Smart Traffic Management System Using IoT

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Abstract- *Traffic is becoming one of the important problems in big cities in all over the world. Due to traffic, big cities faces many problems like congestions and accidents which have caused a huge waste of time, property damage and environmental pollution. This paper presents an intelligent traffic management system, based on Internet of Things, which is featured by low cost, high compatibility, easy to upgrade, to replace conventional traffic management system and the proposed system can improve road traffic tremendously. Our project focuses on two main areas smooth traffic flow and emergency vehicles such as an ambulance. This will lead to time saving and reduce road accidents. The system will control timing of traffic light using sensor it will calculate the density of traffic of each lane and according to density it will lamp the traffic light and manage the traffic. This will lead to smooth and efficient traffic flow which will save time. Also the proposed system is designed to accept information about emergency case through RFID based technology. As an emergency case such as the passing ambulance vehicles that requires immediate opening for the traffic automatically. The system has the ability to open a complete path for such emergency case from the next traffic until reaching the target destination. Further, the proposed system is tuned to run automatically without any human intervention.*

Keywords- Traffic, Internet-of-Things, RFID, Wi-Fi, IR sensors, Arduino uno controller

I. INTRODUCTION

In few years we see the popularity of private motor vehicle is getting increased. Thus urban traffic monitoring becomes more and more crowded. As result traffic monitoring is becoming one of the important problems in big smart city infrastructure all over the world. Some of these concerns are traffic congestion and accident that usually cause a significant waste of time, property damage and environmental pollution. Therefore, there is an urgent need to improve traffic management. The appearance of the Internet of Things provides a new trend for intelligent traffic development. This research proposes to employ the IoT, agent and other technology to improve traffic condition and relieve the traffic pressure. Information generated by traffic IoT and collected on all roads can be presented to travelers and other users. Through collected real time traffic data the system can be recognize current traffic operations, traffic flow conditions and can be predict the future traffic flow. Therefore the system can precisely administrate, monitor and control moving vehicles. Constructing an intelligent traffic system based on IoT has a number of benefits such improvement of traffic condition, reduction the traffic jam and , high reliability, and traffic safety .Such traffic IoT must include every element of traffic such as roads, traffic signals, vehicles. All these items will be connected to the internet for convenient identification and management through sensor devices, such as RFID devices, IR sensors, etc.

The paper is organized as follows. The section II presents in-depth literature survey on different IoT based applications. Section III describes the proposed IoT based traffic management system. The block diagram is described in Section IV. Finally, the conclusions are presented in Section V

II. LITERATURE REVIEW

Following section presents the in-depth literature review on different IoT based systems.

A. IoT based dynamic control of street light for smart city

Snehal Bhosale et. al [1] addressed the energy wastage and crimes problems. It is seen that many times street lights are ON at morning session. Because of that more amount of power gets wasted. So for solving this type of problem the concept of IoT is important here. Here we require two light dependent register (LDR): one LDR used for checking the day/night condition and other LDR is used for checking the status of the street lamp. They use Rasberripi as controller to control these system. Controller will send this information to the server using Wi-Fi module. So by using IoT concept we can see and control all the system. If any lamp gets ON or faulty then we can easily find out or see that problem from anywhere. So by using this project we can a save the electricity. We also avoid the accidents and crimes.

B. IoT based underground wire fault detection

Sudarshan Bhosale. et.al [2] investigated the fault in the wire and also distance from where fault is created that found. The faults occurred are open circuit fault, short circuit

fault, symmetrical fault, asymmetrical fault. That faults are find on the basis of ohms law. The components used are PIC16F877A, LCD, Wi-Fi module etc. Here microcontroller used for interfacing LCD. LCD is used for display the distance. We get the accurate distance. Wi-Fi module is used for sending the information to the server. They use two methods for finding the fault is online method & offline method. Online method utilizes process of sampled voltage and current. Offline method special instrument is used.

C.   IoT based Traffic Management System

Linganagouda R. et al. [3] solves problem on congestion of traffic in big cities .This is done by controlling traffic form remote server using wireless method. This system improves Ambulance service which is affected by traffic jam. But system lacks when the number of automobiles are more in no due to use of RFID technology.

Dian-xia HU et al. [4] brings forward a plan for an intelligent management system of the traffic. This is based on RFID. The system mainly includes: intelligent traffic management center system\intelligent traffic monitor system and intelligent traffic charging system etc. The system can greatly enhance the efficiency of traffic manage. It has good application foreground.

Ahmed S. Salama et al. [5] aimed to overcome the traffic jam, and create a flow of traffic in city streets through applying an intelligent algorithm based on the calculating priorities that represent the total calculated relative weight of a specific direction in cross road traffic. This system is capable of detecting the emergency cases vehicles such as ambulance cars through using a RFID technology or mobile device used by drivers and providing a flow of traffic for such emergency cases.

