TRAFFIC MANAGEMENT FOR AMBULANCE

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Abstract - *In today's generation there is an increase in population, and an increase in people's demand for living an easy, rich and comfortable life that leads to an increase in buying cars, bikes for individual use. This increases traffic on the road. For regulating this traffic, we rely on traffic signals and traffic police. Traffic congestion is generated at intersections.*

Currently in India we rely on traffic police and traffic signals for regulating the traffic in the roads. There are new technologies emerging for regulation of traffic. The use of IoT and Machine Learning has proven to be a solution for traffic. Using RFID sensors which detects the RFID card already present in ambulance. This data is communicated with the NodeMCU where traffic signaling system gets changed based on emergency and priority case of vehicles entering the lane. This helps us to regulate the traffic and helps the emergency vehicles to move fast from traffic. Thus, we can regulate the traffic properly and congestion in the road can be avoided. This proves to be better solution for ambulance in the traffic.

***Key Words*: Traffic congestion, use of IOT, RFID, NodeMCU**

1. INTRODUCTION

Due to increase in traffic demand, vehicle takes a halt or gets slowed down resulting in traffic congestion. In the area of traffic, Traffic light Signals are there to clear traffic deadlock condition. The signal systems are dependent on humans for controlling it based on the amount of traffic occurring rather than being a smart system. There are new technologies emerging for regulation of traffic. Use of IOT and machine learning was the solution for traffic.

1.1 USING IOT

RFID is "Radio-Frequency Identification" and refers to a technology where digital data is encoded in RFID tags or smart labels are captured by a reader via radio waves .It is an Auto-ID Technology is similar to barcoding in that data from a tag are captured by a device that stores the data in a database. The most notable is that RFID tag data can be read outside the line-of-sight, whereas barcodes must be aligned with an optical scanner. Using RFID sensors detects the RFID card which is present in ambulance and this data is communicated with NodeMCU where based on priority case of vehicles entering lane traffic signaling system gets changed. This helps to regulate the traffic and helps emergency vehicles to move fast. So, to solve this above-mentioned problem, we have done research some survey and came out with the solution of Information and communication Technologies i.e. IOT smart systems for regulation of the traffic signaling system.

2. OBJECTIVE

Currently in India we rely on traffic police and traffic signals for regulating the traffic in the roads. There are new technologies emerging for regulation of traffic. The use IoT and Machine Learning has proven to be a solution for traffic. Using RFID sensors which detects the RFID card already present in ambulance. This data is communicated with the NodeMCU where traffic signaling system gets changed based on emergency and priority case of vehicles entering the lane. This helps us to regulate the traffic and helps the emergency vehicles to move fast from traffic. Thus, we can regulate the traffic properly and congestion in the road can be avoided. This proves to be better solution for ambulance in the traffic.

3. LITERATURE SURVEY

Urban emergencies are always going to be hard to avoid and hence, researches have taken place to implement mainly IoT technology for urban traffic emergency response systems. The advantage of IoT is that the system used is intelligent and human errors aren't applicable until there is a problem in connectivity.

A structured database is formed by summarizing data of decision-making measures like vehicle operation, personnel evacuation, traffic bayonet, etc. The decision-making tree is established by data mining and an emergency rescue path guidance system is established. The data collection consisting of locations of nearby emergency vehicles, location of rescue, dynamic condition of the pathway - is sent to the rescue path guidance processing unit. Bayesian network model is used for processing these discrete data thus allowing the rescue vehicle to leave the incident area and reach the accident spot. [3]

Most existing approaches based on Wireless Sensors and Actuator Networks [4] are to be designed in such a way that they are able to determine the best value of network scheduling parameters. However, the delay constraint of each packet of communication protocols do not provide stability. Based on the worst-case probability, the traffic generation rate is optimized while guaranteeing the schedulable constraint of the network.[4]

In the past, Fixed Cycle (Static) TLS was used rather than Dynamic TLS in traffic management systems. Fixed Cycle TLS was inefficient because it leads to increased density of traffic and congestion, especially on roads that already had a high volume of traffic flow to begin with. A Dynamic TLS can help to greatly reduce this congestion by adapting traffic pattern based on the number of vehicles on the road at any given time. [2]

Modern systems are also based on operation in real time by using RFID tracking systems of vehicles. Since they provide cost-efficient solutions to reduce traffic and take care of the safety measures and automated, also saving the cost constant human involvement, they can be extensively used but in a country like India, the traffic Signaling System is still dependent on traffic police. The advantages of Integrated Traffic Control Systems (ITCS) provide effectiveness in traffic management systems. However, the detector used in ITCS contains the vehicle information to detect arrival time at the next intersection and can also be proven a violation of citizen rights such as privacy. [1]

