

Traffic Control System for Emergency Vehicles using Radio Frequency Identification

Santhalin Shebila. S^{#1}, Sankar. R^{*2}

¹Scholar, Master of Computer Application, S.A. Engineering College, Chennai, India
santhalinshebila@gmail.com

²Assistant Professor, Master of Computer Application, S.A. Engineering College, India

Abstract— Nowadays road traffic in all urban and in national highways are increased and which leads to the accidents. The road traffic is controlled by using Radio Frequency Identification (RFID) technology [1][2]. The RFID sensor, sense the data about the vehicle which is near the signals and sends it to the controller. The controller receives the signal from the sensor to his/her smart phone and controls the traffic using his smart phone according to the emergency vehicles priority in the traffic. In this paper, the priority is given to the emergency vehicle to save the human life. This technology can be enhanced in big cities with huge traffic congestion. Furthermore, this paper can reduce the traffic congestion during the arrival of emergency vehicles to save the human life and to reach the appropriate destination. The algorithm which is used in this paper is Priority Based Control Algorithm to control the traffic in roads specifically for the emergency vehicles.

Keywords— Radio Frequency Identification; Emergency Vehicles; Road Traffic; Sensor; Priority Based Control Algorithm.

1. Introduction

According to the statistics on Road traffics and accidents in India, more than 1, 37,000 people were died in 2013. This scenario has created a tedious job for controlling traffic and to make the emergency vehicles to move freely in the area of Delhi NCR, which is the top most traffic cities in India. The main reason for the traffic congestion is the increasing of the vehicles day-by-day. To avoid traffic and to save the human life, some process has to be done. Due to the traffic congestion in Delhi NCR, more than 30Lakh litre fuel is wasted daily.

Nowadays, the emergency vehicles are waiting in the traffic due to traffic jams. Due to the increasing of the vehicles, the traffic congestion is also being high and so that the emergency vehicles also being struck in the heavy traffic of Delhi NCR. This traffic congestion leads to the loss of human life because, the vehicles do not reach the destination at time. In order to overcome this, a new way to control the traffic based on the priority of the vehicle is been enhanced in this paper. This paper proposes a new way of controlling the traffic congestion based on the

priority of the emergency vehicles using the RFID technologies. The RFID tag which is used for sensing the vehicles in Active RFID tags. RFID tag is a small chip which can carry more or less 2,000 bytes of data. RFID sensor can sense vehicles information which is around 20 feet distance from the sensor [3][4]. The RFID tag is attached in all vehicles, which contain the vehicle's and owner's information with a Unique ID. The Active RFID tag senses the vehicle at the real-time and the frequency range is between 433MHz to 915MHz. It uses the battery power consumption which last between 3 to 5 years. The batteries can be replaced.

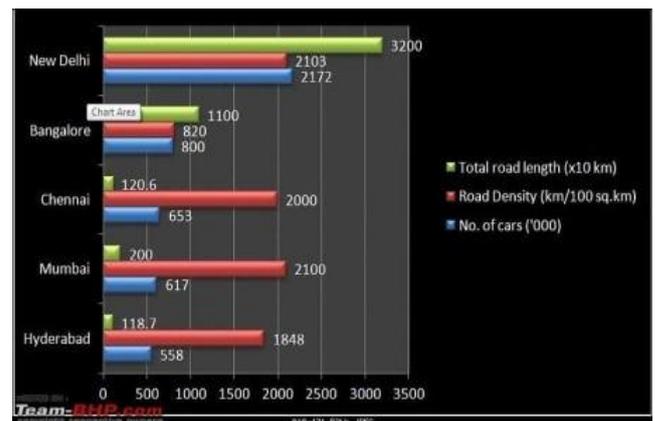


Fig. 1: Comparison of traffic cities in India

The road traffic control system is to check emergency vehicles and allow them to pass immediately or help to cross the signal without waiting in the traffic. The vehicles are sensory and the data are stored in big data (to store large or complex data) and are filtered and transmitted to the controller to control the signal.

2. Existing system

The system is to track and sense the Vehicle using RFID tag and also a camera is used to monitor the images of the vehicles which cross the signal. The data and images are collected for transmitting them to database and for tracking the vehicle. This helps in giving alert signals about traffic and the shortest path to reach the destination. Global

System for Mobile (GSM) is the technology used earlier. The data are collected and transmitted through the smart phone using GSM or General Packet Radio Service (GPRS) technology [5]. The smart phone application allows the controller to connect to the server using Software Development Kit (SDK) in order to develop applications that run on the android platform.

2.1 Disadvantages of Existing System

- Time delay occurs for emergency vehicles until it cross the signal.
- If an ambulance got struck in the traffic, loss of life for human being may happen.
- The GSM network used is not fully reliable.
- Waiting time, fuel consumption loss occurs during the traffic congestion.

3. Proposed System

In the proposed system, a new algorithm known as priority based control algorithm is used to filter the necessary data about the emergency vehicles from the collected data. Based on the priority of the emergency vehicles, the filtered data is send to the controller's smart phone. The traffic is being controlled by the controller from the location where he is. The time required for the emergency vehicle to cross the traffic is being calculated and the signal is set or the time is extended for the emergency vehicle to cross the signal, and after the emergency vehicle passed, the traffic is set back to the normal state.

