

INSTINCTIVE EMERGENCY VEHICLE RESCUE AND STOLEN VEHICLE DETECTION USING RFID AND GPS

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ABSTRACT

Nowadays in modern urban areas the accidents and vehicle thefts are increased to uncertain level. The loss of human life due to accident is to be avoided. Traffic congestion and tidal flow are major facts in cities of developing countries like India. Congestion on roads eventually results in slow moving traffic. Emergency vehicles and fire trucks need to reach their destinations earliest. To bare loss of human life due to accidents, here introduce a system called green wave system. The idea behind this system is to turning the traffic signal to green when the ambulance is at a certain distance from the traffic junction. It uses GPS system on PIC16F877A system-on-chip for wireless communications between ambulance and traffic controller. Then, each individual vehicle is equipped with RFID tag, which makes it impossible to remove or destroy. The RFID reader, NSK EDK-125-TTL, and PIC16F877A system-on-chip in the traffic controller reads the RFID tag attached to the vehicle. If the RFID tag belongs to the stolen vehicle, the information is send to the police control room using GSM SIM300. The system is fully automated and thus, requires no human intervention at the traffic junctions.

Keywords: *Emergency vehicle clearance, Green wave system, GPS, stolen vehicle detection, RFID tag.*

I. INTRODUCTION

India is the second most populous Country in the World and is a fast growing economy. It is seeing terrible road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints. Bangalore is one of the most accident prone countries in India. Moreover the ambulance, often get stuck at the traffic signals where all other vehicle try to squeeze in to all the available spaces. Unlike western countries, Indian cities cannot think of having separate lanes for emergency purpose due to lake of road planning and infrastructure. With the lives of the patients depend on the speedy arrival of the emergency vehicle at the respective venue. It needs a traffic control solutions, which are different from the developed countries. Instinctive green wave system can reduce the negative impact of traffic congestion. A “green wave” is the synchronization of the green phase of traffic signals. Technologies like GPS, RFID and GSM used in traffic control systems to provide effective solutions. That is the arrival of the emergency vehicle is to be communicated to the nearest traffic signal controller through GPS transceiver and receiver, so that it can turn the traffic light to green and hence clear the traffic before it reach the junction. However all the ambulances will not be used for emergency purposes? To overcome this buzzer in the ambulance will be switched ON when vehicle is used for emergency purposes. RFID is a wireless technology that uses radio frequency electromagnetic energy to carry information between the RFID tag and RFID reader. Some RFID systems will only work within the range inches or centimeters, while others may work for 100 meters (300 feet) or more. If the RFID reader receives the stolen vehicle RFID tag signal by using GSM it send information to the police control room or display it in LCD. A GSM modem is a specialized type of modem, which accepts a SIM card and operates over a subscription to a mobile operator, just like a mobile phone.

II. BACKGROUNDS

The Global Positioning System (GPS) is a space based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. A GPS receiver’s job is to locate four or more of these satellites, figure out the distance to each, and use this information to deduce its own location.

The Radio Frequency Identification (RFID) usually refers a whole system, which usually contains three main parts: The RFID tag, RFID Reader, and the Application. RFID tag refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying some kind of information depending on applications. The RFID readers, also called interrogators, are used to recognize the presence of nearby RFID tags.

III. LITERATURE SURVEY

Suresh Sharma, A.Pithora, G.Guptha, M.Goel, and M.Sinha proposed a RFID system. The use of RFID traffic control to avoid problems that usually arise with standard traffic control systems, particularly those related to image processing and beam interruption

techniques are discussed. This RFID system deals with multivehicle, multilane, multi road junction areas. It provides an efficient time management scheme, in which a active time schedule is worked out in real time for the road of each traffic column. The real-time operation of the system gives the judgment of a traffic policeman on duty. Number of vehicles in each column and the routing are proprieties which upon the calculations and the judgments are done. The disadvantage of this work is that it does not discuss what methods are used for communication between the emergency vehicle and the traffic signal controller.

Geetha.E, V.Viswanadha, Kavitha.G proposed an intelligent auto traffic signal control system. Traffic congestion is one of the major issues to be considered. Generally Vehicular traffic intersects at the junctions of the road and are controlled by the traffic signals. Traffic signals need a good coordination and control to ensure the smooth and safe flow of the vehicular traffic. During the rush hours, the traffic on the roads is at its peak. Also, there is a possibility for the emergency vehicles to stick in the traffic jam. Therefore; there is a need for the dynamic control of the traffic during rush hours. Hence, they propose a smart traffic signal controller. The proposed system tries to minimize the possibilities of traffic jams, caused by the traffic lights, to some extent by clearing the road with higher density of vehicles and also provides the clearance for the emergency vehicle if any. The system is based on the PIC 16F877A micro controller, IR sensors and Radio Frequency Identification (RFID) technology. The code for this project is compiled in high tech C compiler and the simulated with Proteus software.