4. METHODOLOGY

An Intelligent Traffic Control System (ITCS) is proposed which uses Radio Frequency Identification (RFID) to solve the problem of controlling the traffic. The USA RFID tag with high speed which operates in the band of frequency 902-928Mhz was designed for nationwide road toll collection. The RFID Tags are given to vehicles and the RFID reader is situated at the junction. At a distance of 100m appx the reader can identify the vehicle and put the data in CCS. As a vehicle passes by a reader, it tracks the vehicle through the RFID tag attached to the vehicle and retrieves its electronic product code (EPC) data, it consists of vehicular identification number (VIN). The VIN in each vehicle has a unique VIN. So, when a vehicle moves towards or away from the junction, the two readers in its path detect it and convey obtained data to the CCS with some delay. Then the two readers respond by giving the information of the movement of the vehicle (whether it is moving towards or away from the crossing). Every instant, the Database processing system (CDPS) checks the data in various parts of the dynamic database and computes the level of traffic for all the roads merging at the junction. Then it sends the computed information to the Decision making system(DMS), which operates the traffic signals according to the current traffic (showing the green light in the direction of maximum traffic).
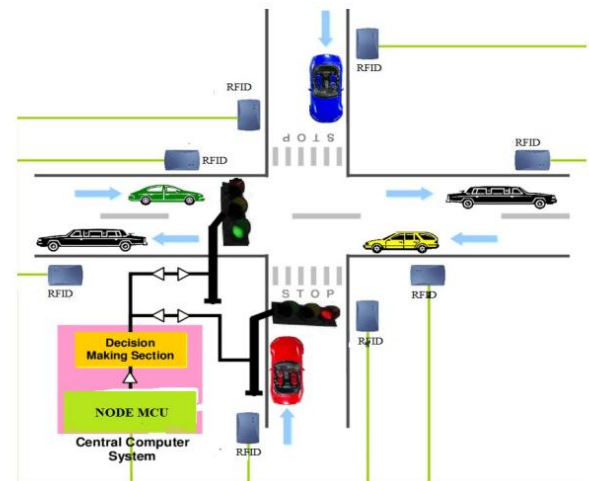

Fig -1: A Road Crossing with RFID Readers

5. HARDWARE AND SOFTWARE REQUIREMENT

To implement the proposed system, it was required that we need electronic components and a suitable bridge to connect us to the medium processing the data i.e. the software and the hardware. So, we used Radio frequency identification module (RFID) for identification method and we used NodeMCU for communication process. We also have PCF8574 for the pins connection which is needed. For the software requirements we need Arduino Ide where the basic code is for the traffic light signals. A cloud processing session takes place on the platform FIREBASE from Google Inc.

6. SYSTEM DESIGN

It combines different technologies like cloud services, android app, sensors. RFID sensors at a certain distance from the signal junction say 100m or greater than that, the placement is such that the ambulance should be detected early in the heck traffic and should be dispatched as soon as possible from that junction and the other consecutive junctions along its path.

The drivers will provide details of the accident once he reaches the spot. The details get stored in Google Cloud Services (firebase). The driver is tracked with his vehicle using Rfid tags and RFID sensors. This will prioritize the ambulance of which lane to be released first if the RFID is punched at the same time.

There will be RFID modules at the 4 corners of the road which will track the radio frequency of emergency vehicles by RFID card tag. When vehicle passes the reader, it tracks the vehicle through the RFID tag attached to the vehicle and retrieves the electronic product code (EPC) data. This data is communicated with the NodeMCU where traffic signaling system gets changed based on emergency and priority is given to that vehicle when entering the lane. For high traffic,

more time will be allotted, until the road is clear and for low traffic density normal sequence time is given. The traffic density information of every road is to be sent to NodeMCU to differentiate as heavy traffic and normal traffic. This information on traffic density along with date and time are updated on web page of cloud for further process and change the traffic light sequence accordingly.

6.1 BACKEND PROCESS

Now the RFID card scanned matches their manipulation of the regular signal working at that junction, RFID gives the data to ESP8255 NodeMCU module which is connected to signal through wire and wirelessly to the traffic control room. The signal gets manipulated, which means the lane in which the ambulance is detected remains green until the RFID next to signal detects the ambulance and recapitulates the function of the normal signal. And while this process is happening simultaneously the NodeMCU which has wifi module inbuilt sends the data to cloud about the manipulation and the data of the ambulance of its source and destination the case carrying along with it. The control room gets aware about the manipulation and they have access to set the signal back to normal functioning through reverse communication. This process continues for the next junction and so on wherever required.
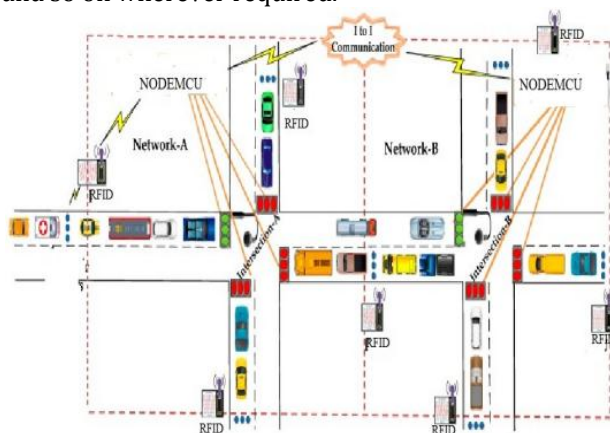

Fig -2: Demonstration of 4 lanes and working

7. ADVANTAGES OF INTELLIGENT TRAFFIC CONTROL SYSTEM

1. Traffic signals are used according to the current volume of traffic. Some of the existing systems also operate according to traffic volume.

