Automated Traffic Signal Control System for Ambulance Based on IOT

[1]Sujata Yadav, [2]Mrs.Vaishali Kulkarni, [3]Ajita Zade, [4]Tanuja Shinde

Rajarshi Shahu College of Engineering, Pune University, Maharashtra

Abstract: Road traffic congestion has become a major issue for highly crowded metropolitan cities like Pune, Mumbai. This will create delay for the ambulance to reach the hospital in emergency case. The proposed system smoothens the ambulance movement by using RFID and an android app. This system creates an android app that connects both the ambulance and the traffic signal station using cloud network. This system uses RFID (radio frequency identification) technology to implement the intelligent traffic signal control. The basic idea behind this system is, if the Ambulance halts on the way due to a traffic signal, RFID installed at the pole near the traffic signal tracks the RFID tagged ambulance and sends the data to the controller. In case the RFID fails, the acknowledgment is taken from the user through the mobile app then the particular signal is turned to Green for some time interval and after the ambulance passes the original sequence of signaling is regained. Hence this system controls the traffic signal and can be very useful at emergency periods.

I. INTRODUCTION:

The main purpose of the project is to provide a free flow of ambulance to reach the destination early so the delay caused by the traffic congestion can be minimized. The Microcontroller based RFID system is used to alter the traffic lights upon its arrival at traffic light junction which would save lives at critical time. Radio Frequency Identification is a tiny electronic gadget that comprise of a small chip and an antenna. The RFID reads these information from the RFID tag installed at the ambulance. In case the RFID fails the system works further with the mobile app. This project would be helpful to make free flow of ambulance without being stuck into the traffic. In the current situation itself, transportation of a patient to hospital in emergency conditions seems quite simple but in actual it is very difficult during peak hours. Moreover, the situation gets worse when emergency vehicles have to wait for other vehicles to give way at intersections with traffic signals. In future it may get even worse. In this case recovery action need to be taken immediately. So, for our over populated environment, there is a real need of this project for the society to make easier day to day transportations. Our project will help to reduce blockage of system to meet the above need. It can be achieved by making use of two major technologies namely RFID, mobile app with cloud access.

SECTION I:

What is RFID?

Radio-frequency identification (RFID)

RFID is a technology that works in an electromagnetic field and identifies the tagged objects. It has two main components

1) Reader 2) Tag

The two types of tags are

i) Active tag: It requires a power source like battery and can work at larger distances from the reader. This distance can be of hundreds of meters.

ii) Passive tag: Unlike active tag, it does not require a battery or power source. The power here is supplied through the RFID reader. So the tags serve the main purpose of storing the information electronically.

Why RFID?

The RFID reader firstly interrogates with the RFID tag through encoded signal. Further the tag responds to the signal and provides the reader with required data and identification. Each tag has a unique serial number. This helps to identify the particular tag among several tags.

In this paper all such techniques are discussed in the following section for implementing an automated traffic signal control system for ambulance.

SECTION II:

B.Janaki Saradha [1] proposed a system using Radio frequency identification which is a tiny electronic gadgets that comprise of a small chip & an antenna .The chip is embedded with information's about patient's status & the ambulance current lane. The RFID reader located at the traffic signal reads these information from the RFID locator installed at ambulance. To avoid unnecessary traffic signal changes the ambulance current location & patient's condition using mobile app registered by the ambulance driver is referred. In case of network failure RFID takes the whole control. The 2 major technologies on which it works are

- RFID
- Mobile app with cloud access & GPS provided.

    RFID tracks the arrival of ambulance at the traffic signal at a certain distance, a mobile app is used for authentication whether the condition is emergency or non- emergency of the ambulance. GPS is used to track the nearest traffic signal and in turn to send the same data to the particular signal, this data from the RFID & app is given to the microcontroller to process the results & changes the signal accordingly. Both the RFID & mobile app integrate to serve the system without failure at any manner by alternatively working when other fails in it's action.

The system involves 4 scenarios

1. If the ambulance is in emergency condition is halted in traffic then the RFID gives the data of the ambulance and the app gives the value 'emergency' by the user and the signal changes to green.
2. If the ambulance is not in emergency situation then the user gives the value 'non-emergency' to the cloud network and the signal is not necessarily made green.
3. If the ambulance is in emergency and the RFID fails to work then the user gives the value 'blocked' to the cloud through app which makes the system work without failure.
4. If the ambulance in emergency is stopped due to network failure then the mobile app can't be accessed here the RFID takes the whole control by sending continuous data to the controller over a long time and further the signal changes are made.

    Another part is an Android app is developed which contains the patient's additional information about the patient's status and current location. This all gets stored in the server database; this information is then send by the server to the traffic signal controller which cross verifies from the RFID reader. In case the RFID fails after certain period of time 'BLOCKED' command from the app is send to the server. So, without further verification the traffic is cleared.

P. Priyanka [2] proposed system uses wireless technology and high speed microcontroller to

 avoid the traffic congestion and provide a smooth flow. It makes use of Arduino, RFID reader and a tag. After detection of the emergency vehicle the information is send through the RF transmitter and receiver. Also, a pair of IR sensors is placed to estimate the congestion in traffic and this information is send to the ambulance driver using GSM. It also detects the stolen vehicle passing through the path and the same information is send to the control room for further action.

