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RFID AND ZIGBEE BASED TRAFFIC CONTROL SYSTEM FOR CONGESTION CONTROL,AMBULANCE CLEARANCE AND STOLEN VEHICLE DETECTION

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ABSTRACT

This paper existing an intellectual traffic control system for congestion control, ambulance clearance and stolen vehicles detection. Each individual vehicle is equipped with special radio frequency identification (RFID) tag (placed at a strategic location), which creates it impossible to eliminate or destroy. We use RFID reader and PIC16F877A system-on-chip to read the RFID tags involved to the vehicle. It counts amount of vehicles that passes on a particular path during a specified period. It also regulates the network congestion, and hence the green light period for that path. If the RFID-tag-read goes to the stolen vehicle, then a message is directed using GSM to the police control room. In addition, when an ambulance is go near the junction, it will join to the traffic controller in the junction to turn ON the green light. Using FRID to identify the ambulance to give the way for the vehicles in the traffic light control and using this reduce the cost of the project. The prototype was tested under different ways more than one road combinations of inputs in our wireless Communication laboratory and experimental results remained found equally expected.

I.INTRODUCTION

India is the second most thickly populated Nation in the World and is a fast growing economy. It is seeing dreadful highway congestion problems in its capitals. Infrastructure growth is slow as compared to the growth in number of vehicles, owing to space besides cost constraints. Also, Indian traffic is non-plan based and chaotic. It needs a traffic control solutions, which are unlikecommencing the developed Countries. Intelligent management of traffic flows can diminish the negative impact of congestion. In modern years, wireless networks are widely used in the road transport as they afford more rate effective decisions.Technologies like ZigBee, RFID and GSM container be used in traffic control to provide cost actual solutions. RFID is a wireless machinery that uses radio frequency electromagnetic oomph to transport facts between the RFID tag with RFID reader. Some RFID patterns will only work within the range inches or centimeters, while others could work for 100 meters (300 feet) or more. A GSM modem is a specialized type of modem, which accepts a SIM card and activates over a contribution to a mobile operator, just like a mobile phone. AT

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commands are hand-me-down to control modems. These commands come sinceHayes commands that were charity by the Hayes smart modems. The ZigBee operates by low-power and canister be used at all the levels of work configurations to perform predefined tasks. It operates popular ISM groups (868 MHz fashionable Europe, 915 MHz in USA and Aust). Data transmission rates vary from ralia, 2.4 GHz in rest of the world 20 Kilobits/second in the 868 MHz frequency collection to 250 Kilobits/second in the 2.4 GHz frequency crowd [3], [4]. The ZigBee uses 11 channels popular case of 868/915 MHz broadcasting frequency and 16 channels in case of 2.4 GHz radio frequency. It similarly uses 2 channel configurations, CSMA/CA and fitted CSMA/CA [5]. The entire paper is gathered into 5 parts. Sections II conferences about the literature survey. Section III discusses about the current difficulty that exist in producing way to an ambulance and extra vehicles. It moreover talks of how the proposed copy will beat the difficult faced in developing Countries as well as established countries. Section IV gives the execution details of the proposed model. Section V presents the enhancement of this work.

II. LITERATURE SURVEY

Traffic congestion is a major problem in cities of developing Countries like India. Growth in urban population and the middle-class segment contribute significantly to the rising number of vehicles in the cities [6]. Congestion on roads eventually results in slow moving traffic, which increases the time of travel, thus stands-out as one of the major issues in metropolitan cities. In [7], green wave system was discussed, which was used to provide clearance to any emergency vehicle by turning all the red lights to green on the path of the emergency vehicle, hence providing a complete green wave to the desired vehicle. A 'green wave' is the synchronization of the green phase of traffic signals. With a 'green wave' setup, a vehicle passing through a green signal will continue to receive green signals as it travels down the road. In addition to the green wave path, the system will track a stolen vehicle when it passes through a traffic light. Advantage of the system is that GPS inside the vehicle does not require additional power. The biggest disadvantage of green waves is that, when the wave is disturbed, the disturbance can cause trafficproblems that can be exacerbated by the synchronization.