2. Different priorities can be assigned to vehicles – (a) Ambulances, Fire Brigades and VIP vehicles can be given unrestricted passage irrespective of volume of traffic.

3. Stolen vehicles, or vehicles booked for offence can be tracked and the time and direction of travel is obtained.

4. E-Tolling of vehicles can be done (for all directions)

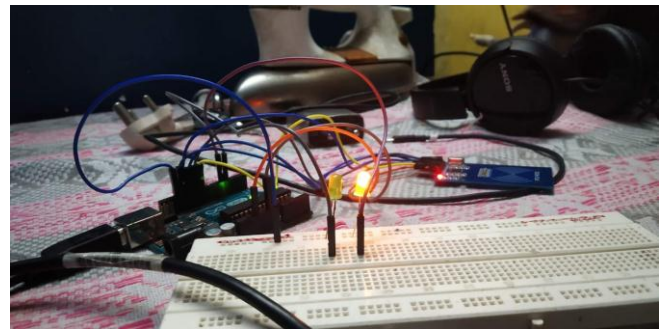5. Reliable traffic data is generated for statistical purposes.

8. RESULT

Fig -3: Hardware output 1

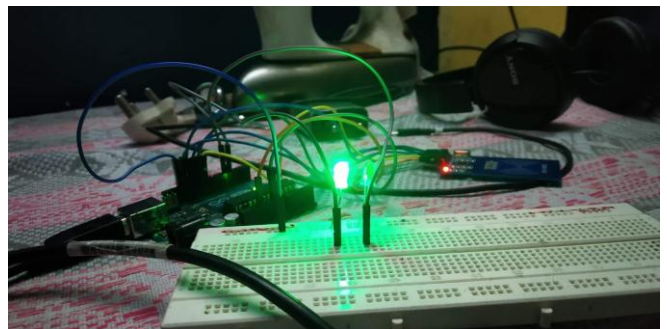This shows the normal sequential functioning of signal controlled by Node MCU.

Fig -4: output 2

As a RFID tag is identified by the sensor the signal gets green for that particular lane there by clearing the lane for emergency vehicles.
Clearance of the traffic ahead of emergency vehicle happens efficiently as the green light stays on as long as the vehicle passes the respective lane.

Fig -5: model
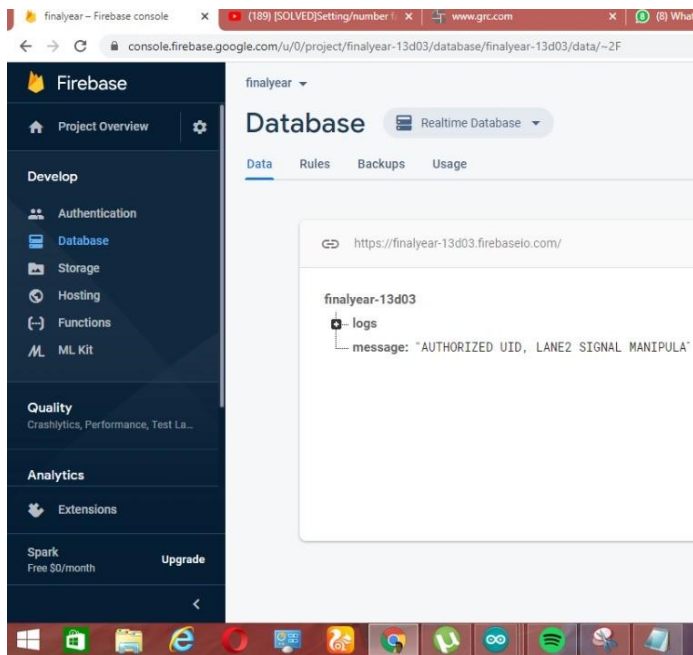
Fig -6: firebase output

In Fig -6: firebase output, this web page alerts the control room about the manipulation made in XYZ junction due to an emergency vehicle.

9. CONCLUSION

In this paper, we have proposed a methodology as a solution to pave the path for emergency vehicles that could get stuck in critical situations, say traffic. Here, we implement the use of a cloud center which makes the decisions for traffic lights and clears the lane in which the emergency vehicle is travelling using RFID tags and sensors. The one main component with each 4 cross-lanes will send information to the control/monitor room (cloud to control room) which will carry an automated system i.e. the cloud which will help us change signals without any further due wirelessly (cloud to signals). We need to basically allot more green-signal time depending on the density of traffic i.e. more for intense traffic and less for normal traffic. For now, we allot the same time interval irrespective of the density of traffic that will follow a complex algorithm on Ubuntu and certainly can produce delay in change of traffic lights from red to green.

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