TRAFFIC CONTROL AND MANAGEMENT SYSTEM USING RFID AND ZIGBEE MODULE

P.Nikhil Kumar, P.Teja Sasank, G.Kranthi
Kumar , Department of Electronics and
Communication SRM University, Chennai
Email:Sasankofficial@gmail.com

U Hasini
Asst.Prof(U.G)
Department of Electronics and Communication SRM
University, Chennai

Abstract--This paper is intended to design a smart traffic control system interfaced with RFID and ZIGBEE module. Our system mainly depends on the RFID technology i.e. the RFID tag present in each vehicle and the RFID readers present at the junctions The system can control the traffic based on the density of the vehicles present in each of the four lanes of the junction and thus green signal is given to the lane with highest density of vehicles that is the duration of the green signal also varies based on the density. The density of each lane is calculated by counting the number of vehicles present in each lane by means of RFID readers It also detects the presence of emergency vehicles and will give immediate allowance to the emergency vehicle by giving green signal to the particular lane. Any stolen vehicle can be tracked down at the junction by the RFID readers if particular vehicle crosses the junction through the RFID tag information of stolen vehicle updated through the server
.Another feature of our system is that we can detect the information of the vehicle which jumps the signal during red light .As this system is equipped with ZIGBEE transceiver module it is completely wireless .All the information generated at the system can be monitored through the server.

Key word: RFID module, ZIGBEE transceiver module

I.   INTRODUCTION

In the present day conditions the traffic is increasing at a rapid pace and there are scores of reason behind this. This Traffic which is increased is not handled properly.Due to this the instances of traffic jams are increasing a lot and vehicular transportation has become a rather herculean task.The system[1] consists of barrier and a buzzer equipped with IR sensor technology and GSM technology .

The IR sensors present in the system will measure the density of the traffic and the barrier gate is operated based upon the density i.e the lane with high density Is allowed in the first hand and the information of the vehicle crossing the stop line is intimated to the nearby control room through the GSM technology .In [2] IR sensors are used to calculate the density of the traffic and the traffic signal is varied based on the density of the traffic present in each lane .

The details of the vehicles can be tracked down by capturing the number plate using the image processing technology .By referring to [3] the author devised a new feature to detect the presence of the emergency vehicle i.e.(for example ambulance) will be equipped with a radio frequency emitter which will emit a specific radio frequency and this frequency will be identified by the receiver at the junction .In system[4] RFID technology is used to calculate the density of the vehicles present in each lane by means of RFID tags present in each vehicle and video processing technology is used to capture the number plate of the vehicles. In [5] the author proposed to vary not only the priority of the green light to the lane highest density of vehicles but also varied the duration of the green light in the lane with more density by doing so the traffic in the that lane will be cleared seamlessly and quickly.In system [6] author proposed a way of visual monitoring the whole traffic flow by installing the cameras(cctv)
.Using sensors it will calculate the density of the traffic .Whereas in [7] the system consists of an image processing system which captures the image of the vehicles converts that image into gray scale format and its threshold value is calculated in order to calculate the Number of vehicles and thus the count of the vehicles present in the particular line is calculated .By means of this the lane with highest is given allowance by giving green signal to that particular lane .By observing [8] it is known that image processing technique is used to calculate the density of the traffic and the duration of the green light varies depending on the density of the traffic .

The Motivation Behind this paper is very well discussed in **Section II. Section III** describes the problems with the present day systems .The proposed Methodology for solving the problems is described in **Section IV.** Simulation analysis for the system is very well depicted in the **Section V**. Finally in **Section VI** the Hardware implementation of the proposed system is explained

II. MOTIVATION

In our day-to-day life we all face a similar problem on road i.e. traffic jam.This problem is mainlybecause of the increase in vehicles.Because of these Many uncalled activities are taking place like Signal Jumping and violation of other traffic rules causing trouble to the public .For this increased vehicular traffic automated traffic control system is developed which completely time based .But, at times the existing system is not at all fruitful and creating lots of problem to the traffic and those who are violating the traffic are not being tracked down effectively. In order to prevent all these problems a smart traffic control system has been devised in order to prevent the traffic violations.