In such cases, the line of vehicles in a green wave produces in size until it becomes too large and some of the vehicles cannot spread the green lights in time and duty stop. This is called over-saturation [12], [13]. In [8], the use of RFID traffic regulator to avoid problems that usually arise with standard traffic control systems, especially those associated to image processing and beam intermission techniques are discussed. This RFID technique deals with multivehicle, multilane, multi road junction areas. It delivers an effective time management scheme, in which, a dynamic time schedule is worked obtainable in real time for the opening of each traffic column. The real-time operation of the system emulates the decision of a traffic policeman on obligation. The number of vehicles in each column and the routing are proprieties, upon which the controlsand the judgments are completed. The disadvantage of this work is that it does not discuss what methods are recycled for communication among the emergency vehicle and the traffic signal controller. In [9], it proposed a RFID

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and GPScreated automatic lane clearance system aimed atambulance. The focus of this work is to reduce the delayin arrival of the ambulance to the hospital through automatically payment the lane, in which, ambulance is travelling, before itreaches the traffic signal. Christo Ananth et al. [10] discussed about Intelligent Sensor Network for Vehicle Maintenance System. Modern automobiles are no longer mere mechanical devices; they are pervasively monitored through various sensor networks & using integrated circuits and microprocessor based design and control techniques while this transformation has driven major advancements in efficiency and safety. In the existing system the stress was given on the safety of the vehicle, modification in the physical structure of the vehicle but the proposed system introduces essential concept in the field of automobile industry. It is an interfacing of the advanced technologies like Embedded Systems and the Automobile world. This "Intelligent Sensor Network for Vehicle Maintenance System" is best suitable for vehicle security as well as for vehicle's maintenance. Further it also supports advanced feature of GSM module interfacing. Through this concept in case of any emergency or accident the system will automatically sense and records the different parameters like LPG gas level, Engine Temperature, present speed and etc. so that at the time of investigation this parameters may play important role to find out the possible reasons of the accident. Further, in case of accident & in case of stealing of vehicle GSM module will send SMS to the Police, insurance company as well as to the family members. In [11], presently a video traffic surveillance and monitoring system commissioned in Bangalore city. It includes a manual inquiry of data by the traffic management team to determine the traffic light period in every of the junction.It will communicate the same to the local police officers for the necessary actions.

III. PROPOSED MODEL

From the current problem section, it can at, existing technologies arecongestion controller, emergency vehicle clearance, takentruck detection, etc. To solve these difficulties, we propose to implement our Intelligent Traffic Control System. It largelycovers of three parts. First part contains automatic signal control organization. Here, each vehicle is equipped with an RFID tag. When it originates in the range of RFID reader, it will send the signal to the RFID reader. The RFID reader will track how countless vehicles consume passed through for a specific period besides determines the congestion capacity. Accordingly, it sets the green light period for that track. Second part is for the emergency vehicle clearance. Here, each alternative vehicle contains ZigBee transmitter module besides the ZigBee receiver will remain implemented by the traffic junction. The buzzer will be switched ON once the vehicle is rummage-saleaimed at emergency resolution. This will send the signal through the ZigBee transmitter to the ZigBee receiver. It will make the traffic light to change to green. Once the ambulance passes through, the receiver no longer receives the ZigBee signal and the traffic light is turned to red. The third part is responsible for stolen vehicle detection. Here, when the RFID reader reads the RFID tag, it compares it to the list of stolen RFIDs. If a match is found, it sends SMS to the police control room

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and changes the traffic light to red, so that the vehicle is made to stop in the traffic junction and local police can take appropriate action. List of components used in the experiment are CC2500RF module, Microchip PIC16F877A, RFID Reader–125KHz–TTL and SIM300 GSM module.

A.ZigBee Module CC2500

The CC2500 is a RF module and has microcontroller via serial communication. Rx pin of CC2500 is linked to Tx (RC6) of microcontroller

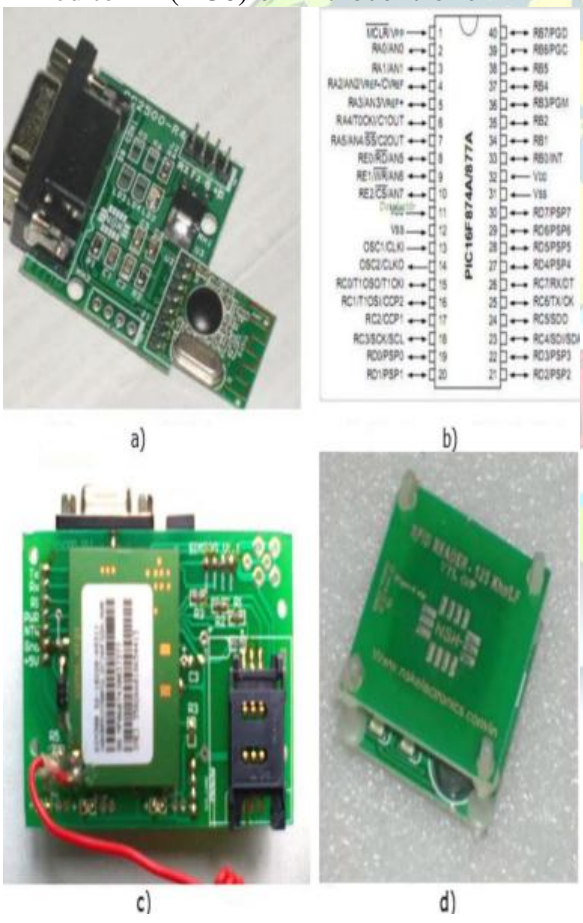

Fig. 2. PIN diagrams of different components used in our prototype.