VeeraVenkatesh, Nazneen Syed proposed a smart traffic control for emergency vehicle clearance. Traffic congestion is a major problem in cities of developing Countries like India. Congestion on roads eventually results in slow moving traffic. Emergency vehicles like ambulance and fire trucks need to reach their destinations at the earliest. If they spend a lot of time in traffic jams, valued lives of many people may be in danger. Here the image sequences from a video camera are analyzed using various edge detection and object counting methods to obtain the most efficient technique. Then, the number of vehicles at the intersection is evaluated and traffic is efficiently managed. The image received by the camera is distorted by noise and it becomes difficult for the system to identify the desired vehicle. This can be implemented in LABVIEW.

Ayush Kr. Mittal and DeepikaBhandari proposed a green wave system. It is used to provide clearance to any emergency vehicle by turning all the red lights to green on the path of the emergency vehicle, for this reason 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. 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 then the disturbance can cause traffic problems.

IV. GREEN WAVE SYSTEM

The current problem section, it can be seen that, existing technologies are insufficient to handle the problems of emergency vehicle clearance and stolen vehicle detection. To solve these problems, we propose to implement our instinctive green wave System. It mainly consists of two parts. First part is for the emergency vehicle rescue. Here, each emergency vehicle contains GPS transmitter module and the GPS receiver will be implemented at the traffic junction. The buzzer will be switched ON when the vehicle is used for emergency purpose. This will send the signal through the GPS transmitter to the GPS receiver. It will make traffic light change to green. Here, the instant change of green waves can cause some traffic problems due to synchronization. To avoid this, make all traffic signal to be red for 5 seconds after the GPS receiver received the signal from transmitter, then the emergency vehicle path to be green. Once the ambulance passes through, the receiver no longer receives the GPS signal and the traffic light is turned to red. The second 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 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 GPS, Microchip PIC16F877A, RFID Reader– 125KHz–TTL and SIM300 GSM module.

A. 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 (GSM 07.07,07.05 and enhanced AT commands). It uses AC –DC power adaptor with following ratings DC Voltage: 12V/1A.

B. 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.

C. RFID Transponders

Passive RFID transponders are installed inside every vehicle at the time of manufacturing. RFID transponders consist of unique ID. Once the vehicle is registered and gets the license plate number, its data is stored in the database along with the category of the vehicle

Fig 1: GSM module and RFID reader

V. WORKING MODEL A. Emergency vehicle rescue system

In this module, there are 2 parts, first part which is GPS 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 GPS module. The microcontroller sends the commands and data to the GPS via serial communication. Second part is the receiver, which is placed at traffic pole. It also contains PIC16F877A microcontroller and GPS 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. We bring an emergency vehicle carrying GPS transmitter into the range of GPS receiver, and then the traffic light will change to green till the receiver receives the GPS signals. The transmitter part is placed in the ambulance. It transmits GPS signal continuously.

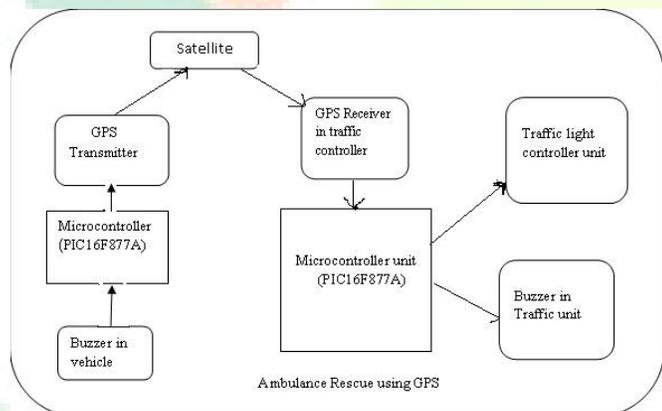


Fig 3: Block diagram for emergency vehicle rescue.

B. Stolen vehicle detection

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. 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 duration of 30 seconds. Also an SMS is sent specifying the RFID number by using SIM300 GSM module. The LCD display will indicate that stolen vehicle is present as shown in figure4.

