Automatic Traffic control for Ambulance and VIP Vehicle

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***Abstract*—The accretion of traffic has led to the use of more sophisticated Traffic management system in today's society. Traffic Congestion is a major factor which forestalls the smooth flow of Ambulance and VIP vehicles. To abate the inconvenience caused by the traffic, the Traffic Light Controller (TLC) is used which minimizes the waiting time of vehicle and also manages traffic load. RFID based systems play a crucial role in solving the problems caused by traffic. The project is a replica of a four way lane crossing of real time scenario. In the first part, concentrated on problems faced by Ambulances, RFID concept is used to make the Ambulance's lane Green and thus provides a free way without interrupting the Ambulance. In the second part, concentrated on problems faced by Priority vehicles, IR sensors are used to actuate the timers accordingly and thus preventing traffic congestion. In the third part, concentrated on Traffic density control, IR transmitter and receiver are used to provide dynamic traffic control and thus increasing the duration of the Green light of the lane in which traffic density is high and hence, regulating traffic.**

***Keywords*: PIC Microcontroller, IR Sensor, RFID Systems, Traffic Congestion, Traffic Light Controller.**

I. INTRODUCTION

Traffic signs are the most advantageous technique for controlling in a bustling junction. But, nowadays transportation has become a crucial role in everyday life and due to increase in vehicles; congestion of traffic is taking place. In this context, many methods are evolved for preventing this traffic congestion problem and giving a clearance way for emergency vehicles. Due to the thriving urbanization, industrialization and population, the traffic management has become a difficult task. As seen in Fig.1, with growth in traffic, there is occurrence of bundle of problems too, these problems include traffic jams, accidents and traffic rule violations.

Fig. 1: Traffic in Delhi City

Fig. 2: Traffic due to VIP Vehicles.

This in turn has an adverse effect on the economy of the country as well as on the lives of many. Traffic lights play an important role in traffic management. Traffic lights are the signaling devices that are placed on the intersection points and used to control the flow of traffic on the road. In 1868, the traffic lights were only installed in London and today these are installed in most cities around the world. Most of the traffic lights around the world follow a predetermined timing circuit. Sometime the vehicles on the red light lane have to wait for green signal even though there is a dearth of traffic. It results in the loss of valuable time. Traffic control at intersections is a matter of concern in large cities. Several attempts have been made to make traffic light's sequence dynamic so that these traffic lights operate according to the current volume of the traffic. Most of them use the sensor to calculate current volume of traffic but this approach has the limitation that this technique is based on counting of the vehicles and treats emergency vehicles as the ordinary vehicles which means no priority to ambulance, fire brigade or V.I.P vehicles. As a result, emergency vehicles are stuck in traffic signal and waste their valuable time. In today's world, health hazards are a major concern. Especially people in the older age group are the victims, due to the worsening traffic conditions which lead to miasma and pollutions of different type.

The use of embedded technology has proved to be very beneficial in present Traffic Light Controller (TLC) and that will minimize waiting time of vehicle and also manage traffic load. This paper exploits the emergence of new technology called intelligent traffic light controller, this makes the use of sensor network along with embedded technology. Here traffic light will be intelligently decided based on the total traffic on all adjacent roads. Thus optimization of traffic light switching increases road capacity, traffic flow and can prevent traffic congestions. If at all the Ambulance encounters the traffic jam in the route, the RFID is used as a remote to control the traffic signals. The particular signal is made Green for a predetermined amount of time and after the ambulance passes by, it regains its original flow of sequence of signaling. The problem of traffic light control can be solved by RFID based system. This system considers the priority of different type of vehicles and also the density of traffic on the roads by installing RF reader on the road intersections. Radio frequency identification is a technique that uses the radio waves to identify the object uniquely. RFID is a technique that is widely used in the various application areas like medical science, commerce, security, Electronic toll collection system, access control etc. There are two main components of RFID:

1. RFID tag and
2. RF Reader.

Various types of tags are available but we can mainly divide them into two categories: passive tags and active tags. There are three parts of the tag: antenna, semiconductor chip and some form of encapsulation. The life of the passive tag is very long. The reader sends electromagnetic waves that produce current in the tag's antenna. In response, antenna reflects the information stored in it. The active tags

contain a battery as an internal power source used to operate microchip's circuitry and to broadcast the information to the reader. The range and cost of these tags is more as compare to passive tags. There are three kinds of RFID tags which work on the three different frequency ranges: low-frequency, high-frequency and ultrahigh frequency.

