GPS BASED TRAFFIC SIGNAL CONTROL SYSTEM FOR AMBULANCE USING MACHINE LEARNING

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Abstract*:This project addresses the given problem statement by automating the traffic signal control from the ambulance's driver end. The ambulance driver will have a mobile app installed in his mobile which will have the emergency mode toggle. When the emergency mode is on, the device will find the nearest traffic signal using GPS and it will send request to the control room for getting the current signal status. If the signal is already green, it will get the remaining time and based on the remaining time, the app will automatically request the control room for freezing the signal till the ambulance crosses with the help of machine learning. And if the signal is red, again based on the time left, the system will calculate the distance of ambulance from the signal and then it will make a request to the control room for opening that particular route where the ambulance is running. This will help the ambulance drivers to run freely without getting locked in the traffic.*

1. Introduction

All the countries are very strict in traffic rules, but we all know that ambulances need not to follow the traffic rules [11][12] during emergency situation as they are a lifesaver. But the problem is, if an ambulance is in a traffic signal and 100 vehicles are in front of ambulance, it is not possible for every vehicles to give way to the ambulance. If signal waiting time is 3 minutes, the ambulance at least have to wait for 3 minutes to cross the signal. In an emergency situation, even these 3 minutes play a vital role in saving a life. Hence, we come up with an idea to control the traffic signal with the help of ambulance driver's smartphone itself. This will considerably reduce the waiting time of the ambulance in signals and therefore we can save lot of lives.

We may think like, what will change in just few minutes delay. Let's talk about few statistics, According to a report published by Times of India about 146,133 people were killed in road accidents in India in the year 2016. Unfortunately about 30% of deaths are caused due to delayed ambulance. Another Indian government data shows more than 50% of heart attack cases reach hospital late, which can constitute unavailability of ambulances too but majority of it is due to patients stuck in traffic. What can as a responsible society we can do about it.

To achieve this, we are going to use the driver's smart phonein which an application will be installed. With the help of GPS, driver can able to find the nearby signal and can request the control room for freezing the traffic signal to green till the ambulance crosses the signal irrespective of the normal timed process.

2. Existingsystem

At present, we do not have any automation system for controlling traffic signals during emergency situations. There are traffic inspectors will be available in the main signals who are monitoring the vehicles which are breaching the signal. Also, if there is any ambulance waiting in the signal which could not able to move further due to traffic, the traffic inspector will instruct the other vehicles either to move or give space to the ambulance to cross the signal.

Though ambulances need not to wait in any traffic signals, there will be a big trouble if the signal is too big and it has number of vehicles in front. Traffic inspectors will always try to help the ambulances to cross during red signal. But sometimes it will take a considerable amount of time to clear the signal. And in other hand most of the smaller and medium signals will not have a regular inspector to monitor. Rarely, those signals will also face some heavy traffic, and in this situation if an ambulance tries to cross, the possibility is very less and the ambulance may need to wait till the signal turns on.

Though, the traffic signals are completely automated nowadays and it can be controlled by a control room, nowhere someone can request to change the signal

immediately during emergency. The few minute delays are killing many people in ambulances because of this situation.

There are lot of theories have been published for traffic automation system using IOT and many other concepts. Inspite of its theoretical success, those theories cannot succeed in terms of practical implementations due to various technical and real-time difficulties including hardware failures, network issues and so on.

3. Literature survey

In [1], hardware is used to calculate the health parameters. Serial communication is used to store it in PC which is in ambulance through which they are transferred to the hospital. RF communication is used to control the traffic.

The two systems which are combined in this paper are -health monitoring and traffic controlling systems. Dataacquisition will take place in Health monitoring system andparameters will be sent to the hospital server via PC. Thedriver of the ambulance controls the traffic using the keypadin the ambulance. Both the systems will worksimultaneously. The doctor in the hospital monitors thepatients' health parameters. The signals could bemanipulated by the driver of the ambulance at the sametime.

By adding a GPS navigation system with a congestiondetection module, this system can be improved for the realtime scenario.

In [2], the main aim of the paper is to design aMicrocontroller based intelligent ambulance system whichcan change the traffic lights upon its arrival at traffic lightjunction using IR(Infrared) sensors.

The ambulance system also has Global System for MobileCommunication based information device that alerts thedoctors about the patient's condition and informs thedoctors to report to the nearest hospital for patient's quickrecovery.

There could be a case where two Ambulances are exactly at equal distance from traffic light, in this case the traffic light receiver will give chance to the transmitter of any one Ambulance randomly without considering any fact.

