INTERNATIONAL JOURNAL OF RESEARCH
In Advanced Engineering Technologies

Volume 5, Issue 4 OCT 2016

DESIGN AND IMPLEMENTATION OF INTELLIGENT SMART TRAFFIC CONTROL SYSTEM FOR EMERGENCY AMBULANCE CLEARANCE AND STOLEN VEHICLE DETECTION

B.Bhavani [1] bhavani.bhupathi311@gmail.com[1]

Y.Vishwasri [2] vishwasri456@gmail.com[2]

B.Chandrakala[3] bchandrakala701@gmail.com[3]

[1] PG Scholar, Dept of ECE, Kommuri Pratap Reddy Institute of Technology, Ghanapur (v), Ghatkesar(Mandal), Ranga Reddy Dist, Telangana, India.

[2] Guide, Assistant Professor, Dept of ECE, Kommuri Pratap Reddy Institute of Technology, Ghanapur (v), Ghatkesar(Mandal), Ranga Reddy Dist, Telangana, India.

[3]Guide, Assistant Professor, Dept of ECE, Kommuri Pratap Reddy Institute of Technology, Ghanapur (v), Ghatkesar(Mandal), Ranga Reddy Dist, Telangana, India.

Abstract: This paper describes Nowadays the road accidents in modern urban areas 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 that cause delay to ambulance. To bar loss of human life due to accidents we introduce a scheme Intelligent Traffic Control for Congestion, Ambulance clearance, and Stolen Vehicle Detection.

The main theme behind this scheme is to provide a smooth flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion. The idea behind this scheme is to implement ITLS which would control mechanically the traffic lights in the path of the ambulance. When an ambulance approaching the junction, it will communicate the traffic controller in the junction to turn on the green light. And also we are going to implement a sensor network work which is used to detect the traffic density and also use RFID reader and tags. We use ARM7 system-on-chip to read the RFID tags attached to the vehicles. If the RFID tag read belongs to the stolen vehicles. GSM SIM900 used for message sends to the police control room. This scheme is fully automated, thus it finds the accident spot, controls the traffic lights, helping to reach the hospital in time.

Key words: Keywords: GSM, ZIGBEE, Traffic, Congestion, Sensor system.

I. Introduction

The aim of this project is, INDIA is one of the most populous Country in the World and is a fast growing financial prudence. It is seen that terrible road congestion problems in cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost bounds .Also, Indian traffic is non-lane based. It needs a traffic control solutions, which are different from the other Countries? Smart management of traffic flows can reduce the negative effect of congestion. In recent years, wireless networks are widely used in the road transport as they provide more cost effective options. Technologies like XBee, GSM and RFID can be used in traffic control to provide cost better solutions. RFID system 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 or more. A GSM modem is a special type of modem, which accepts a SIM card and operates over a subscription to a mobile operator, just like a mobile phone. The XBee operates at low-power and can be used at all the levels of work configurations to perform predefined tasks. It operates in ISM bands (868 MHz in Europe, 915 MHz in USA and Australia, 2.4 GHz in rest of the world).

Working model

The disadvantages mentioned in the literature survey are overcome and new methods are being implemented in this system. There are two major operations that are being done in this system. The first is the stolen vehicle detection and the second is the emergency vehicle clearance system.

A. **STOLEN VEHICLE DETECTION METHOD:** Every vehicle is equipped with an RFID tag which cannot be removed or even destroyed. If our vehicle is stolen and we complaint in the police station then at the signal points the RFID reader reads the RFID tag numbers and matches the every number with the stolen number and in that case if the match is found, then it automatically sends SMS to the police control room and the person who belongs to that vehicle and then 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.