Mahesh Lakshminarasimhan et al. [6] discussed the incomprehensible growth of urban population around the globe and its effect on traffic control in big cities. An efficient system is proposed with the implementation by big data analytics and RFID, supported by IoT. The architecture and functionalities of the proposed system are described along with supervised learning used to determine the attributes of traffic management.

III. PROPOSED IoT BASED TRAFFIC MANAGEMENT SYSTEM

The system consists of two main components: the vehicle mounted board and the regional computing unit. The vehicle mounted board has transmitter and receiver which

sends and receives radio waves. Regional computing units are placed in workstations that receive data from vehicles and transmit signals to each vehicle passing to a specified range of area using RFID. In our project we use infrared sensors. We will mount these sensors on each route that is route 1, route 2, route 3, and route 4. Depending upon the length of each route we use that sensor. From those sensors we get the density of the traffic of each route. The route having higher density will be given the priority. Suppose route 1 has 90%, route 2 has 80%, route 3 has 70%, route 4 has 60% density then first priority is given to the route number first. Also in our project we use RFID, it will use for detecting the ambulance. Because if at any time ambulance will come then RFID will give the priority to that specific lane. So this information will be passing to the server by using the Wi-Fi module. We can see the information about traffic from anywhere because of the Internet of Things. So we get the better traffic management system.

IV. BLOCK DIAGRAM & DESCRIPTION

Figure 1 shows the block diagram of IoT based traffic management.

TABLE 1. Components of the proposed systems

| COMPONENTS	DESCRIPTION
IR sensors	Used for measuring the traffic density
LED'S	Red, Green, Yellow LED used for traffic light
RFID	It is Radio frequency identification. Used for detecting the ambulance or emergency vehicles
Arduino uno	Used as controller. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator
WI-FI	Used for transmitting the information or data about traffic to the webpage
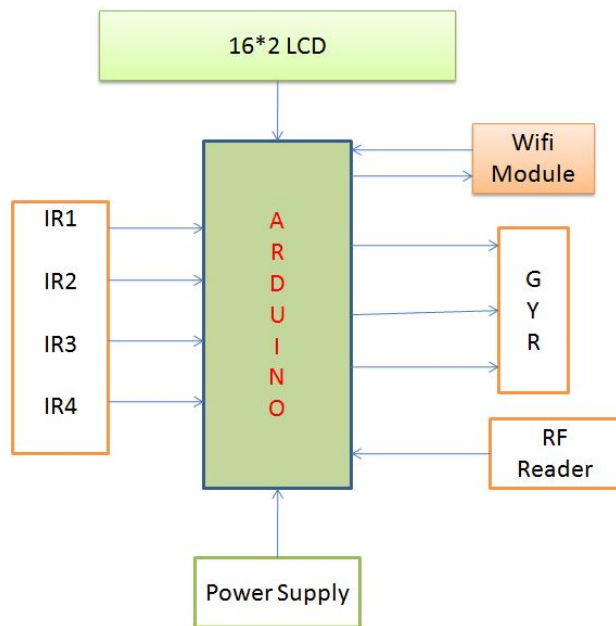
Fig. 1 Architecture of the Proposed System

It consists of following blocks:

- RFID Reader and Tag
- Ardunio
- IR sensor
- Wifi Module

The detail working of each block is as follows:

A. RFID Tag and Readers

Radio-frequency identification (RFID) is the use of a wireless non-contact system that uses radio frequency electromagnetic fields to transfer data from a RF transmitter attached to a vehicle (ambulance), for the purposes of automatic identification and tracking. These devices use a power source (9 V) and emit radio waves (electromagnetic radiation at radio frequencies). The transmitter sends signal to the receiver which can receive from several meters (yards) away. The RF transmitter does not need to be within line of sight of the receiver.

B. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

C. Wi-Fi Module

ESP8266 is an impressive, low cost WiFi module suitable for adding WiFi functionality to an existing microcontroller project via a UART serial connection. The module can even be reprogrammed to act as a standalone WiFi connected device.

The feature list is impressive and includes: 802.11 b/g/n protocol,Wi-Fi Direct (P2P),Integrated TCP/IP protocol stack.

D. IR Sensor

IR sensors are miniaturized IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package contains an IR.

V. CONCLUSION

The accidents are increased rapidly due to heavy traffic. To address this problem we have proposed the IoT based traffic management system. With this system the traffic will become safe and it reduces accidents. With automatic traffic signal control based on the traffic density of the route, the manual effort on the part of the traffic policeman is saved. As the entire system is automated, it requires very less human intervention. Emergency vehicles like ambulance and fire trucks, need to reach their destinations at the earliest. If they spend a lot of time in traffic jams, precious lives of many people may be in danger. In future scope instead of using IR sensor we can use web cameras to measure the traffic density.

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