

IOT BASED SMART AMBULANCE MONITORING SYSTEM WITH TRAFFIC LIGHT CONTROL

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Abstract - The efficiency and robustness increased after using embedded technology for monitoring and control applications. Due to traffic load, intensity can get stuck or they are delayed in reaching their destination. The paper describes an intelligent and complex application that helps to clear traffic and to improve security while having fast response of the emergency services. By making use of embedded and wireless communication we can develop an application to clear the traffic while coming in the path. There is a system called as "Intelligent traffic light controller". Where traffic light intelligently decides based on the total traffic on all adjacent roads. This paper presents the current framework of decision support systems for traffic management based on short and medium term predictions and includes some reflections on their likely evolution, based on current scientific research and the evolution of the availability of new types of data and their associated methodologies. When unexpected and unplanned events such as natural disasters, traffic accidents or even terrorist attacks happen, it is necessary to prepare a quick evacuation process and the provisioning of the quickest access routes for emergency services units. Including with above the heartbeat and temperature details of patient present inside the ambulance also sent to the hospital. By doing this the EMT can do better first aid to the patient under supervision of the doctor.

Key Words: Ambulance, GPS, Microcontroller, RFID, Node.js.

1.INTRODUCTION

With increasing industrialization, urbanization and population, there has been a tremendous growth in traffic. With growing traffic there is rise in problems which include traffic jams, accidents, etc. One of the major effects of these traffic jams are faced by ambulances, fire-brigades and other emergency vehicles. Ambulance service is greatly affected because of traffic jams. Delays in reaching the hospital may lead to the loss of life of a patient. These things need a speedy response. Thus it is crucial and necessary to determine direct, fast and efficient response technique. Although each and every vehicle passing through the traffic has its own purpose, importance should be given to ambulance and other emergency vehicles because if they have to wait longer time on the traffic there is increase in the risk.

Majority of the traffic signals work on simple timers. Based on the traffic density at a particular intersection, the traffic light will cycle through red, yellow, and green at regular intervals to ensure a uniform traffic flow in all directions through the intersection. Timer-based signals are excellent for busy areas that have a uniform and heavy volume of traffic. Whereas in areas

having sporadic and unpredictable traffic, timer-based systems don't prove to be beneficial.

To overcome all the above given situations a solution is proposed in this paper.

This paper describes the solution to the problem of ambulance getting stuck in a traffic jam and can be addressed by ensuring that the way through which ambulance is travelling is cleared. This can be done by alerting the nearest traffic light control room whenever an ambulance is approaching. The paper also proposes a health monitoring system in which vital health parameters of the patient in ambulance are monitored and transferred to the hospital before the patient reaches the hospital.

For controlling the traffic an android application is created which can be used by both, the ambulance and the control room. The application can be viewed as a platform for the ambulance and control room to view the traffic conditions in the desired area. Whenever the ambulance driver notices a high density of traffic, on the app, on the route to the hospital, he can alert the traffic control room by sending a request signal. The control room can control the traffic signals on the route of the ambulance based on the ambulance's destination and the traffic conditions on the route.

For monitoring the health of the patient, parameters like the heart rate and body temperature of the patient are measured using heart rate sensor and lm35 temperature sensor, respectively, and are sent to the hospital through GSM using raspberry pi.

Following are the objectives of this project:-

- 1) The main objective of this project is to create a 'green corridor' for the ambulance so that the ambulance can reach the hospital without having to face many obstacles.
- 2) To enable the driver of the ambulance to view the traffic conditions so that he decide the best route to reach the hospital.
- 3) To allow the traffic control room to view and clear the traffic

2. Internet of Things based approach:

Internet of Things is found upon GPS, GPRS and network, to construct an intelligent traffic monitoring system, which can serve a good facility to make a path to ambulance in traffic load to reach the hospital. Also, intelligent traffic monitoring system based on Internet of Things has a number of advantages such less

cost, high reliability, never affected by adverse weather, all weather operations etc. In addition, the technologies of Internet of Things makes it possible that a complete automation in monitoring system from data detect to data transmission, and to intelligent decision-making, from vehicle management to highway congestion control[4].

