

SMART TRAFFIC SIGNAL MONITORING & CONTROLLING USING IoT

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Abstract—This paper is about Smart Traffic Signal Monitoring & Controlling Using IoT which uses intelligent components like mobile application, HM-10 BLE, microcontroller, camera etc. It also consists of modules for i) Allowing passage of prioritized vehicles viz Ambulance, VIP, etc. ii) Enabling users to track their stolen or lost vehicles. iii) Help people to get information about the traffic density in specific area. Camera's are used for unique identification of emergency vehicles and mobile applications are used to get the traffic free road and nearest hospital.

Keywords: HM-10 BLE, Micro controller, Mobile application

1. INTRODUCTION

Traffic signal management is one of the major problematic issues in the current situation. Such scenarios, every signal are getting 60 seconds of timing on the road at a regular interval, even when traffic on that particular road is dense. The main motto behind our project is to provide a smart way of controlling traffic light timing during a peak hours and also to provide smooth flow for the ambulance to reach the hospital in time. This scheme is fully automated thus it controls the traffic lights, helping to reach the hospital in time. This is not preferred only for ambulance. It is preferable for other emergency vehicles such as fire engine.

2. LITERATURE SURVEY

There were many previous works carried out on SMART TRAFFIC SIGNAL MONITORING & CONTROLLING USING IoT. But these are a few of them which helped us to get ideas for our current prototype. In India as the population is being increasing day by day the traffic is also increasing with proportionality. So the traffic signals need good coordination for the smooth flow of traffic during the peak hours. More over road accidents in the city have been incessant and to bar the loss of life due to the accidents is even more crucial. In this fast-moving world, we are in a compulsion to rush our self which makes the traffic congestion and accident an inevitable one. In foreign countries, they successfully save human life, because whenever an ambulance comes, they move aside to clear out the route till the ambulance passes through. On the other hand, in INDIA, whenever an ambulance comes it is controlled manually at the traffic junction by a traffic officer. Nowadays all systems are

working automatically. So, we proposed system called "SMART TRAFFIC SIGNAL MONITORING & CONTROLLING USING IoT". In early days, the traffic is controlled manually by police officer. They decide when the vehicle has to cross the road and also provide importance to the emergency vehicle. Then in Intelligent Traffic Management System, the traffic is controlled automatically by each lane 120 seconds of green light is set on. Before green light, yellow light flashes for 20 second, signifying to start your vehicle and be ready to go. The disadvantages of this system is it does not provide timing based on priority because of that people has to wait for long time even though there is no traffic and also does not recognize and prioritize the emergency vehicle. They consists of two parts: wireless sensors network (traffic sensor nodes (TSN)) and a application for set a path for hospital. In this model they collected traffic data with help of sensors and control the traffic.

Describes the concept of traffic clearance in which the time delay between the switching of signals is based on the congestion of vehicle. In our project we use 10s for green light to be left ON. If the congestion increases this duration will extended to 20s. Describes about density based traffic clearance: Initially we started this project only for ambulance mode but we thought of using this concept for normal mode also by using the knowledge of this paper. Keeping this paper as reference we can extend our project by placing camera at junction in four ways. Traffic is cleared using green wave system. The green wave is the synchronization of the green phase of traffic signals. The disadvantage of this system is that if green wave is disturbed the traffic will collapse. Way for ambulance in lane is provided through IMAGE PROCESSING technology. When emergency vehicle is on lane it turn traffic signal to green.

3. Existing Work

Then in Intelligent Traffic Management System, the traffic is controlled automatically by each lane 120 seconds of green light is set on. Before green light, yellow light flashes for 20 second, signifying to start your vehicle and be ready to go. The disadvantages of this system is it does not provide timing based on priority because of that people has to wait for long time even though there is no traffic and also does not recognize and prioritize the emergency vehicle.

4. PROPOSED WORK

The proposed method provides an intelligent traffic control system to pass emergency vehicles smoothly. Here, each individual vehicle is equipped with special radio frequency identification (RFID) tag which is placed at a specific location which cannot be removed easily. This method makes use of RFID reader, max 232, and PIC16F877A system-on-chip to read the RFID tags attached to the vehicle. In addition, when an ambulance is approaching the junction, it will communicate to the traffic controller in the junction to turn ON the green light until the ambulance passes and the red light for the other path should be turned red.

5. Working principle

It avoids problems that usually arise with Standard traffic control systems, especially those related to image processing and beam interruption techniques. This RFID technique deals with a multivehicle, multilane, multi road junction area. It provides an efficient time management scheme, in which a dynamic time schedule is worked out in real time for the passage of each traffic column. The real time operation of the system emulates the judgment of a traffic policeman on duty. The number of vehicles in each column and the routing are proprieties, upon which the calculations and the judgments are based.

The vehicles like Ambulance and Fire Brigade are also stuck in traffic and waste their valuable time. The proposed system provides quality of service to Emergency vehicles and improves the accuracy of Automatic Traffic Light Violation Detection system as well as helps to trace out the stolen vehicles using RFID.