3.1 Advantage

- Less human work is needed to control the traffic system.
- The controller can control the signal at the place where he is present and no need to go to the control room to control the traffic.
- Less time is consumed and no fuel wastage on the traffic.
- The first priority is given only to the emergency vehicles.

4. Methodology

Nowadays, we can often see emergency vehicles waiting in traffic jams. On busy roadway, the traffic delays may cost a lot more than the time. In such cases, the emergency vehicle prioritization system is obviously necessary. The methodology used in this paper is Priority Based Control Algorithm (PBCA). When manufacturing

vehicles, a unique code is assigned to the vehicles which is known as Vehicles identification Number (VIN).

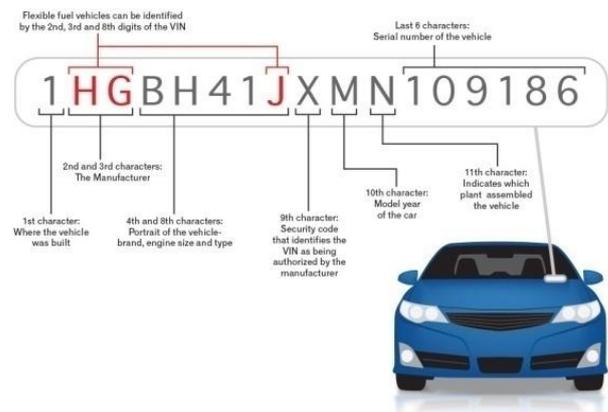


Fig.2: Representation of Vehicle Identification Number

The VIN composed of 17 characters. The emergency vehicles contain the RFID tag with the information about the vehicle. The main purpose of this methodology is to make the emergency vehicle to move freely without getting stuck in the traffic so as to save the human life. The process followed in this paper is,

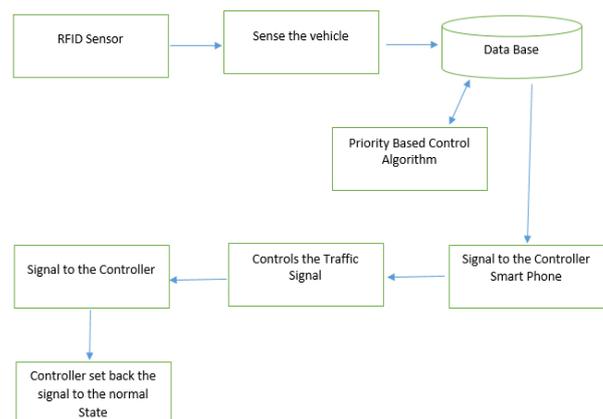


Fig.3: Process flow

The data is censored from the vehicles using RFID tag. It is processed in data acquisition and then to the database. In the database, the priority based control algorithm is performed to check the priority of the vehicle, the direction of the vehicle, distance between the vehicle, signal and time taken to cross the signal are calculated and then sends to the data acquisition.

The data acquisition converts the signal into the digital value. Then, the data is modulated, encoded and send to the controller's smart phone. The controller sets the time delay and change the signal according to the direction of the emergency vehicle. After emergency vehicle is crossed the signal, the controller set back the signal to the normal state.

5. Implementation

The main purpose of the PBCA is to check for the priority of the emergency vehicle. The implementation of PBC Algorithm - The four directions are NN, NE, NW and NS, and the direction of the emergency vehicles is XN, XS, XW, and XW.

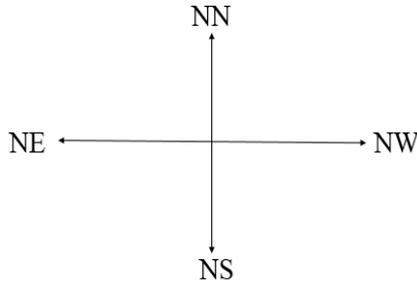


Fig.4: Direction of the vehicles

The RFID tags are placed in 2 places to hear the signal in each direction. One of the RFID tag is placed near the speed break of the signal and the other tag with a distance of about 40 meters, because the tag can sense for about 20 meters around it.

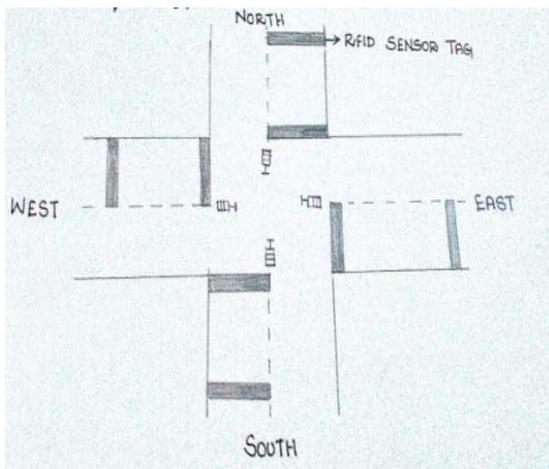


Fig.5: Location of the RFID sensor near the Traffic Signal

Priority Based Control Algorithm

- The algorithm checks for the direction of the emergency vehicle.
- It measures the distance between the signal and the emergency vehicle.
- Now, current signal in the direction of the emergency vehicle is checked.