RF based approach:

In this traffic control approach an RF transmitter on the ambulance will communicate with the RF receiver mounted on the signal post. An algorithm is used to control the traffic signals automatically based on the key pressed by the driver from keyboard in the ambulance[3]

3. PROBLEM STATEMENT:

As compared to other countries with proper emergency systems, there is no single emergency system which could play a major role in managing medical emergency in India. There is a system in place to attend emergencies in the country, 108 is the emergency telephone number for ambulance services in parts of India. A typical problem such a system face is to get the location of the victim to send the help needed. Traffic signals in India has a fixed time period to switch the signals. No changes for emergency vehicles. There is no traffic control unit in ambulance. Whenever ambulance reaches a certain junction with a traffic signal, it has to wait for several minutes until clearance.

4. METHODOLOGY

The following two systems are combined in this paper - Traffic Control and Health Monitoring.

Both traffic controlling and health monitoring systems will work simultaneously. Patient's health parameters are monitored and at the same time driver of the ambulance can request the control room to manipulate the traffic signals. The ambulance first sends a request to the control room for traffic control. The request consists of the current location of the ambulance accessed using GPS and the location of the desired hospital is sent by the ambulance driver. This request is now sent to the AWS server. The server consists of all the requests of various ambulances that request for traffic control. Now, the server sends all the data of all ambulances that have requested for traffic control to the Control room. The control room side of the application now displays the requests of all ambulances. The ambulances are displayed in order of their distances. The control room operator can now choose which ambulance it chooses to navigate by selecting it. Now a map is displayed which shows the current location of the ambulance as well as the location of the hospital. The route between the ambulance and the hospital and the live data of traffic is displayed on the map. Here, green represents less traffic, orange represents moderate traffic and red indicates high traffic. An option is also displayed which enables navigation on google maps. The shortest route between the ambulance and hospital is displayed as well as the traffic at various junctions. With the help of this data, the control room can control the traffic signals at various junctions.

TRAFFIC CONTROL SYSTEM:

To develop the application for this system, the software used is Android Studio. The Google Maps API Key is used to deploy the features of google maps in the application. Also AWS Parse Server is used as the server for this application.

5. SYSTEM ARCHITECTURE:

5.1. Traffic management Architecture:

It is an intelligent traffic controlling system. There are four lanes and four traffic signals in the above diagram. Every signal has an RFID reader and a controller unit.

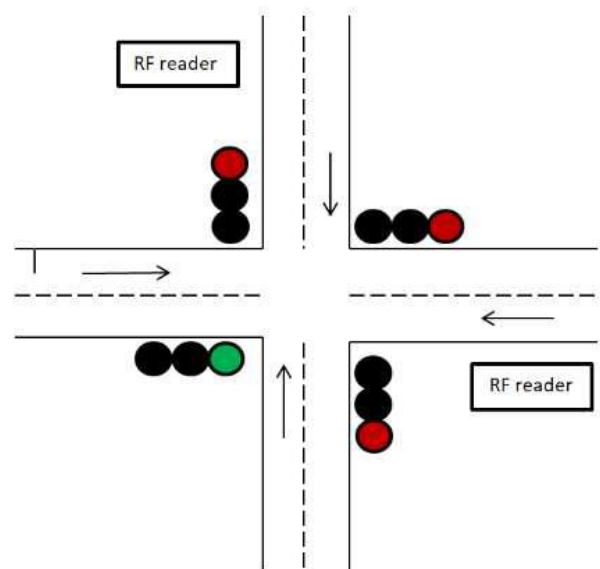


Fig 1. Traffic management

Whenever an ambulance is within the range of RFID reader of the traffic signal, RFID reader scans the RFID tag which is attached to the ambulance and the control unit automatically changes that signal to green and all other signals in the circle to red.

6. On the Ambulance Side of Application:

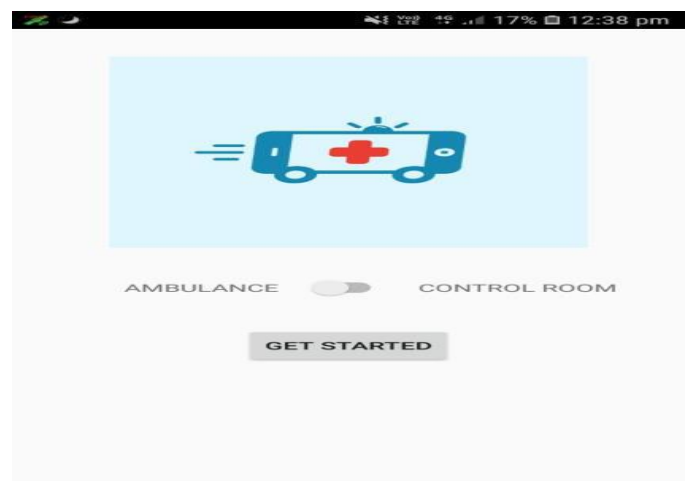


Fig. 1 Launch Screen of Application

As shown in Fig. 1, the user of the application can select whether to login as an ambulance driver or as control room operator.