The mobile application helps the IR transmitter to transfer signal only to the signals located in the travelling path which avoids signal collision

6. Applications

- Can be used in all ambulances.
- Traffic management and control.
- Used for road safety control.
- Defense vehicle in emergency cases.
- Fire Extinguishing vehicle.
- Police van in emergency cases.
- Avoid the traffic violence.
- Avoid accidents.
- Easily state approximate vehicles count

7. HARDWARE SPECIFICATION

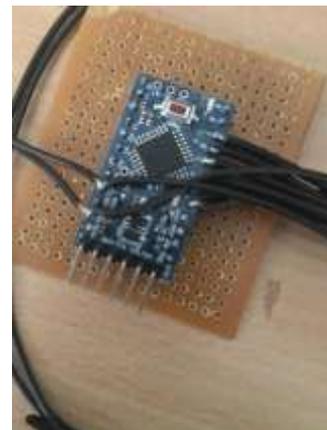
A. LED Display



Figure1.LED Display

Objective of proposed system is to improve efficiency of existing automatic traffic signaling system. Proposed system will be functioning Based on traditional system along with automated signaling. The prototype we have used have a LED Display which will display the signal being delayed in case of an ambulance approaching signals

B. Arduino UNO



The high-performance ATmega328P is a 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1024 EEPROM, 2KB SRAM, 23 common purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with comparative modes, internal and external interrupts, serial programmable USART, 2-wire serial interface with a byte-oriented, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes.

The device operates from 1.8-5.5 volts.

C. *RFID tags*



Each individual vehicle is equipped with special radio frequency identification (RFID) tag which is placed at a specific location which cannot be removed easily. If the RFID-tag-read belongs to the stolen vehicle, the location is tracked using GPS and then a message is sent using GSM to the police control room.

D. *RFID Reader*



In addition, when an ambulance is approaching the junction, the RFID reader placed in each signal reads the vehicle with the tag and it will communicate to the traffic controller in the junction to turn ON the green light until the ambulance passes and the red light for the other path should be turned red.

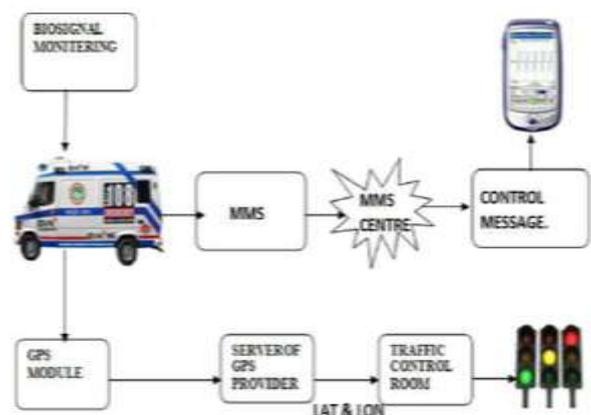
8. SOFTWARE SPECIFICATION

E. *Mobile Application*



Mobile Application for a smart traffic system provides traffic information based on data collected from driver's mobile devices. It takes into consideration the privacy of the users and the security of the whole system. Using mobile devices as traffic sensors is not a new concept, but according to our knowledge a fully operational traffic information system hasn't been deployed yet. However, an experiment using GPS - enabled mobile phones as traffic sensors. The main components of the proposed system are a mobile application running on each driver's device and a traffic server where a traffic prediction algorithm is running in order to reconstruct the traffic model from the gathered data, and to provide real time guidance back to the driver. Additional components of the system are the location service provider.

F. *GPS*





Prototype of the project:



The mobile device's location is calculated using the GPS receiver and network provided positioning techniques. Then the application sends updates to the server according to an algorithm that prevents revealing the user's private information. The communication between server and client is implemented through the cellular network and the subscriber is connected to. In order to preserve the security of the system and the privacy of the user, a secure channel has to be established between the two parts, which will also allow mutual authentication.

G. GSM



GSM is an open, digital cellular technology used for transmitting mobile voice and data services. The information regarding the density is sent to the server time to time and also GSM helps to send a message to the police control room.

9. CONCLUSION

This method helps in tracking shortest distance and lot of time is saved at the signal. Especially the GPS helps in accuracy for calculating the distance between hospital and every signal. This method can be used in all ambulances. It can also be used for road safety control. At critical situations this concept holds good. The android application in the mobile phone shares the location of the ambulance. The result shows the efficiency in clearing traffic congestion for Ambulance. This system is more advantageous when compared to other systems.

The proposed system will examine the possibility of deploying an intelligent real-time traffic signal controller, which will receives information transmitted from vehicles, and then utilizes this information to optimize the traffic signal scheduling at the intersection. With an objective of developing a new transport system for vehicles in a smart city, this article proposed a modern traffic control system using connected vehicle technology.

For the overall benefit of the traffic system, various modules like video monitoring, smart traffic control system, signal system and smart devices are included in the presented approach with detailed structure of their smart functionality. Simulation results show that it has an improved rate of congestion control in traffic points as it uses advanced technology of auto mating vehicles, mobile agent and big data analytic tools.

10. REFERENCES

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