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Traffic Management System for Emergency Vehicles and Life Saving Activities using IOT

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Abstract: Delay in providing Emergency Medical Services (EMS) is the cause of the high mortality rate in road traffic accidents in countries like India. There is delay involved in each and every stage of the process, right from reporting an accident to dispatching an ambulance, till the patient is safely handed over to the casualty. Minimizing this delay can help save lives. To minimize such delays it is important to introduce smart system for control of traffic congestion at traffic signals. A system is autonomic if it can monitor changes by itself, analyze, plan actions according to it and execute them automatically in order to become a reliable system. The present work focuses on a real life case study of traffic light management system, plays an important role in our daily lives. In most places, "especially in developing countries" the traffic light system is time bounded, which sometimes does not allow an ambulance carrying a patient to pass through traffic light; red light. Hence there should be a smart traffic light signal system which can overcome with such problems, allow the ambulance to pass through traffic signal whether it's red or green. This can be done using a wireless sensor network and Internet of Things.
Keywords: RFID, IoT, EMS

I. INTRODUCTION

The next generation of connected world is Internet of Things (IoT) which connects devices, sensors, appliances, vehicles and other things. The aim of IoT is to extend the benefits of Internet with remote control ability, data sharing, constant connectivity and so on. Internet of Things (IoT) is an ecosystem of connected physical objects that are accessible through the internet.

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to connect and exchange data

The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

IoT has shown a lot of advancement in various fields including healthcare, transportation, home automation, environment management, agriculture etc. The human intervention is decreasing day by day and the concept of an "Internet of living things" has been proposed to make every human related field automated and making systems much smarter.

The regular trouble witnessed by every individual is the increasing traffic and increase in delay to reach desired destinations. There are so many people who fall prey to numbers of problems due to the increase in traffic regularly.

The congestion leads to increase in risk on lives of people if any emergency vehicle is stuck in traffic.

The emergency vehicles more often face problems due to regular traffic, thus finding a solution to control the congestion and reducing the risk to lives of people is an important concept and a solution for the same is the need of an hour and can be achieved with the help of IoT.

II. PROBLEM STATEMENT

The increasing traffic has led to a lot of traffic congestion on roads today and Emergency Vehicles fall victim to this traffic every now and then. The vehicles are unable to reach their destination on time thus causing an increasing risk towards the activities they perform. Thus it is important to find out a way that can be helpful for these emergency vehicles to deal with traffic congestion.

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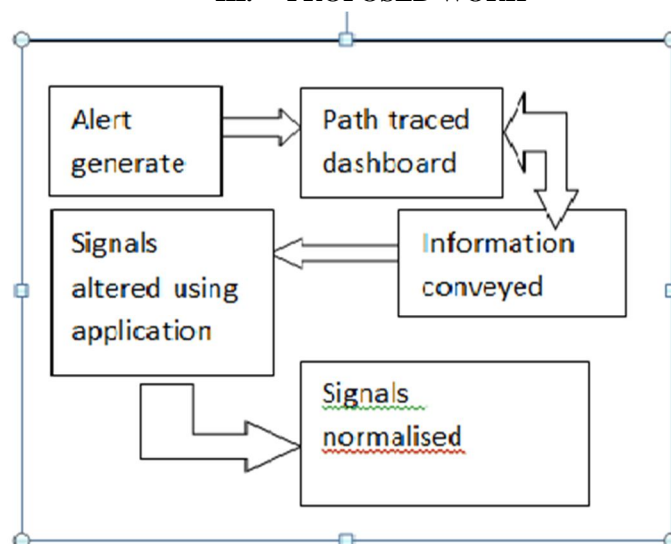
III. PROPOSED WORK

Figure 1 Traffic Management System

In the proposed system above has a GPS sensor present on the emergency vehicle. The sensor is used for tracking the path of the emergency vehicle. Initially a mobile application is used for alert generation by the driver of the emergency vehicle. Once the alert is generated the alert is notified on the dashboard which is present in the control room controlled by the dashboard controller. Then the path of the emergency vehicle is traced using the GPS sensor and the path is visible on the dashboard. Further while the path is being traced by the GPS, the path is notified to the traffic police officer at regular intervals. While the emergency vehicle arrives at any traffic signal the vehicle will not have to wait at signal. The traffic police present at the respective signals will change the signal using a controller which is mobile operatable. The signals can be changed using mobile phones but the authorization of changing the signals will be only given to the traffic police to handle security of signals. Rfid tag and reader is also used for security purpose. Here the tag is present on the emergency vehicle while the reader is placed at a few meters distance before the traffic signal. While the vehicle passes the signals the reader will read the tag placed on the vehicle at identify whether the vehicle is authorized or not the information collected by the reader can be used for future analysis. With the help of this information historical data can be collected about the vehicles which can be used for analysis of the vehicle and can be used for handling the delays caused by the traffic at signals.