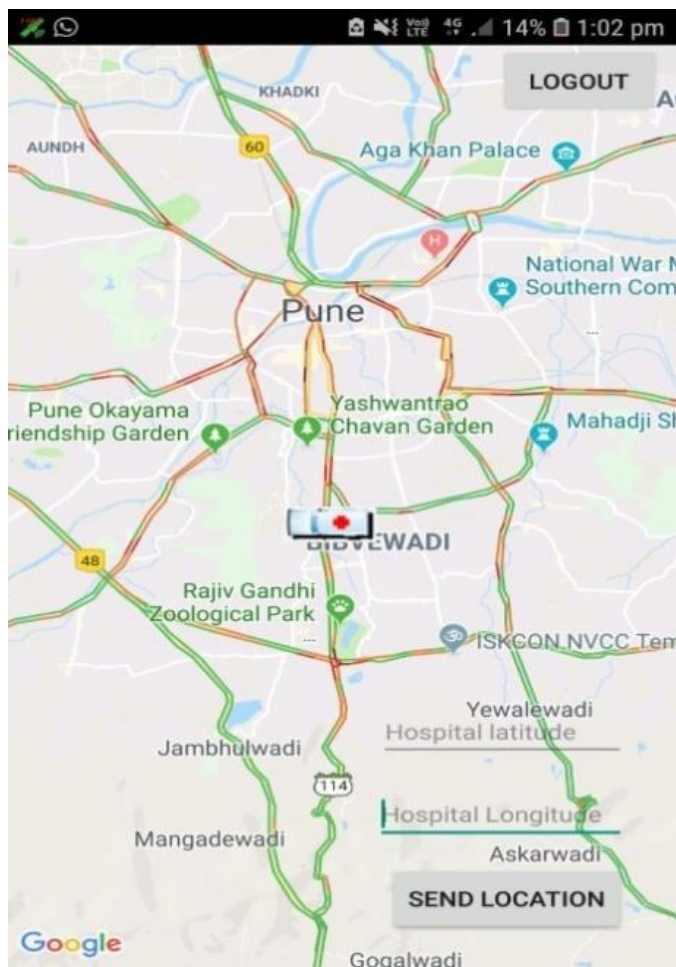


Fig. 2 Sending Request Screen

The request signal comprises of the current location of the ambulance as well the desired hospital location. This request is sent to the server.

On the Control Room Side of Application:

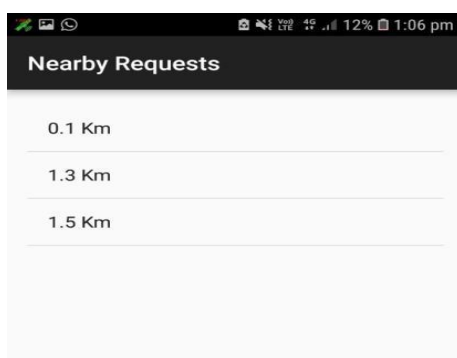


Fig. 3 Viewing Requests screen

On the control room side of the application, the list of distances from control room, of all the ambulances that have requested for traffic clearance, can be seen, as shown in Fig. 3. One of the requests has to be selected by the control room, to see the location of that particular ambulance and its destination hospital.