If the signal is in green, the time taken for the emergency vehicle to cross the signal and the time left for the signal colour to change is verified. If it is equal then it proceeds with the same time limit if not the time

delay is been set. If the signal is in red color, it stops the direction of the signal which is green in color and changes to red. Then it sets the direction of the emergency vehicle to green and once the vehicle crossed the signal, the signal is again set back to the normal state.

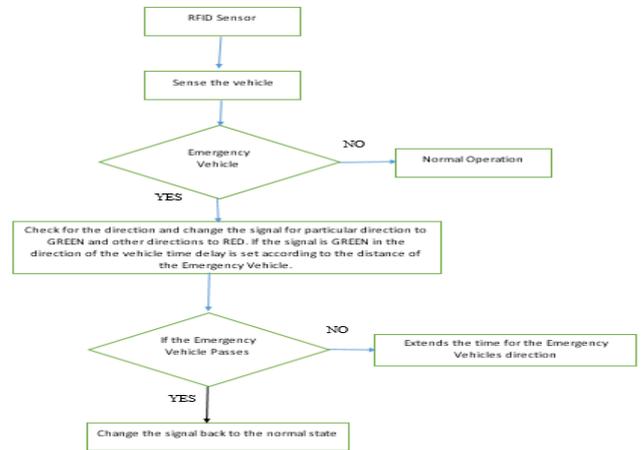


Fig.6: Flow chart for one emergency vehicle in Traffic

Suppose if more than one Emergency Vehicle occur at the same time in different directions. It measures the distance between the vehicles and the signal; the vehicle with the least distance is allowed first and then the next emergency vehicle passes the signal.

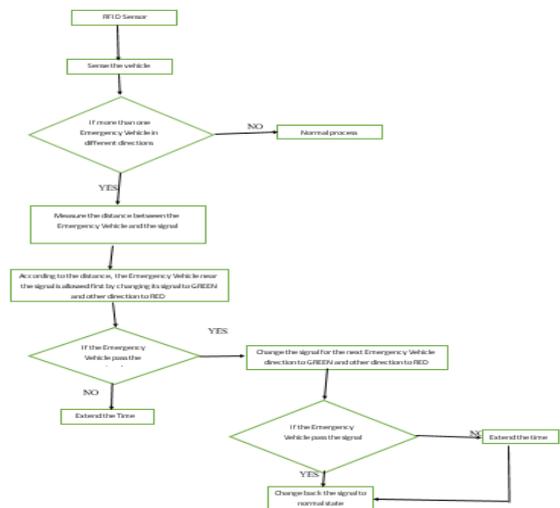


Fig.7: Flow chart for more than one emergency vehicle in traffic

The smart phone used by the controller is connected with the database where the user gets the filtered data about the emergency vehicle and then he controls the traffic signal according to the data received in the phone by changing the traffic signal for the arrival and departure of the emergency vehicle.

5. Result

By using the Priority Based Control Algorithm, there is a decrease in the human being death by avoiding the traffic and to reach the destination of the emergency vehicle in Time. The method is implemented and made a sample survey for 6 years.

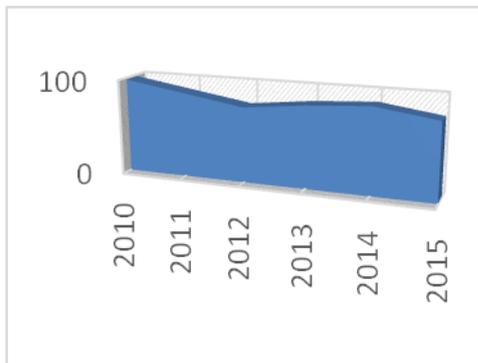


Fig. 8: Percentage for death of human due to the emergency vehicle stuck in traffic

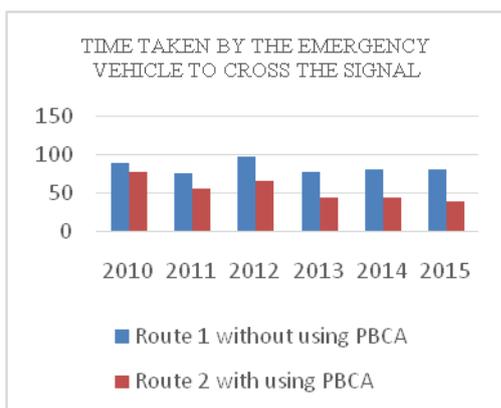


Fig.9: Time taken by the emergency vehicle to cross the signal

6. Conclusion

This paper helps the emergency vehicles to reach appropriate destination in accurate time to save the life of human beings using active RFID sensor technology. The RFID tag is used to sense the data of the vehicle and send to the database. The data are filtered based on the priority of the vehicles and then send to the controller’s smart phone. The controller controls the traffic signal to allow the Emergency Vehicle to cross the signal and to reach the destination in time. Thus the process of filtering vehicle is based on the priority.

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