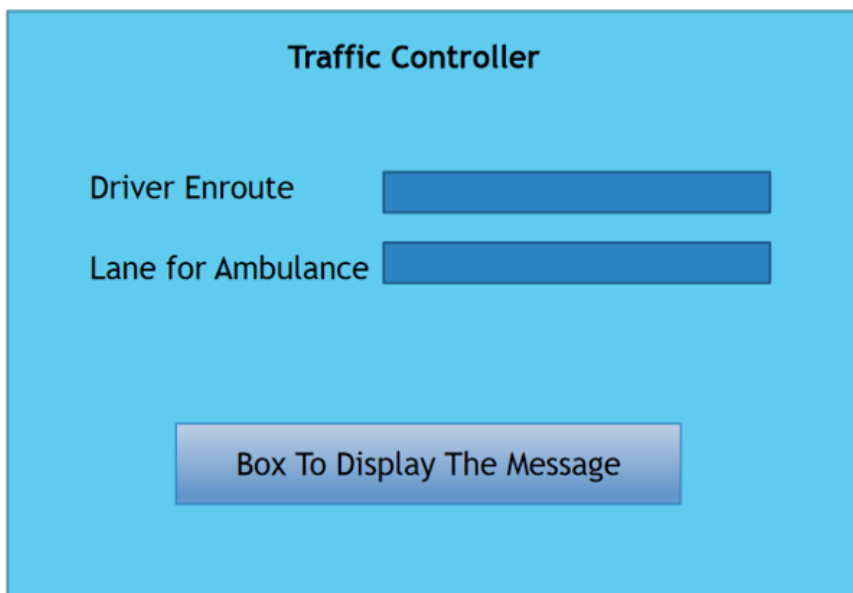


Fig:Traffic Controller Dashboard

Feedback Form

Rate Us



A feedback form with a light blue background. At the top, the text "Feedback Form" is centered. Below it, the text "Rate Us" is on the left. Under "Rate Us" is a row of five stars. The first four stars are orange and filled, and the fifth star is grey and empty.

Fig:Feedback Form

Conclusion

The work presents review of the existing research done in field and tries to develop a system suitable for developing countries. The project has two objectives, which are, first, finding the shortest route to hospital for ambulance and, second, displaying message of ambulance arrival on all digital screens present on the route of the ambulance. The microcontroller can be programed easily which gives scope for deployment better algorithms in future. This system for emergency services will prove life changing for all citizens residing as it eases the work of traffic controllers and also saves precious lives.

Future Scope

Right now the system is just focused towards helping the Ambulance reach its location faster and quicker. Hence it can be used in different emergency situations such as for fire brigade, police, bomb squad etc. The proposed system holds a vast area to grow in future. The smart board can be used in future for the purpose of certain different public awareness programs too. One of our future scope holds the usage of sensors, which would be enabled to collect real-time data of traffic around particular areas. This would help in making wise decision before starting the journey to destination.

References

- [1] Retraction: Smart Traffic Assistance System for Ambulance Vehicles using Internet of Things (J. Phys.: Conf. Ser. 1916 012127) Published 23 February 2022
- [2] IoT Based Intelligent Ambulance Monitoring and Traffic Control System Chapter · February 2021 Santhosh Krishna B V New Horizon College of Engineering
- [3] Implementation of intelligent Traffic clearance system for Ambulance using Voice Assistance UG Scholars, Department of ECE, AURORA'S TECHNOLOGICAL AND RESEARCH INSTITUTE, Uppal, Hyderabad, India Issue III, 2021 August
- [4] IoT Based Traffic Management System for Ambulances Preprint · April 2020 Central University of Kashmir
- [5] Development of an IoT based real-time traffic monitoring system for city governance Communication and Information Research Center, Sultan Qaboos University, Muscat, Oman Accepted on 23 September 2020
- [6] IOT based Smart Notice Board Gaurav Bhardwaj UG Student, Department of ECE MIT School of Engineering Pune, Maharashtra, India Vol. 9 Issue 06, June-2020
- [7] IoT based heart monitoring and alerting system with cloud computing and managing the traffic for an ambulance in India by Khushboo Bhagchandani, D. Peter Augustine Department of Computer Science, CHRIST (Deemed to be University), India Accepted Jul 3, 2019
- [8] Feedback Management System with reference to Institutions of Higher Education: Opportunities Challenges - An Exploratory Study, Vol 4, No 1, March 2019 by Pradeep M D Kalicharan M L
- [9] Ambulance Assistance for Emergency Services Using GPS Navigation Issue: 09 Sep-2016 by Shantanu Sarkar School of Computer Science, VIT University, Vellore
- [10] Intelligent Traffic Monitoring System Conference Paper · July 2015 by Paromita Roy West Bengal University of Technology

1 Publication

Paper entitled “**Paper Title**” is presented at “**International Conference/Journal Name**” by “**Author Name**”.