B. **EMERGENCY VEHICLE CLEARENCE SYSTEM:** Each vehicle contains Zigbee MODULE with the transmitter and receiver implemented at the traffic junction. And also in the ambulance unit. A green wave is shown when the vehicle reaches the junction point so that it can move smoothly without any traffic jams and waste the time near the junction in emergency condition and when it passes away from the junction automatically the green is changed to red. Here there was no need of giving the starting and ending point of the travel. So this system works even if the ambulance needs to take another route if in emergency condition. When it takes another route then the receiver at that route sends the information to the Zigbee receiver placed at the junction that the emergency vehicle has passed in this way so it can change the signal green to red and work in the normal way. In this way the system is being used.

III. Design of Proposed Hardware

In this proposed system consists of two sections one is in the vehicle and another one is at signal section

Vehicle section: It consists of switches, Zigbee and Gsm module these modules are interfaced with microcontroller. Whenever ambulance need to go fast in signal section just driver press the switches. The switches contains the way that ambulance or any emergency vehicle selects. The information microcontroller sends to the ZigBee via serial communication. Here zigbee sends information to Second part, which is placed at control unit. Here GSM send the message to the authorized number located at receiver section. This Message contains the information about the ambulance "WAY SELECTION" We can observe all messages like way selection and way exit on LCD display.

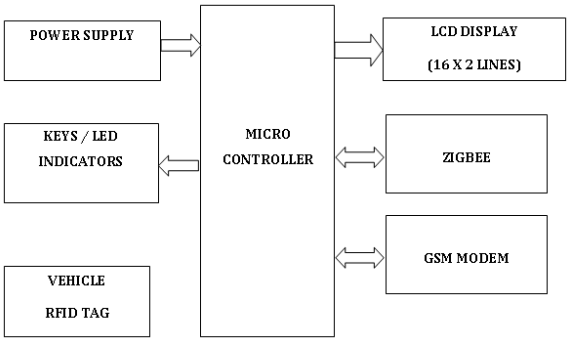

Fig. 1. Vehicle section/ambulance section

Monitoring/ Traffic signal section

In this section consists of RFID Reader, GSM module, IR sensor, Zigbee module and Traffic lights. The microcontroller connected to the RFID reader reads the RFID tags which having the information of the vehicle and IR Sensors will count the number of vehicles in that particular way. This pattern is applied to remaining ways. For example If the density of vehicles(RFID tags) are more in the way1 junction compare to the remaining ways then the green light duration will more at that particular junction. Here the functioning of traffic signal is based on the density of vehicles at selective ways. Here RFID Reader is at control section and RFID Tags are at vehicle section. List of RFIDs of the stolen vehicles are stored inside the data base of the microcontroller. Once, the RFID of a vehicle is loaded to the microcontroller, it compares it with the list. If any

match is found, the control signals are sent to the GSM module. GSM module is programmed such that at commands is generated and the message is send to the police control room indicating the theft vehicle is detected.

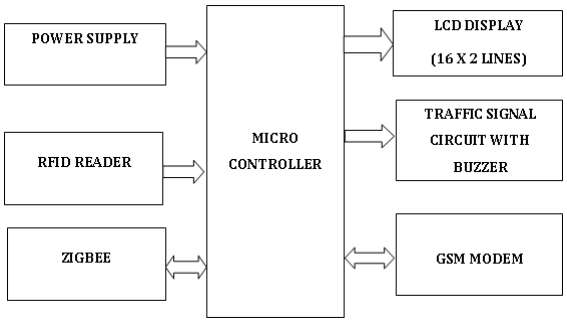

Fig. 2. Monitoring/ Traffic signal section

The emergency mode is triggered when the Zigbee receiver received the transmitted signal from the Zigbee transmitter to override the normal sequence of the traffic light. For example, an ambulance arrives at the traffic light 4 and the green light of the traffic light 1 is on. When the push-on button no.4 is turned on, the Zigbee receiver received the transmitted signal and changed the sequence to the emergency sequence mode. The emergency sequence mode started. Then the green of traffic light 4 is on. The emergency sequence mode is ended when the exit button being push, then the sequence of the traffic light is back to the normal sequence which the green light of traffic light 1 is turned back on for the remaining time before the emergency sequence mode is triggered.

