Dynamic Traffic Control System Using RFID and GSM

Ramshida V.P

Msc student, Department of Computer Science, Ansar Women's College, Perumpilavu,Thrissur, Kerala,India

Abstract – This paper deals with changing the traditional traffic system as an intelligent and real time one. For this it uses components like RFID (used for unique identification of vehicles), GSM (for sending SMS) and microcontrollers etc. This system mainly consist of modules for 1)real time traffic management 2)allowing passage for prioritized vehicles like ambulance 3)help people to get information about traffic in particular areas 4)Avoiding corruption by automated fine deduction.5)Stolen vehicle detection.

Index Terms – RFID, GSM, IR Sensors, Micro Controllers.

1. INTRODUCTION

Nowadays especially in urban areas traffic system is not efficient. The traditional traffic system has the drawbacks: - heavy traffic jam, even though no traffic in road vehicles have to wait, emergency car stuck in jam, lack of traffic information to users. To provide efficient traffic system we have to manipulate the traffic light dynamically based on real time traffic size, also we have to provide some mechanism to provide passage for priority vehicles so that they didn't stuck in the traffic. Also it needs some mechanism to help people to get information about traffic in specific areas if they wish. And also some mechanisms to take actions against rule breakers, such as fine deduction.

2. RELATED WORK

Since inefficient traffic system results in great economic loss in terms of fuel time and money, sometime it results in loss of someone's life. So a lot of works are done to solve these problems.

In 2009 IEEE published an intelligent traffic control system using RFID it tracks the vehicle through the RFID tag attached to the vehicle and retrieves its electronic product code (EPC) data. The volume of traffic is calculated according to type of vehicle, priority of vehicle and path and time. The decision making section (DMS) contains a decision making algorithm that determines how the traffic lights are operated. In 2012 a research was done by *shilpa s. chavan (walke), dr. r. s. deshpande, j. g. rana* in design of intelligent traffic light controller using embedded system. It uses sensor network along with embedded technology. Thus traffic light switching increases road capacity and traffic flow, and can prevent traffic congestions. Additionally a GSM cell phone interface is also

provided for users those who wish to obtain the latest position of traffic on congested road.

In 2013 IEEE published a paper on DTC: a framework to detect traffic congestion by mining versatile GPS data which consist of the mining of GPS data to help in detection of the locations which face frequent traffic congestion will help the users in deciding whether or not to opt for that route. In 2014 another research done *by p. lakshmi pallavi, dr. mohammed alihussain* as intelligent traffic control system using embedded web technology. The emerging embedded web server technology to design a web-based traffic management system that can remotely control and monitor the traffic at various road intersections simultaneously. The master node is the central traffic management unit (CTMU) used to remotely monitor and control the different nodes using the internet technology. In 2014 IEEE published a paper on energy - efficient WSN-based traffic safety system. It describes the design of an energy-efficient wireless sensing network (WSN) system for highways lighting that we called vehicle detection for light providing system (VDLPS). It develops a system that would enable the efficient use of solar light poles deployed in dangerous portions of highways. These poles would be assembled in groups and each group will be equipped with a sensor and an actuator. The motivation behind this approach is to reduce accidents by lighting dangerous portions of highways that can be deadly with a reduced cost and along with an optimal and efficient use of solar energy.

In 2015 *rajeshwari sundar, santhoshs hebbar*, and *varaprasad golla* proposed a model for implementing intelligent traffic control system for congestion control, ambulance clearance, and stolen vehicle detection. It uses RFID tag and consists of 3 parts:-automatic signal control system, emergency vehicle clearance, and stolen vehicle detection.

3. PORPOSED MODELLING

The existing traffic control system is insufficient to handle the problem of congestion control, priority vehicle clearance, stolen vehicle detection etc. To solve these problems and to extent the functionalities of traffic control system we propose our intelligent real time traffic control system. This system mainly consists of 5 modules. First module is for automatic signal control system. To Count the number of vehicles it uses IR sensors. It will count the number of vehicles on the traffic

signal junction and based on that it sets the traffic light. Also each vehicle is equipped with an RFID tag. An RFID reader is equipped in the traffic control system. When the tag comes in range of RFID reader, it will send a signal to the reader, using these signals from vehicles the RFID reader will determines the types of vehicle. This information is used to prioritize vehicles, to detect stolen vehicle, to identify rule breakers. Based on the type we can change the traffic signal and also fine deduction can be applied. An android app is used to help users to get information about the traffic on specific areas.

3.1 COMPONENTS

A. Ardino UNO microcontroller

The Arduino UNO is a platform based on the Atmel AVR microcontroller. It is an open source project. We can customize it as per the needs. It supports high level language and runs with minimal support of circuitry.
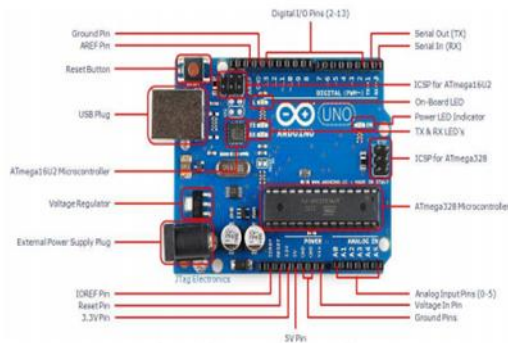

Figure 1: Ardino UNO Microcontroller

B. GSM Module SIM 300

Figure 2: GSM module

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

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. Whereas 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.
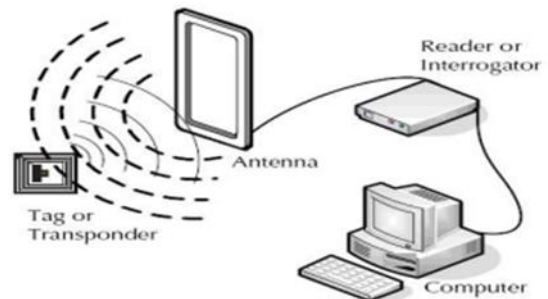

