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INTELLIGENT TRAFFIC MANAGEMENT SYSTEM

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ABSTRACT

The density of Traffic has grown tremendously in the past few years' and due to which lot of problems arises because of delay in traffic. So to avoid and overcome these problems the intelligent traffic control system to pass emergency vehicles smoothly is proposed in this paper. Each individual vehicle is equipped with special radio frequency identification (RFID) tag (placed at a strategic location), which makes it impossible to remove or destroy. We use RFID reader, NSK EDK-125–TTL, and PIC16F877A system-on-chip to read the RFID tags attached to the vehicle. It counts number of vehicles that passes on a particular path during a specified duration. It also determines the network congestion, and hence the green light duration for that path. If the RFID-tag-read belongs to the stolen vehicle, then a message is sent using GSM SIM300 to the police control room. 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. This module uses ZigBee modules on CC2500 and PIC16F877A system-on-chip for wireless communications between the ambulance and traffic controller. The prototype was tested under different combinations of inputs in our wireless communication laboratory and experimental results were found as expected.

Keywords : RFID, traffic, IR sensors, Max 232.

I. INTRODUCTION

Transportation via road is the most widely used mode of transport throughout the country and probably the world at large. Constantly, there is an increase in the number of vehicles annually and its corresponding increase in the number of road users. The need to maintain order on our roads inevitably becomes a matter of concern and that is where traffic lights have become a very important item on the menu of road users. Unfortunately, these traffic control systems that currently exist have out-lived their purpose and as a result, they cannot handle the number of vehicles on our roads today and the consequence of this is the sever traffic congestion that exist in most parts of the cities in the country. One way to improve traffic flow and safety of the current transport system is to introduce automation and intelligent control methods to roadside infrastructure and vehicles. Transportation research has the goal to optimize transportation flow of people and goods. As the number of road users constantly increases, and resources provided by current infrastructures are limited, intelligent control of traffic will become a very important issue in the future. The main objective of this paper is to design an embedded system that operates along with image processing techniques to be implemented in a traffic light control system, which ensures a safe and efficient traffic flow. Techniques to be implemented in a traffic light control system, which ensures a safe and efficient traffic flow.

Fast transportation systems and rapid transit systems are nerves of economic developments for any nation. All developed nations have a well-developed transportation system with efficient traffic control on road, rail and air. Transportation of goods, industrial products, manpower and machinery are the key factors which influence the industrial development of any country. Mismanagement and traffic congestion results in long waiting times, loss of fuel and money. It is therefore utmost necessary to have a fast, economical and efficient traffic control system for national development. The monitoring and control of city traffic is becoming a major problem in many countries. With the ever increasing number of vehicles on the road, the Traffic Monitoring Authority has to find new methods of overcoming such a problem. The measures taken are development of new roads and flyovers in the middle of the city; building of several ring such as the inner ring road, middle ring road and outer ring road; introduction of city trains such as the light rapid transit (LRT), and monorails; restricting of large vehicles in the city during peak hours; and also development of sophisticated traffic monitoring and control systems. Growing numbers of road users and the limited resources provided by current infrastructures lead to ever increasing traveling times. One way to improve traffic flow and safety of the current transportation system is to apply automation and intelligent control methods to roadside infrastructure and vehicles [7]. Transportation research has the goal to optimize transportation flow of people and goods. As the number of road users constantly increases, and resources provided by current infrastructures are limited, intelligent control of traffic will become a very important issue in the future. The problems of typical conventional traffic light Controller are mentioned below:

A. A. Heavy Traffic Jam

With increasing number of vehicles on road, heavy traffic congestion has substantially increased in major cities. This happened usually at the main junctions commonly in the morning, before office hour and in the evening, after office hours. The main effect of this matter is increased time wasting of the people on the road. The solution for this problem is by developing the program which different setting delays for different junctions. The delay for junctions that have high volume of traffic should be setting longer than the delay for the junction that has low of traffic. This operation is calling Normal Mode.