IV. TESTING
Initially the first phase of testing was carried out by doing unit testing of the modules.

A. GPS Module
The module was tested to check whether the path was tracked properly. The module was taken to a specific distant place and travelled from the distant place to some other place and the path was checked on the dashboard. The path was traced. The test resulted accurate results.

B. RFID Module
The RFID tag was fixed on the ambulance and the reader was placed at certain distance away. While the ambulance passed the reader the tag was read and the data of the tag was collected. The dashboard displayed the results showing that an authorized vehicle was passed through the reader.

C. Alert generation app
The app developed for alert generation was also tested to yield accurate results. The application consisted of various fields to enter the source, destination of the vehicle. The respective fields were filled and after clicking the start button then the alert was generated on the dashboard. The test yielded accurate results.

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D. *Test Results*

Test case ID	Test Case	Expected Result	Actual Result	Remark
GP_M1	Check GPS location of Ambulance	Shows correct current location of Ambulance	Shows correct current location of Ambulance	Positive
GP_M2	Check GPS location without wifi connection	Incorrect location of Ambulance because Internet connection in needed	Incorrect location of Ambulance	Negative
GP_M3	Check all Ambulance's location in specific area	Display all Ambulance with proper location	Various Ambulance displayed	positive
GP_M4	Check for optimal route of current Ambulance	Show route towards Ambulance	Ambulance with optimal route	positive

Figure 2: Module 1 results

Test Case ID	Test Case	Expected Result	Actual Result	Remark
RF_1	Check Reader Reads Ambulance with Tag	Reader Reads Tag Of Ambulance and gives registerd information about Ambulance	Reader Reads Tag Of Ambulance and gives registerd information of Ambulance	Positive
RF_2	Check Reader Reads Ambulance Without Tag	Can't Read Bacause every Ambulance must Need a Tag	Can't Read Bacause every Ambulance must Need a Tag	Negative

Figure 3: Module 2 results

| Test Case ID	Test Case	Expected Results	Actual Results	Remark
Ap_1	Check the path will be shown or not when we give the Destination Location	Correct path shown by application	Correct path shown by application	Positive
Ap_2	Check the path will be shown or not when we give the wrong Destination Location	Path can not shown by application because the destination Locaion are does not exist	Correct path can not shown by application	Negative

Figure 4: Module 3 results
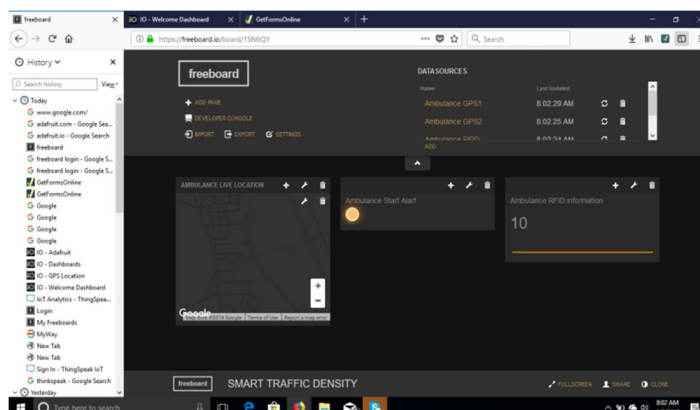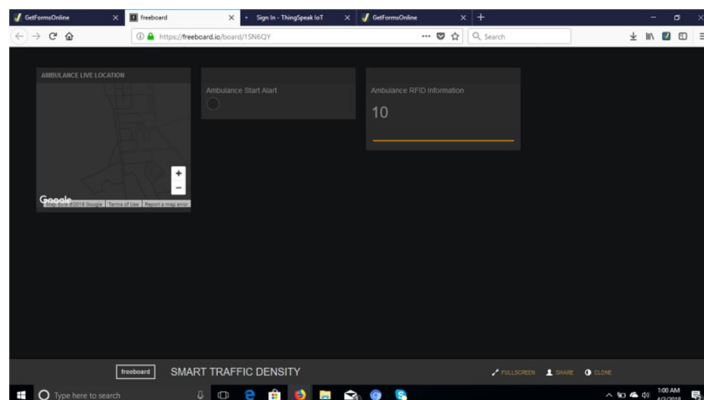

Figure 5: Alert generated

Figure 6: RFID information

In the second phase of testing an integration testing was performed by integrating all the modules on a hardboard. The functionality of the modules was tested and the flow of the entire system was checked. The entire system functioned properly and yielded the accurate results.

V. FUTURE SCOPE

The concept of 'Traffic Management' can become reality. The data collected by RFID reader can be used as the historical data which will be useful for analysis of the daily paths followed by different vehicles and also the daily traffic. It can be used for suggesting the emergency vehicles better paths in future for reducing the delays caused due to traffic.

VI. CONCLUSION

Hence, the prototype model will reduce the time delay caused for emergency vehicles in case of large traffic congestion. The RFID(Radio Frequency Identification) tag with the help of the reader will scan the validity of the emergency vehicle and allow the vehicle to pass through the signal. Thus, the overall delay is reduced and the emergency vehicles will reach their destination in required time.

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