III. PROBLEM DEFINITION

The most common problem with all the existing systems is that the density of the traffic is measured by means of the IR sensors which is not a very effective way of measuring the density of the traffic and also video capturing technology is used to track the information of the vehicle which crosses the zebra crossing during red light ,this process is not effective and also not cost efficient and Emergency vehicles like ambulance etc. are not prioritised and all these connections are totally wired .To overcome this RFID technology is used which makes the identification of the vehicle easy for this to happen the cars must be equipped with RFID tags. Green light is given to the lane with high density the density is calculated by counting the number of vehicle by means of RFID tags and also the duration of the green light varies in accordance with the density of the traffic of the lane .The vehicle which crosses the road during red light will tracked by the RFID reader present after the zebra crossing .Emergency vehicles are being identified by the RFID reader present at the beginning of the lane and thus the particular lane is given green light .Theft vehicles can also be tracked if they pass by the junction.All these module are interlinked through ZIGBEE transceiver module making the system wireless and also all his information can be monitored by the server through the same ZIGBEE module

I. PROPOSED METHODOLOGY

This system consists of 3 ARDUINO UNO micro-controllers which does all the function according to the interfaced program. Two RFID readers are present at the beginning and ending of each lane.Traffic signal present at the junction is equipped with a separate ARDUINO and a ZIGBEE module for wireless communication between the RFID readers and the server

.All the vehicles are provided with RFID tags and all operations are based on the RFID information of the Vehicles .For the purpose of measuring the density ,the RFID readers will count the number of vehicles present in each lane by scanning their RFID tags and Green light is given to the lane with high density and the duration of the green light also changes based on the density of the traffic. The RFID tag information of the Emergency vehicle is updated to the RFID readers on beforehand and if any emergency vehicle is present in any of the four lanes that particular is given Green light in the first hand irrespective off the density of the lane .RFID information of the

theft vehicle can be updated through and so the theft vehicle can be tracked if it passes by that junction .For the purpose of identifying the vehicles which cross the road during the red light the RFID reader present after the zebra crossing will
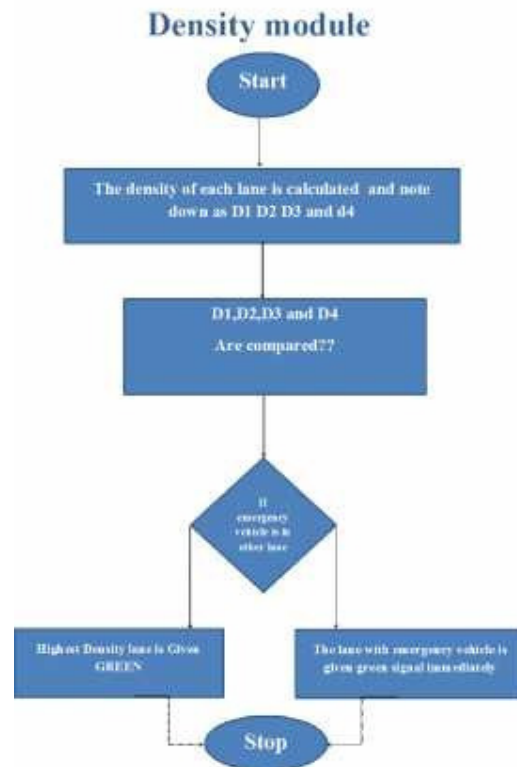

Fig. 1.Flow chart for density Module

scan the details of that vehicle .ZIGBEE transceiver module is used for the purpose of intercommunication and also to transmit the information to the server. For The purpose of calculating the density of the traffic RFID Reader will scan the Tag information of each vehicle and will calculate the number of the vehicles.

If the Tag information of the scanned is matched with any of the Emergency vehicle's Tag information then the signal is turn green and if it matches the Tag information if the Stolen vehicle's Tag information then the vehicle information is noted and the same is transmitted to the server.