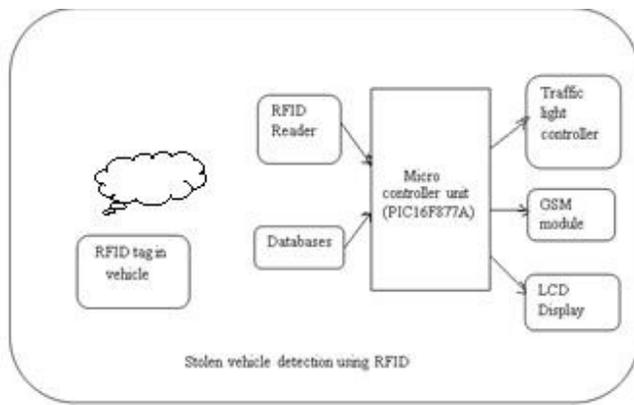


Fig 4: Block diagram of stolen vehicle detection

VI. RESULTS AND CONCLUSION



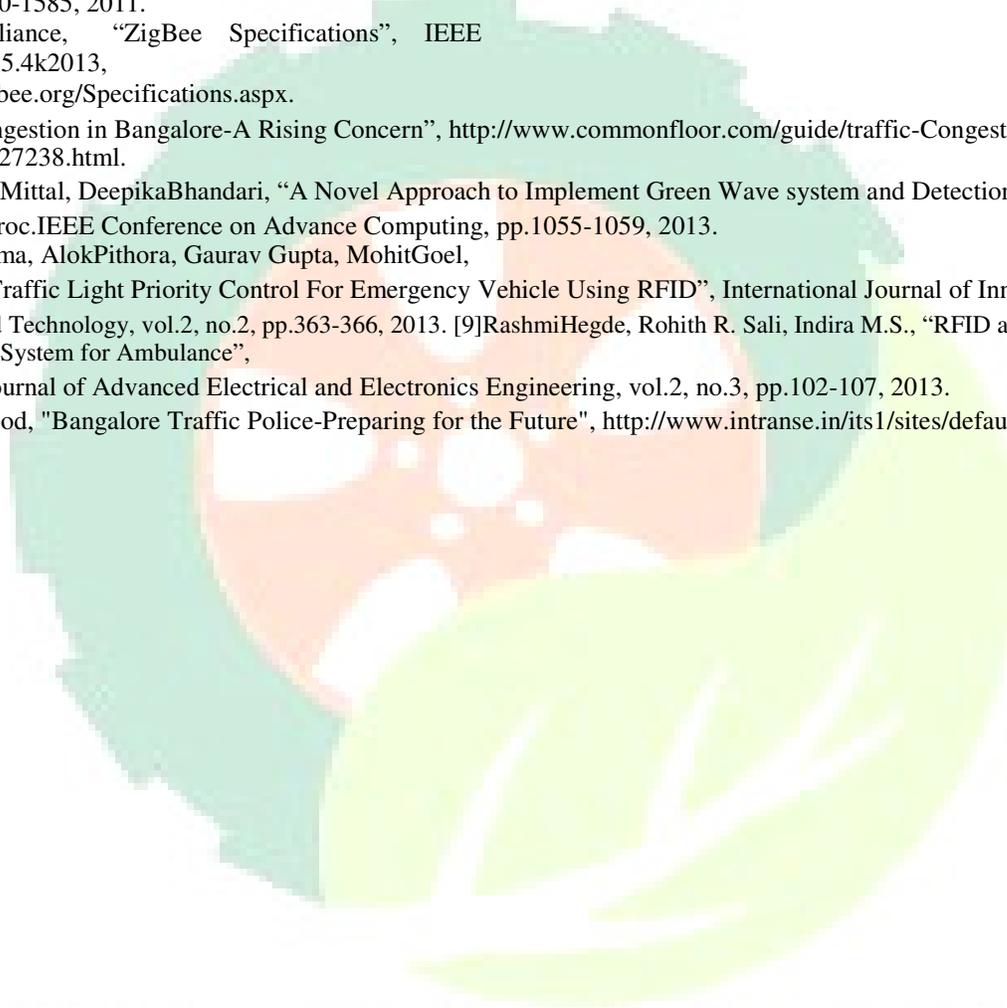
Fig 5: Implementation of Emergency vehicle rescue and stolen vehicle detection

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 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 to police control room and the owner of the vehicle, 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 passed through 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 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 one road of the traffic junction. It can be improved by extending to all the roads in a multi-road junction.

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