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Traffic Control System for Smart Ambulance

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Abstract Now-a-days considering the fast-paced world, particularly in massive cities, several services get delayed due to traffic jams. Ambulance service is one among the crucial services that get delayed fairly often. Additionally, generally onsite doctors aren't obtainable. Therefore, the patient doesn't get medical attention forthwith. To solve this problem this paper provides a solution that is 'Traffic Control System for Smart Ambulance' which creates a 'green corridor' for the ambulance to reach the hospital. Also, it monitors the patient's health and sends the data to the hospital beforehand. In health monitoring system, the patient's very important health parameters like heart rate and body temperature are monitored. These parameters are sent to the hospital via message. In traffic control an android application is used in which the traffic control room controls the signals based on the traffic conditions and the location of ambulance and hospital seen on the app.

Keywords — Android App, GPS Location, Green Corridor, Health Monitoring, Smart Ambulance, Traffic Control.

I. 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 signalswork 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 thathe decide the best route to reach the hospital.
3) To allow the traffic control room to view and clear the traffic between the location of the ambulance and the intended hospital.

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4) To save the time invested in diagnosis of the illness of the patient by sending in advance, the patient health parameters.

II. LITERATURE REVIEW

Following are some of the approaches used for intelligent traffic control for emergency vehicles.

Cluster-First Route-Second approach:

Solving the Ambulance Routing Problem involves two kinds of decisions partitioning the injuries into clusters compatible with ambulance requirements and sequencing the call points in each cluster to get an ambulance itinerary. A classical approach for the basic routing problems is based on the cluster-first route-second principle, in which the partition is determined first. A traveling salesman problem (TSP) is then solved for eachcluster. The proposed algorithm, named PA-PSO is based in Petal Algorithm and the PSO approach[6].

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]

III. METHODOLOGY

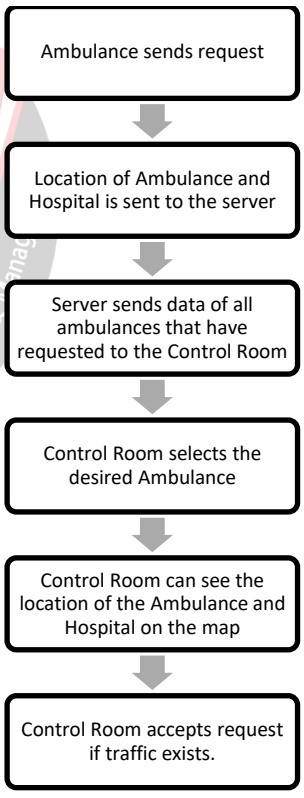
The following two systems are combined in this paper - Traffic Control and Health Monitoring.

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.

Flow Chart of Algorithm used:



On the Ambulance Side of Application:

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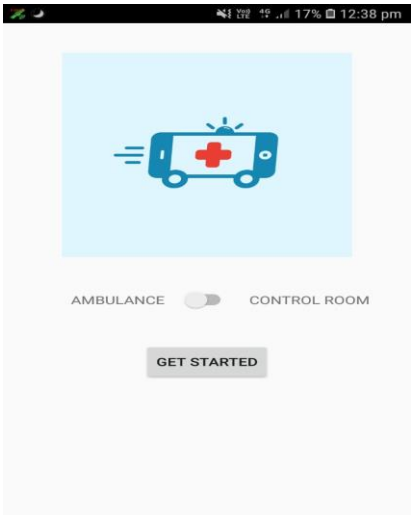

Fig. 1 Launch Screen of Application

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

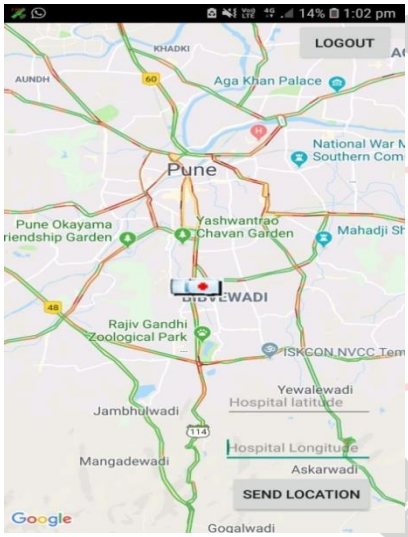

Fig. 2 Sending Request Screen

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:

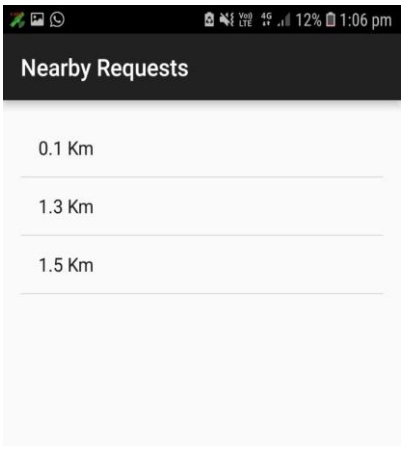

Fig. 3 Viewing Requests screen

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.

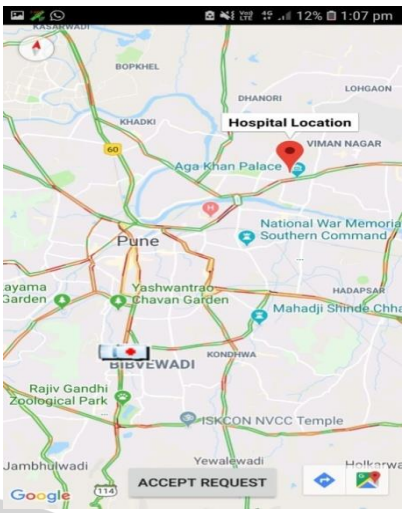

Fig. 4 showing location of ambulance and hospital to control room

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.

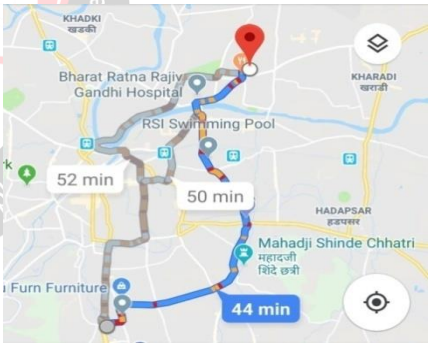

Fig. 5 Navigation Screen

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

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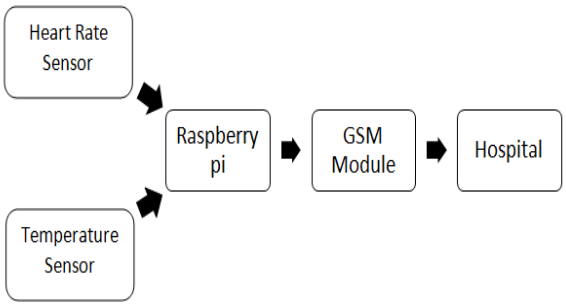
the hospital through GSM module which is also interfaced with the Raspberry Pi.



IV. 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 it's 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 pre-requisites. This traffic controlling and health monitoring system may lead to save one precious life.

V. 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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