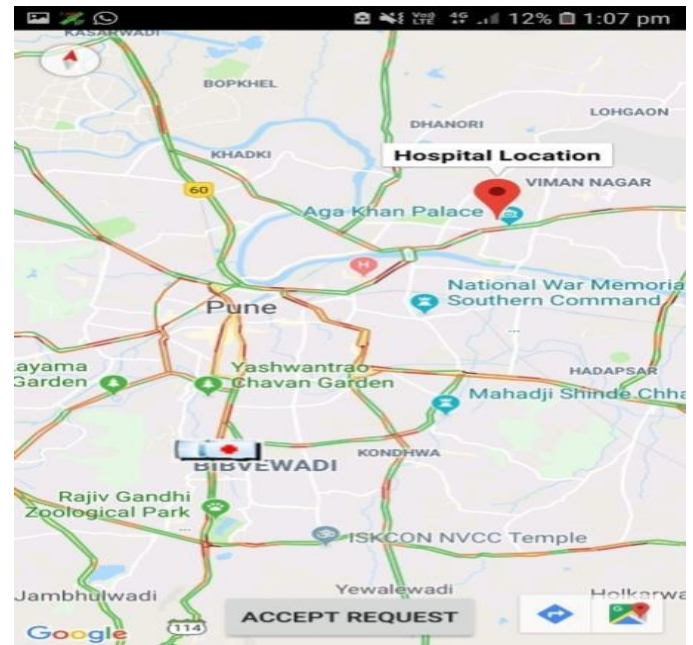


Fig. 4 showing location of ambulance and hospital to control room

On the screen shown in Fig. 4, the operator in the control room is able to view the ambulance location, the hospital location and the traffic conditions. Depending on the traffic conditions the control room can accept the request or ignore the request.

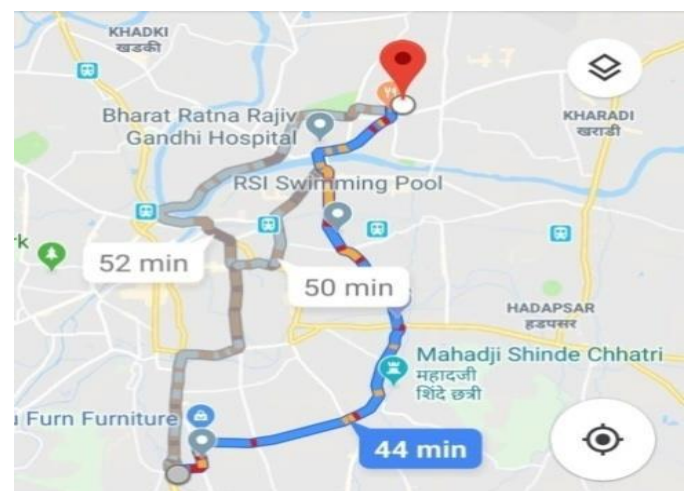
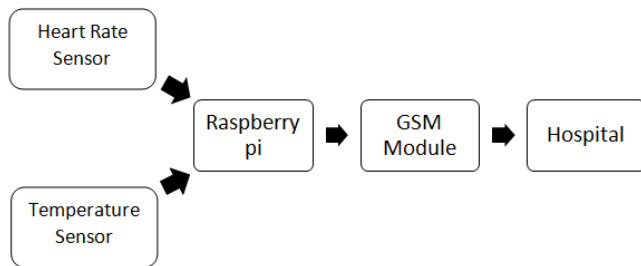


Fig. 5 Navigation Screen

When a request is accepted the control room is directed to the Google maps page. Here, the traffic conditions on the route of ambulance to the hospital can be seen and decisions for controlling the traffic signals can be taken accordingly. If there is heavy traffic, the signals on the route can be made green, thus creating a green corridor for the ambulance.

HEALTH MONITORING SYSTEM:

This part of the project uses Raspberry Pi and GSM Module SIM800A for its operation. The heart rate sensor is used to measure the heart rate of the patient and the lm35 sensor is used to measure the body temperature. The sensors are interfaced with the Raspberry Pi to obtain the health parameters of the patient. These parameters are then sent to the hospital through GSM module which is also interfaced with the Raspberry Pi.



7. CONCLUSION

The proposed Traffic Control for Smart Ambulance is based on monitoring of traffic conditions using Google maps API. Here, both the parties, the ambulance and the control room can view the traffic conditions on the application created. Using this application, the ambulance will be able to reach the hospital without encountering traffic on its way with minimum delay. Also, the health monitoring system will ensure that the conditions of the patient will reach the doctor before the patient so that the doctor can take necessary actions using these prerequisites. This traffic controlling and health monitoring system may lead to save one precious life.

8. FUTURE SCOPE

We further intend to create a database of all the hospitals which includes their location and contact numbers. Using this database the user of the application can select the desired hospital directly from a drop down menu. Also the patient conditions can be sent directly to the server from where the hospital can access the data that is meant for it.

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