In this project:
1. For demonstration purpose three roads are considered.
2. In this prototype RFID reader used is of low frequency. Only road 2 is considered to be the route travelled, more frequently, by VIP vehicles and Ambulances.

II. Existing Model

The effective method is to defend the change in timing delay between the traffic light systems automatically according to the number vehicles passing through the lane. Nowadays fixed time based system is used in traffic signaling system which may provide incompetent if one lane is operational than the others. . It will diminish productivity of the individuals and a lot of work hour is wasted in this system Sometimes higher traffic congestion at one side of the lane needs longer green signal as compared to fixed time based systems, as a result propose here a mechanism in which the time period of green signal and red signal is assigned based on the density of the traffic present at that time. Traffic Congestion is a major factor which forestalls the smooth flow of Ambulance and VIP Vehicles. The inconvenience caused by the traffic, the Traffic Light Controller (TLC) is used which minimizes the waiting time of vehicle and also manages the traffic load. RFID based systems play a crucial rule in solving the problems caused by traffic. To optimize this problem we have to design an automatic traffic control system. This can be achieved by using PIR (proximity Infrared sensors). Once the density is calculated, the luminous period of green signal is assigned with the help of the microcontroller (Arduino).
Instead of using fixed time delay traffic light system, here placing an Infrared sensor on each side of the road at a particular distance. This sensor range is about 10 meters. It consists of IR transmitter and IR receiver and combined together called as IR transceiver. There are multiple sensors are placed on each sides of the road. These IR transmitter and IR receiver will be mounted on each sides of the all the lanes at a particular distance. As the vehicles pass through these IR sensors, the IR sensor will detect the vehicle and it will send the information to the microcontroller. Based on the information microcontroller will count up the number of vehicles pass through the lane and provide green signal to that lane. It is display on LCD and light glows on Traffic light System.IR Sensor, LCD and Traffic light are interfaced with Microcontroller

III. Proposed Model

Many embedded systems have substantially different designs according to their functions and utilities. In this project design, structured modular design concept is adopted and the system is mainly composed of a single microcontroller, comparator, LED's, and RFID reader. The microcontroller located at the center of the block diagram forms the control unit of the entire project. Embedded within the microcontroller is a program that helps the microcontroller to take action based on the inputs provided by the output of the sensors.

IV. Model Description

A. Block Diagram:

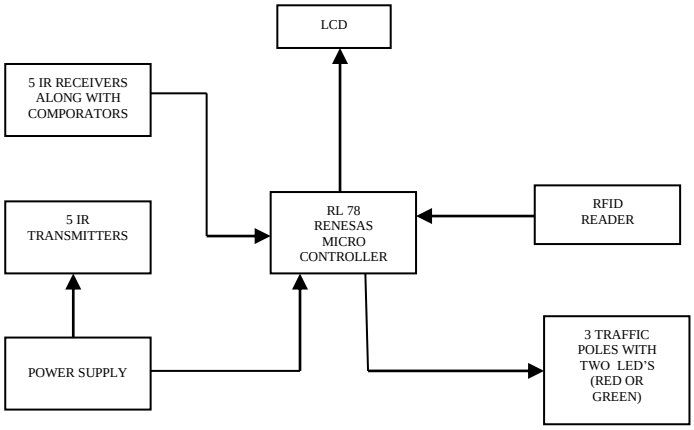

Fig. 2: Block Diagram

As shown in Fig.2, the intelligent traffic management system for ambulance and VIP vehicles mainly consists of the following parts:

- Renesas microcontroller (RL78 series)
- RFID Based System
- LM358 comparator
- IR sensors-5 pair of IR transmitter and receiver
- LED

LCD

Fig.3 shows ATMEGA328P microcontroller (MCUs) from Electronics which is an advanced family of general-purpose and application-specific MCUs, combining true low power and high performance operation. The RL78 is designed specifically for ultra-low-power applications. The innovative Snooze mode allows serial communication and ADC operation in standby, which makes it best-in-class for battery powered designs.