In [3], the large amount of data that is generated by these devices can be handled by cloud computing and it can also be used to send command to those devices to perform a task. This project is based on the IoT and cloud. This project is to establish the communication between the traffic signals and the ambulance so that the traffic signal can respond to the arrival of the ambulance.

The application needs a required bandwidth for the instantaneous communication between the ambulance and the traffic signal.

In [4], the system will be image processing based adaptive signal controlling. Proposed system will be based on traditional system along with automated signal. Digital camera is mounted on the motor for rotation. This faces the lanes and gets the sense of the traffic. The artificial vision is captured with the help of the digital camera. The camera's direction changes in the steps of 90 degrees, it faces each lane and captures the image. In order to change the direction of the camera, it is controlled by the PC through microcontroller. Load of the traffic on each lane is estimated by Image processing techniques. The accuracy of the image processing compared to GPS is low. If a vehicle of a bigger size than an ambulance is in front of the ambulance, then the camera will not be able to capture the ambulance.

4. Proposed system

The proposed system is a complete automation system, where we are going to create a mobile application through which an ambulance driver has to activate emergency mode. The moment emergency mode got activated, the app will keep tracking the nearby traffic signals automatically with the help of GPS. Also, the driver will pin the destination and therefore the app will understand the route where the ambulance needs to travel.

Whenever it finds a nearby signal within the radius of 500 metres, it will immediately sends request to the control room for checking the current status of the signal in which the ambulance has to cross and it will open the signal automatically for giving the way for ambulance, and when it crosses the signal, again a request will be sent to set back the signal to the normal timed flow.

5. Modules

This system is divided into five modules as follows.

Module 1:*Setting up ambulance driver's mobile*

Every ambulance driver has to register his account to get started with this application. The registration details involve his personal details and all other official information. The mobile app has to be installed in the driver's mobile and mobile data and GPS has to be turned on always while he is using this app. The moment ambulance is driving for an emergency, the driver has to register that particular entry and the driver's mobile will be tracked to avoid any misuse of application.

Module 2:*Emergency mode activation*

After successful registration, once a driver picks up an emergency case, before starting from the source, the driver can able to select any nearby hospitals from the list and so the route also will be detected in the app. Then the driver will enable emergency mode and the app will start working in the background. The route map will be updated based on the ride dynamically.

Module 3:*Analysis of traffic signal*

Whenever the ambulance is near a signal i.e 500 meters behind a signal, an automatic request will be triggered from the app to the control room server for checking the current status of the signal and the waiting time for a change in signal. This module is a recurring one, and it will always alert whenever the ambulance finds a signal.

Module 4:*Decision making to switch signal*

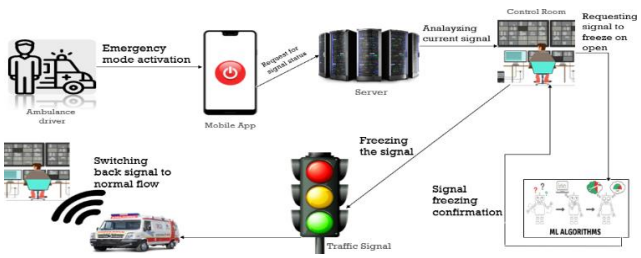
There are multiple scenarios are possible in this current module. If the signal is already green, and the waiting time is more than 30 seconds then there will be no more requests have been processed from the app. Else if the signal is green and waiting time is less than 30 seconds, then a request will be sent automatically to the server for freezing the signal in green itself till the ambulance crosses the signal. Else if the signal is red, then again a request will be sent to the server to change the signal to green and to freeze it on green, till ambulance crosses.

Module 5:*Turning back to normal flow*

Once the ambulance crosses the signal, it will be detected using GPS and again a request will be triggered automatically to set back the signal to the normal mode. That means, if before freezing the waiting time is 20 seconds, then the timer will again resume from that time.

6. Architecture diagram

The architectural diagram of the proposed system can be given as follows.



7. Conclusion

The traffic signal [13] control system for ambulance is proposed successfully and we can able to assure millions of lives by saving time in traffic signal. In this world of busy roads, traffic signal plays the vital factor in saving person's life. An idea is proposed in this paper for saving patient's life in a fastest manner. So, whenever the ambulance is 500 meters before the signal, the mobile app sends request to the server. Depending on the direction of ambulance the server change that particular signal to green. Considering the real time scenario, the system is improved so, we can reduce the death rate during emergencies.

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