B. No traffic, but still need to wait

At certain junctions, sometimes even if there is no traffic, people have to wait. Because the traffic light remains red for the preset time period, the road users should wait until the light turn to green. If they run the red light, they have to pay fine. The solution of this problem is by developing a system which detects traffic flow on each road and set timings of signals accordingly. Moreover, synchronization of traffic signals in adjacent junctions is also necessary.

A. Emergency car stuck in traffic jam

Usually, during traffic jam, the emergency vehicle, such as ambulance, fire brigade and police will be stuck especially at the traffic light junction. This is because the road users waiting for the traffic light turn to green. This is very critical problem because it can cause the emergency case become complicated and involving life.

B. Lack of Traffic Information to users

Present traffic systems fail to provide traffic information including congested roads and alternate routes available in case of congestion. In the proposed Intelligent Traffic Light Controller (ITLC) all these limitations of existing controller are eliminated. The proposed project of 'Intelligent Traffic Light Controller' uses embedded system (microcontroller 89C51) and has advantages of efficient control, GSM

Interface to mobile phones and fast response time. The problem of fixed timing traffic light is totally eliminated in this project.

Literature survey

Traffic Management on the road has become a severe problem of today's society. An efficient traffic management techniques are needed to reduce waiting and traveling times, save fuel and money. In order to alleviate the problem, a large number of methods and approaches have been suggested in the literature. It includes rule based learning to the modern fuzzy and neural network approaches. In this section, the various solutions to the traffic control problems suggested in the literature are presented, along with their merits and demerits. The emergency servicing which is an Ambulance is explained in this literature. Logic used for servicing the emergency is given in this literature. The information about Indian road traffic is in literature. This was important as it was necessary for us to understand how the existing timers of traffic lights work. Information used for timing the timers.

Components used

A. ZigBee Module Cc2500

The CC2500 is a RF module and has transreceiver, which provides an easy way to use RF communication at 2.4 GHz. Every CC2500 is equipped with the microcontroller (PIC 16F877A), which contains Unique Identification Number (UIN). This UIN is based on the registration number of the vehicle. One of the most important features is serial communication without any extra hardware and no extra coding. Hence, it is a trans receiver as it provides communication in both directions, but only one direction. The microcontroller and CC2500 always communicate with the microcontroller via serial communication. Rx pin of CC2500 is connected to Tx (RC6) of microcontroller and Tx pin of CXC2500 is connected to Rx pin of microcontroller (RC7). Other two pins are used to energize transreceiver. It is used to transmit and receive the data at 9600 baud rate.

B. GSM Module SIM 300

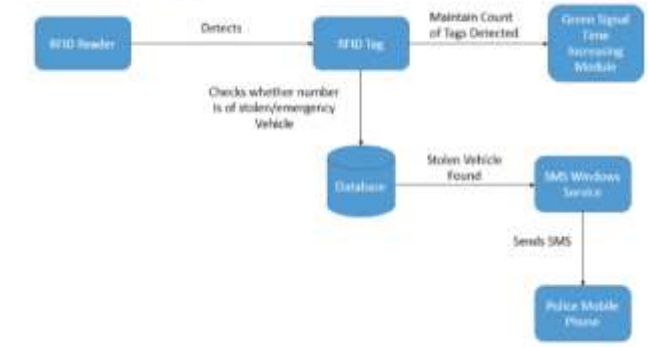
Here, a GSM modem is connected with the microcontroller. This allows the computer to use the GSM modem to communicate over the mobile network. These GSM modems are most frequently used to provide mobile Internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. GSM modem must support an "extended AT command set" for sending/receiving SMS messages. GSM modems are a cost effective solution for
receiving SMS messages, because the sender is paying for the message delivery. SIM 300 is designed for global market and it is a tri-band GSM engine.