Fig. 3: Atmega328P

B. Layout:

Fig. 4: Layout

Consider the Fig.4, by default green signal will be activated for a particular road for 5 seconds. Whenever the first IR receiver on a particular road is blocked, green signal will be displayed for 10 seconds. If the second IR receiver on a particular road is blocked, green signal will be displayed for 15 seconds. Whenever ambulance or VIP vehicle passes on a particular (here road 2 for demo), green signal will be displayed for 20 seconds. All IR transmitter sensors communicate with IR receivers, on the opposite side of the road, in a line-of-sight propagation method. Every RFID tag has an eight digit unique serial number. These RFID tags are

mounted on the vehicle. Whenever the vehicle passes on Road 2, the RFID reader acquires the tag serial number through EM (Electro-Magnetic) waves. Embedded within the microcontroller is a database consisting the tag number of the particular vehicle. So whenever, an ambulance or VIP vehicle passes on Road 2, the serial number of the tag attached to there is acquired and the corresponding vehicle whether VIP or ambulance is displayed on LCD. In the above block diagram LCD is utilized to demonstrate the working of the entire unit. IR data transmission is also employed in short-range communication among computer Peripherals. These devices usually conform to standards published by IrDA, the Infrared Data Association. Remote controls and IrDA devices use infrared LEDs to emit infrared radiation that is focused by a plastic lens into a narrow beam. The beam is modulated, i.e. switched on and off, to encode the data. The receiver uses a silicon photodiode to convert the infrared radiation to an electric current. It responds only to the rapidly pulsing signal created by the transmitter, and filters out slowly changing infrared radiation from ambient light. Infrared communications are useful for indoor use in areas of high population density. Infrared is the most common way for remote controls to command appliances. Radio Frequency Identification (RFID) is a generic term for non-contacting technologies that use radio waves to automatically identify people or objects. There are several methods of identification, but the most common is to store a unique serial number that identifies a person or object on a microchip that is attached to an antenna [4]. The combined antenna and microchip are called an "RFID transponder" or "RFID tag" and work in combination with an “RFID”

V. SIMULATION

Fig.5 shows the schematic representation of self -organized system for controlling the congestion of the traffic and thereby providing a way for the emergency vehicles. In this system the microcontroller is utilized to control the traffic light system and it can be easily reprogrammed. The RF transmitter and RF receiver used in this system is of 433 Mhz ranging up to 100 meters. The components used in this system leads to low cost and easy installation. Thus by making it working in real time environment the same design can be used for ambulances and fire emergency vehicles. The major advantage of this proposed intelligent system is that the power consumption is very low and this system can be used for long term basis.

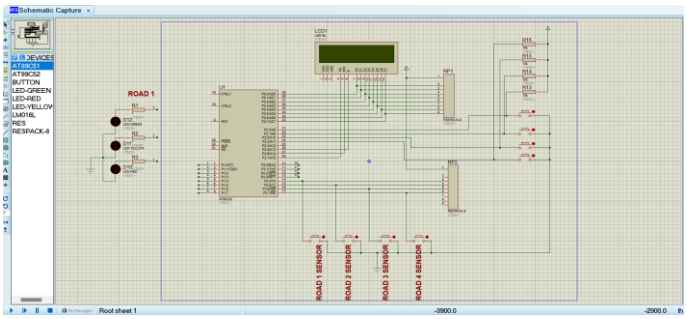

Fig.5: Simulation of traffic light control using

VI. RESULT

The results of the normal traffic light control and traffic light control of proposed system are discussed. The indications of red light, yellow light and green light of a normal traffic control system. In the proposed system, the traffic light control is controlled by the microcontroller. The RF system identifies the emergency vehicles and sends message to the microcontroller. Upon receiving the message, the microcontroller operates the green light for the emergency vehicle. Project will provide minimum waiting time for vehicles and also manage traffic load. The traffic light will be intelligently decided based on the total traffic. When the RFID on the ambulance is detected by the receiver the traffic lights are controlled based on the timer. It depicts the model of intelligent traffic management for ambulance and VIP vehicles with LCD display and traffic signaling lights and also depicts the LCD display of traffic density on road 3. This system will definitely help traffic police to give the way to the ambulance when there is heavy traffic on the road. The design and implementation of this technique is directly targeted for traffic management so that emergency vehicles on road get clear way to reach destination in less time and without any human interruption.

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