The **flow chart** of the following operation is as follows

Fig. 2. Flow chart for Emergency, Theft and Signal Jumping Modules

Emergency, Theft and signal jumping modules
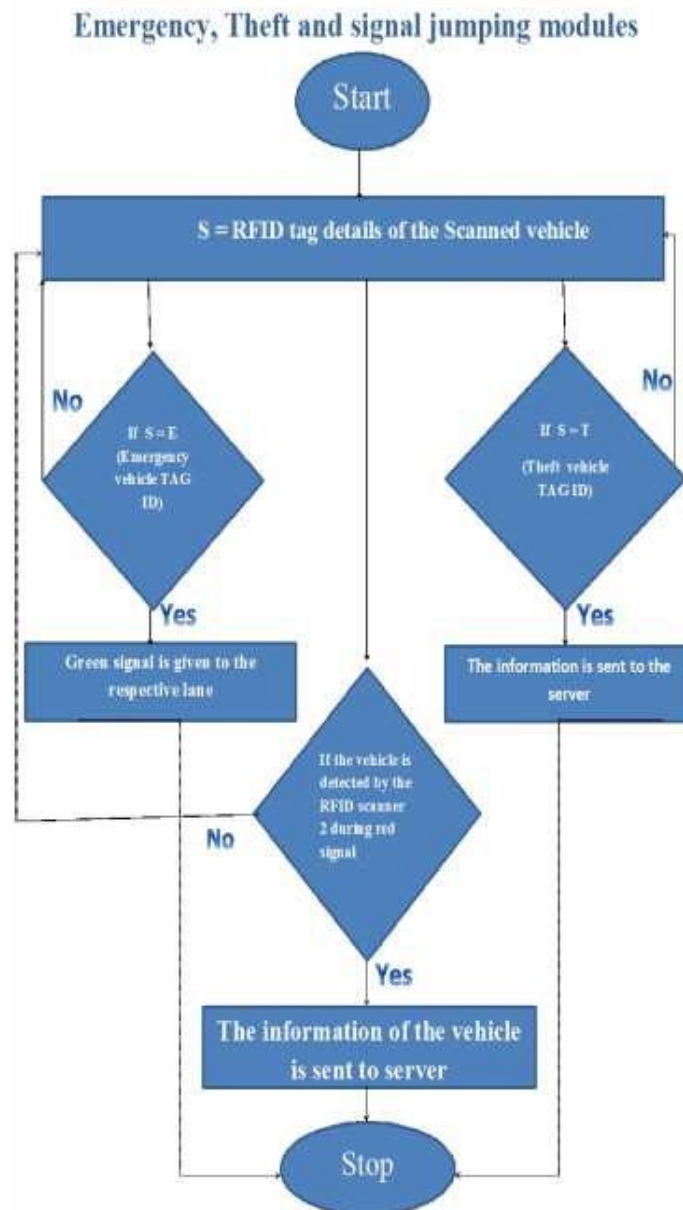
	DURING RED SIGNAL	DURING GREEN SIGNAL
LANE 1	RFID READER 1- ON RFID READER 2- ON	RFID READER 1-OFF RFID READER 2-ON
LANE 2	RFID READER 1- ON RFID READER 2- ON	RFID READER 1-OFF RFID READER 2-ON
LANE 3	RFID READER 1- ON RFID READER 2- ON	RFID READER 1-OFF RFID READER 2-ON
LANE 4	RFID READER 1- ON RFID READER 2- ON	RFID READER 1-OFF RFID READER 2-ON

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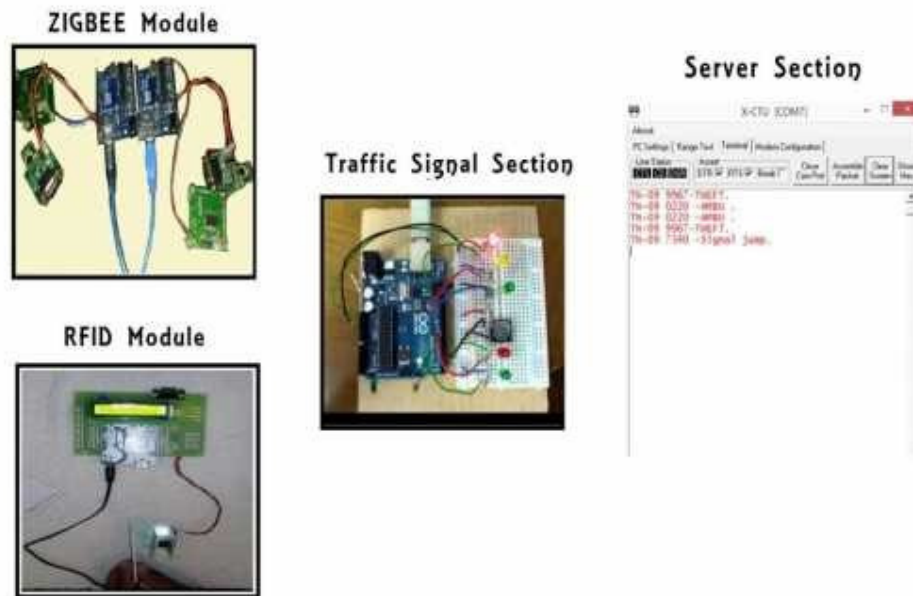TABLE 1: RFID Reader Configuration during the Traffic Sign

fig. 5.Hardware Implementation of the Proposed System

A.Arduino Uno

the basis of the ATMEGA 328 microcontroller .It consists   of 6 analog pins   .It also consists of 14 input/output pins   which

are digital in nature .It also consists of serial buffers. It can either be powered through a USB cable or through the DC port .