C. RFID Reader–125 kHz–TTL

Radio Frequency Identification (RFID) is an IT system that transmits signals without the presence of physical gadgets in wireless communication. It is categorized under automatic identification technology, which is well established protocol. The working of an RFID system is very simple. The system utilizes tags that are attached to various components to be tracked. The tags store data and information concerning the details of the product of things to be traced. The reader reads the radio frequency and identifies the tags. The antenna provides the means for the integrated circuit to transmit its information to the reader. There are two types of RFID categories, active and passive tags. The tags that do not utilize

power are referred to as passive and they are driven by an antenna that enables the tag to receive electromagnetic waves from a reader. On the contrary, active tags rely on power and they have inbuilt power sources that enable it to send and receive signals from RFID reader. RFID range depends on transmit power, receive sensitivity and efficiency, antenna, frequency, tag orientations, surroundings. Typically, the RFID range is from a few centimeters to over hundred meters. FID reader uses frequency 125 KHz with a range of 10 cm.

Architecture Design



IV. WORKING MODEL

In this model, there are mainly 3 modules as follows.

A. Automatic Signal Control System:

In this module, for experiment purpose, we have used passive RFID tags and RFID reader with frequency 125 KHz. RFID tag, when vehicle comes in the range of the receiver will transmit the unique RFID to the reader. The microcontroller connected to the RFID reader will count the RFID tags read in 2 minute duration. For testing purpose, if the count is more than 10, the green light duration is set to 30 seconds, if count is between 5 and 9, the green light duration is set to 20 seconds. If the count is less than 5, the green light duration is set to 10 seconds. The red light duration will be for 10 seconds and orange light duration will be for 2 seconds. Implementation for automatic signal control and stolen vehicle detection system.

B. Stolen Vehicle Detection System

In this module, for testing purpose, we compare the unique RFID tag read by the RFID reader to the stolen RFIDs stored in the system. If a match is found, then the traffic signal is immediately turned to red for a duration of 30 seconds

C. GSM Module SIM 300

Here, a GSM modem is connected with the microcontroller. This allows the computer to use the GSM modem to communicate over the mobile network. These GSM modems are most frequently used to provide mobile Internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. GSM modem must support an "extended AT command set" for sending/receiving SMS messages. GSM modems are a cost effective solution for receiving SMS messages, because the sender is paying for the message delivery. SIM 300 is designed for global market and it is a tri-band GSM engine. It works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz. SIM300 features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes. This GSM modem is a highly flexible plug and play quad band GSM modem, interface to RS232, it supports features like voice, data, SMS, GPRS and integrated TCP/IP stack. It is controlled via AT commands (GSM07.07,07.05 and enhanced AT commands). It uses AC – DC power adaptor with following ratings DC Voltage: 12V/1A.

D. RFID Reader–125 kHz–TTL

Radio Frequency Identification (RFID) is an IT system that transmits signals without the presence of physical gadgets in wireless communication. It is categorized under automatic identification technology, which is well established protocol. The working of an RFID system is very simple. The system utilizes tags that are attached to various components to be tracked. The tags store data and information concerning the details of the product of things to be traced. The reader reads the radio frequency and identifies the tags. The antenna provides the means for the integrated circuit to transmit its information to the reader. There are two types of RFID categories, active and passive tags. The tags that do not utilize power are referred to as passive and they are driven by an antenna that enables the tag to receive electromagnetic wave from a reader. On the contrary, active tags rely on power and they have inbuilt power sources that enable it to send and receive signals from RFID reader. RFID range depends on transmit power, receive sensitivity and efficiency, antenna, frequency, tag ori-

entations, surroundings. Typically, the RFID range is from a few centimeters to over hundred meters. RFID reader uses frequency 125 KHz with a range of 10 cm.

Conclusion:-

In a world which has more number of vehicles than Human, the Intelligent Traffic Management System proves to be more efficient than any other control system. Through this we can not only control the flow of traffic but also handle the cases emergency vehicles such as police vehicles, an ambulance, fire brigade, etc. Using this Intelligent Traffic Management System, stolen vehicle can also be detected with ease.

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