(a) ZigBee module CC2500. (b) Pin diagram of PIC16F877A. (c) GSM Module SIM300. (d) RFID reader–125 kHz–TTL.

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. Here, we uses CC2500 ZigBee module and it has transmission range of 20 meters.

B.Microcontroller (PIC16F877A)

Peripheral Interface Control (PIC) 16F series has a lot of advantages as compared to other series. It executes each instruction in less than 200 nanoseconds. It has 40 pins and has 8K program memory and 368 byte data memory. It is easy to store and direct UINs. At the junction, it is easy to store large number of emergency vehicles. Before switching to green, it should satisfy all the conditions. Simple interrupt option gives the advantage like jump from one loop to another loop. It is easy to switch any time. It consumes less power and operates by vehicle battery itself without any extra hardware.

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

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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 (GSM 07.07,07.05 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 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. RFID reader uses frequency 125 KHz with a range of 10 cm.

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. Figure 3 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.

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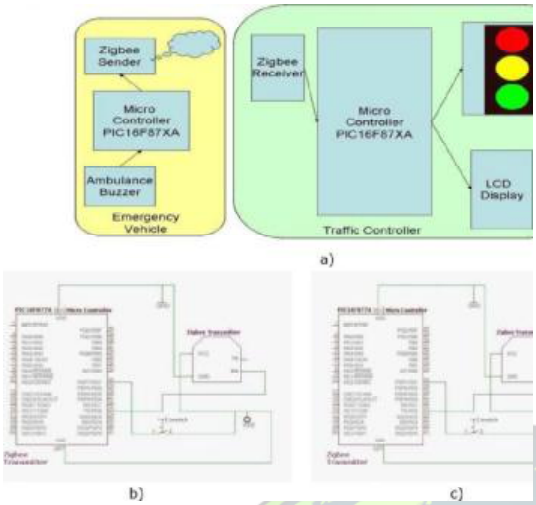

C. Emergency Vehicle Clearance System

In this module, there are 2 parts, first part which is ZigBee transmitter is placed in the emergency vehicle. When the switch is pressed, it will transmit the signal. The signal contains unique id and security code. The transmitter contains PIC16F877A microcontroller and ZigBee module. The microcontroller sends the commands and data to the ZigBee via serial communication. Second part is the receiver, which is placed at traffic pole. It also contains PIC16F877A microcontroller and ZigBee module. The receiver compares the security code received to the security code present in its database. If it matches, then it will turn the green light on. For testing purpose, we used short range RFID reader in our prototype. First, the receiver part is turned on. The red and green signal will be on for 10 seconds duration and orange light will be on for 2 seconds duration one after the other. secondly, we bring the RFID of stolen vehicle into the range of RFID reader. Then the signal will turn to red for duration of 30 seconds and a SMS is received.Thirdly, we bring 12 RFIDs into the range of RFID reader, and then the green light duration will change to 30 seconds. Fourthly, we bring an emergency vehicle carrying ZigBee transmitter into the range of ZigBee receiver, and then the traffic light will change to green till the receiver receives the ZigBee signal the images of different components and highlighted features the proposed work the signal pole installed in junction. In the default condition, red and green light will set for 10 seconds. The time period will be varied according to the traffic conditions, stolen vehicle, part is placed in the ambulance. It transmits ZigBee signalcontinuously. Figure 5.c shows the LCD display status at different conditions (in that figure one is normal conjunction image (traffic signal running as per the default time period) and another one is LCD display status, when an ambulance coming near to junction. Figure 5.d shows the actual connections of different components like RFID, GSM, ZigBee, interfacing different microcontrollers. Figure 5.e shows the status updated at the time of stolen vehicle is found. The stolen vehicle RFID number should be updated in the database. If stolen vehicle is found, then it will immediately turn on red light in the signal. It sends immediately a message to authorized person.

V. CONCLUSION AND ENHANCEMENTS

With automatic traffic signal control based on the traffic density in 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. With stolen vehicle detection, the signal

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automatically turns to red, so that the police officer can take appropriate action, if he/she is present at the junction. Also SMS will be sent so that they can prepare to catch the stolen vehicle at the next possible junctions. Emergency vehicles like ambulance, 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. With emergency vehicle clearance, the traffic signal turns to green as long as the emergency vehicle is waiting in the traffic junction. The signal turns to red, only after the emergency vehicle passes through. Further enhancements can be done to the prototype by testing it with longer range RFID readers. Also GPS can be placed into the stolen vehicle detection module, so that the exact location of stolen vehicle is known. Currently, we have implemented system by considering all the roads in a multi-road junction.

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