Figure 3 Working of RFID

3.2 WORKING MODEL
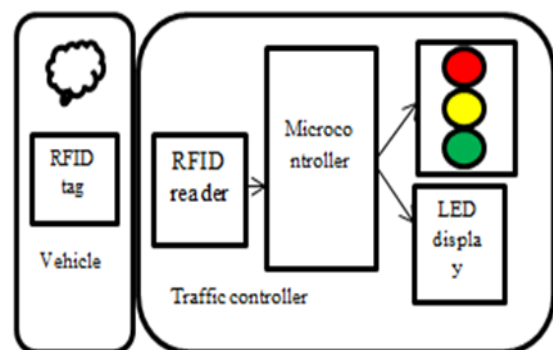
A. Automatic signal control system

Figure 4: Block diagram for automatic signal control

This module uses IR sensor to count the number of vehicles in junction. IR sensors are positioned just far from the junction like 100 meters away. The micro controller connected to IR sensors via a serial USB modem. Based on the count get, the micro controller drives the traffic signal.

B. Emergency vehicle clearence system

In this module the vehicles are equipped with RFID tags, when vehicles come in the range of the RFID reader they will transmit the unique RFID to the reader. Based on the information read it will detect the emergency vehicles by comparing the RFID with the list of emergency vehicle RFIDS stored on the central Data Base.
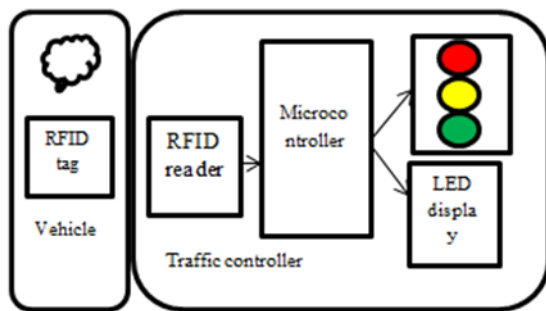
Figure 5: Block diagram for emergency vehicle clearance

C. Stolen vehicle detection system

In this module, we compare the unique RFID tag read by the reader with list of stolen vehicle's RFIDs stored in the system. If any match found then the traffic light is turned to red 30 seconds and at the same time SMS is sent to the nearby police station as well as to the owner using the GSM module. The LCD display will indicate that the stolen vehicle is present.
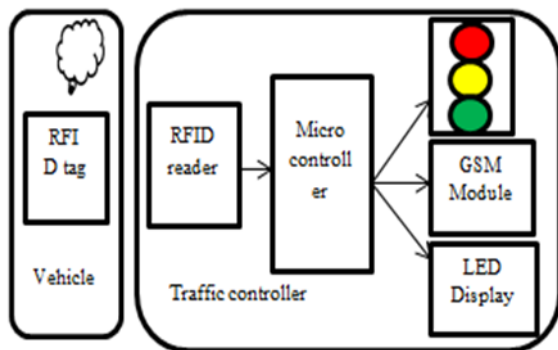
Figure 6: Block diagram for stolen vehicle detection

D. License invalidation

This module is used to for automated fine deduction. When people breaks rules then fine will be deducted fromhis account.

When the user repeats this more than a specified number then the license will be invalidate.
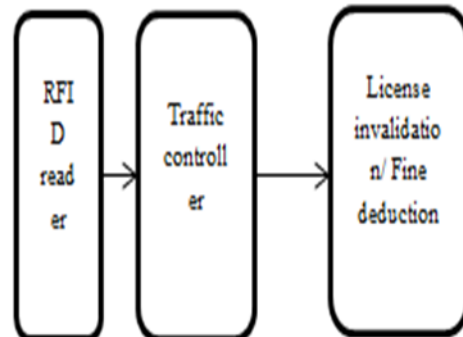
Figure 7: Block diagram for License invalidation

E. Android application

This module helps the user to get information about traffic densities in the area he wish to know. And he can select the desired uncongested paths for his travel. The user only want to login to the system and to select the desired area
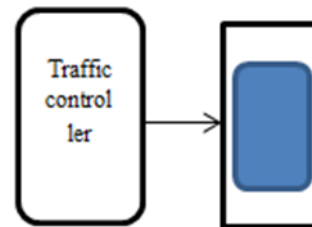
Figure 8: Block diagram for android application

4. RESULTS AND DISCUSSIONS

This paper has a great impact on the traffic problems faced in urban areas. Normally the traffic is controlled by a predetermined signal light controlled system. This paper solves all the problems faced in that case. Also it has special modules to deals with stolen vehicle detection and emergency vehicle clearance. The working of the modules is based on the RFID tag information. Also the license invalidation module is present to ensure the rules are obeyed by the drivers otherwise a fine will be deducted from his account specified in the RFID tag. After repeating the problem in number of times the license will be invalidated. With the emerging of the smartphones an android application can provide more help to drivers. By log in to the system it can tell the traffic status on desired area by which user can select the desired route to destination. The only requirement of this paper to be implemented is that the vehicles should be provided with a unique RFID tag.

5. CONCLUSION

The proposed traffic control system can solve the problems that are occurred with traditional traffic control aystem.Also by introducing an android application each traveller who log in to

the system can access the information about the traffic. By using the licenc invalidation module we can reduce rule breakings. In this system when a stolen vehicle is detected the traffic light will change to red so the police can take appropriate actions and also the owner can know it.With the emergency vehicle detection module it will ensure that the emergency vehicles will reach the destination as soon as possible.

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