Mercy Esther Tharabai [3] proposed a system using Advanced Risk Machine(MCU) in the ambulance section. Here a sensor is fixed at the emergency vehicle which collects the vibrations to the amplifying circuit. The circuit will then amplify the vibrations and give to MEMS (Micro electro-mechanical systems). This are able to store the factors like humidity, vibrations, temperature, pressure. The system is further connected with the accelerometer hence if the speed of the vehicle is at a high rate it will give a warning alarm to the driver. If the driver continues to drive at the same speed an in case the accident occurs the MEMS detects whether it is linear (x direction) or nonlinear (x, y, z direction) and stores the data of vehicle with cause of accident. GPS & GSM communication is done through serial communication which creates an interface through which it converts CMOS to TTL logic. The GPS is used to locate the position (latitude & longitude of the vehicle)

Suresh Sharma [4] this is system is based on RFID traffic control which eliminates the problem arising in the techniques of image processing. It works for multivehicle, multilane, multijunction area of a road. This system works on priority basis and makes efficient time management. The number of vehicles at each lane in a junction and the other routings are priorities based on which the other judgement and decisions are made.

Darpan U. Patil [5] The proposed system implements a real-time system using Android, GPS and cloud computing. It minimizes the time as well as cost in routing the emergency vehicles. This system automates for integration of cloud management, road infrastructures and emergency vehicles.

Harpal Singh [6] This system makes use of 8 RFID readers. In this system road has two lanes. Each lane has its own RFID reader. This reader keeps track of the vehicle that passes by. The information regarding the vehicle is stored on the database. Every reader has a different database at the interaction point. It also has a particular time stamp and traffic light.

Every vehicle passing by has a tag installed which has a pin is a vehicle identification number which is unique for every vehicle. This number provides information regarding type of vehicle and its priority. The number has 3 parts as shown below.

1) Priority of vehicle

2)Type of vehicle

3)vehicle number

Priority: here different priorities are considered for different vehicles. Initially the vehicles are divided into 4 different types based on priority.

1) Highest priority: Ambulance, fire brigade, VIP vehicles

2)High priority: school buses, college buses etc.

3) Low priority: car, motor cycle, scooters

4) Lowest priority: heavy vehicles

This priorities changes according to time. As during day time motor cycle and cars have higher priority and at night time heavy vehicles have higher priority. This system also avoid violation by using time stamp based on RFID readers.

Intelligent Traffic Light Controller:

Here the two lights called linked lights are at the opposite sides of the road joining intersections. RFID reader has information of every vehicle passing by the traffic signal follows its own round robin sequence, but when any higher priority vehicle like emergency vehicle is detected, the controller at traffic signal stops the round robin and makes the signal green to pass the emergency vehicle. Also the controller keeps watch on the time the signal is made green (this is based on number of vehicles). Based on this time limit is defined, if this limit gets exceeded, the signal changes.

Ben Ammar Hatem [7] In the proposed work the RFID integrated with the wireless sensor network. By WSN the read range of the RFID can be extended while identification of the WSN also monitors the RFID and the object environment and boosts the performance and energy of the reader. Here this system is being implemented for bus tracking. It implements on efficient intelligent bus tracking system by monitor. The traffic inside spacious station and thereby informing administrators about the schedule of the bus that is, whether it will arrive late or early. Thus, after the data is received the same is displayed on the WSN displays on the bus station as well as inside the bus.

Karthik Chaganty [8] This system makes use of various communication system for preempting traffic signal for emergency vehicle. It has a RF transmitted receiver pair of 434MHZ, it can be used for short range communication over a distance of 200m. The RF receiver is further connected to the microcontroller, which is to be connected to zigbee. The zigbee communication helps the central processor to recognize the lane for the emergency vehicle. After the reception of the data at the Zigbee receiver the signal is sent to the controller that is ATMEGA 328 which is at the traffic signal. Here a master-slave combination is used so that simultaneously 4 lanes can be controlled. Another controller is connected to this controller in master-slave pair. The slave is further connected to the traffic signal at the four other lanes. Another pair is the master is attached to the data logging system, which helps to produce the timestamp and also recognizes the lane name.

CONCLUSION

Human life is precious and must follow safety measures very conscious in all aspects this of course includes ambulances services too. In this, by using intelligent ambulance system we can achieve the uninterrupted service of the traffic control system by implementing the alternate methods for signal change to allow flow control. As the accuracy of the RFID is more than Cameras, therefore our proposed paper also improves the performance of traffic light Violation Detection System. This system is cost effective, multiple usage and deployed using trending IOT, which is more efficient.

ACKNOWLEDGEMENT

REFERENCES

[1] B. Janani Saradha, G. Vijayshri & T. Subha "Intelligent Traffic Signal Control System For Ambulance Using RFID And CLOUD" 2017 Second International Conference On Computing and Communications Technologies(ICCCT'17)

[2] P. Priyanka, V. Sharmila, V.C. Sindhu, P. Sangeeth "Intelligent Traffic Control System for Ambulance Clearance and Stolen Vehicle Detection" International Journal of Research and Engineering, Volume 3.

[3] Mercy Esther Tharabai.M "Automatic ambulance rescue system using shortest path finding Algorithm" International Journal of Advanced Information Science and Technology (IJAIST) Vol.4, No.2, February 2015 .

[4] Suresh Sharma, Alok Pithora, Gaurav Gupta,Mohit Goel & Mohit Sinha "Traffic Light Priority Control For Emergency Vehicle Using RFID" International journal in innovations in engineering and technology(IJIET).

[5] Darpan U.Patil "Emergency Vehicle Sensing Traffic Signals Using Android and Cloud Computing "International Journal of Innovative Research in Science Engineering and Technology"

[6] Harpal Singh, Krishan Kumar, Harbans Kaur "Intelligent Traffic Lights Based on RFID" International Journal of Computing & Business Research.

[7] Ben Ammar Hatem &Hamam Habib "Bus System Using RFID In WSN" European and Mediterranean Conference on Information Systems 2010.

[8] Karthik Chaganty, Tanmay Karadkar and Dr. Rajani Mangala "Traffic signal preemption for emergency vehicles" International Journal of Electronics and Communication Engineering and Technology (IJECET).