B.RFID reader

RFID is the abbreviation for Radio Frequency Identification .The RFID reader is a device which can collect the information from the RFID tag .It is very useful in tracking the objects. Radio waves within a frequency range from 125Khz to 2.5Ghz can be used to transfer Data.

C.RFID Tag

RFID tags are of two types Passive and Active. Active tags need power supply whereas Passive tag does not need any kind of power supply. Passive RFID tags are being used here. The RFID reader generates a Radio Frequency when these radio waves come in contact with the RFID tags will collect the energy stored in the RFID tag.

D.ZIGBEE Transceiver module

CC 2500 ZIGBEE transceiver module is a device which can be used for the purpose of wireless communication .The reason behind using ZIGBEE instead of WIFI is that ZIGBEE consumes very less amount of power So it can easily be powered by means of a battery whereas the same is not possible when WIFI is used. With a maximum range of 15 meters it can be used in frequency range of 2400 to 2483.5 MHz.
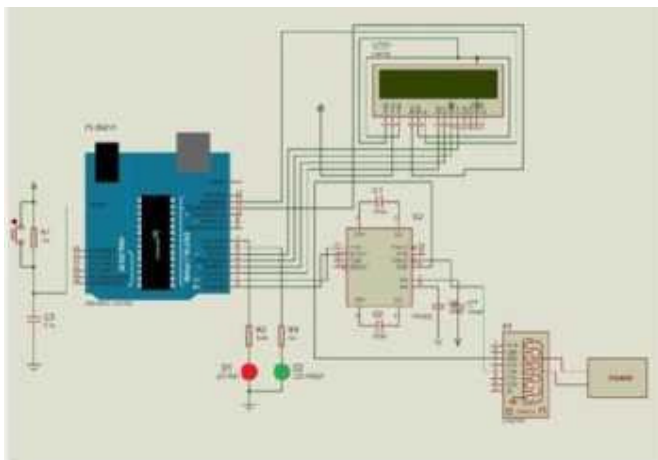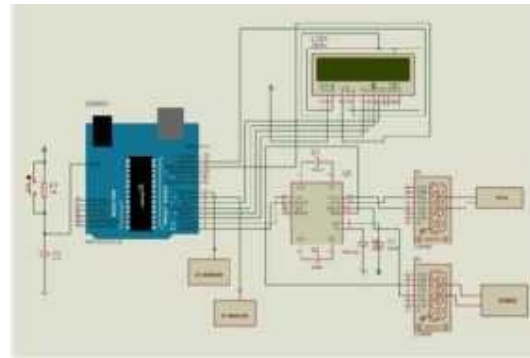
V.SIMULATION ANALYSIS
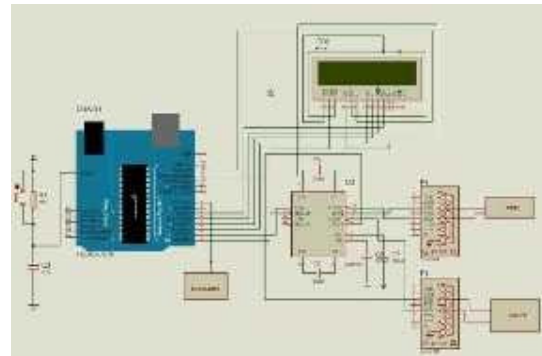

Fig. 4.1

Fig. 4.2

Fig. 4.3

Fig 4.1,4.2,4.3 -Simulation analysis of the system

The ARDUINO UNO microcontroller is compiled using the C compiler.This simulation consists of ARDUINO UNO units.RED and GREEN lights which are represented here are running in loop based on the code that is interfaced with the ARDUINO.Generally the Red and Green light will be running in a loop but whenever the density increases the Green light will start glowing and also whenever an Emergency vehicle passes by the junction the signal will automatically turn to Green .. four lanes is equipped with all the features and rest of the three are equipped with IR sensor only in order to estimate the density of each lane

.ARDUINO UNO is given a power supply of 12V DC and all the other components derive the required power from ARDUINO itself .IR sensor will count the number of vehicles in each of the three lanes and the density of all the lanes is being compared and the lane with highest density is given GREEN signal.

The above proposed system for traffic control and management system using RFID and ZIGBEE module is advantageous to many existing systems for this heavy volume of traffic .The RFID technology makes it easy to scan the details of the vehicle in a very simple way .ZIGBEE helps to get rid off all the wired connections and it also helps to connect to the server wirelessly by means of which traffic police can monitor the

methods .And there is no doubt in saying that this system will help the traffic police to control the traffic and will definitely be helpful.

VIII .REFERENCES

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