Board Hardware Resources Features

LPC2148 CONTROLLER:
LPC2148 is ARM7TDMI-S Core Board Microcontroller that uses 16/32-Bit 64 Pin (LQFP) Microcontroller No.LPC2148 from Philips (NXP). All resources inside LPC2148 is quite perfect, so it is the most suitable to learn and study because if user can learn and understand the applications of all resources inside MCU well, it makes user can modify, apply and develop many excellent applications in the future. Because Hardware system of LPC2148 includes the necessary devices within only one MCU such as USB, ADC, DAC, Timer/Counter, PWM, Capture, I2C, SPI, UART, and etc. The LPC2141/42/44/46/48 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/42/44/46/48 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

GSM MODEM GSM Modem It is a globally accepted standard for digital cellular communication. GSM is the name of standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900MHZ. Presently GSM supports more than one billion mobile subscribers in more than 210 countries throughout the world. The GSM commercial modem is an approved modem for embedded applications. It provides a 5v TTL compatible serial interface to host data terminal equipment. Call control is provided by using the Hayer AT command set. By sending a code from a transmitter GSM equipped mobile to other mobile which is a receiving GSM equipped mobile.

Fig 3: GSM module

Radio Frequency Identification (RFID): RFID is an acronym for radio frequency identification. Briefly the RF stand for “radiofrequency” and ID means “identifier” that allows an item, for instance a library book, to be identified, accessed, stored, reprogrammed and communicated by using radio waves. Radio Frequency Identification (RFID) is a generic term for non-contacting technologies that use radio waves to automatically identify people or objects. There are several methods of identification, but the most common is to store a unique serial number that identifies a person or object on a microchip that is attached to an antenna. The combined antenna and microchip are called an "RFID transponder" or "RFID tag" and work in combination with an "RFID reader". An RFID system consists of a reader and one or more tags. The reader's antenna is used to transmit radio frequency (RF) energy. The tag will then modulate the electromagnetic waves generated by the reader in order to transmit its data back to the reader. The reader receives the modulated waves and converts them into digital data. There are two major types of tag technologies. "Passive tags" are tags that do not contain their own power source or transmitter. When radio waves from the reader reach the chip’s antenna, the energy is converted by the antenna into electricity that can power up the microchip in the tag. The tag is then able to send back any information stored on the tag by reflecting the electromagnetic waves as described above. "Active tags" have their own power source and transmitter. The power source, usually a battery, is used to run the microchip's circuitry and to broadcast a signal to a reader. Due to the fact that passive tags do not have their own transmitter and must reflect their signal to the reader, the reading distance is much shorter than with active tags. However, active tags are typically larger, more expensive, and require occasional service.

ZIGBEE Technology

ZIGBEE is a new wireless technology guided by the IEEE 802.15.4 Personal Area Networks standard. It is primarily designed for the wide ranging automation applications and to replace the existing non-standard technologies. It currently operates in the 868MHz band at a data rate of 20Kbps in Europe, 914MHz band at 40Kbps in the USA, and the 2.4GHz ISM bands Worldwide at a maximum data-rate of 250Kbps.The ZIGBEE specification is a combination of Home RF Late and the 802.15.4 specification. The specification operates in the 2.4GHz (ISM) radio band - the same band as 802.11b standard, Bluetooth, microwaves and some other devices. It is capable of connecting 255 devices per network. The specification supports data transmission rates of up to 250 Kbps at a range of up to 30 meters. ZIGBEE's technology is slower than 802.11b (11 Mbps) and Bluetooth (1 Mbps) but it consumes significantly less power. 802.15.4 (ZIGBEE) is a new standard uniquely designed for low rate wireless personal area networks. It targets low data rate, low power consumption and low cost wireless networking, and its goal is to provide a physical-layer and MAC-layer standard for such networks.

Wireless networks provide advantages in deployment, cost, size and distributed intelligence when compared with wired networks. This technology allows users to set up a network quickly, and allows them to set up networks where it is impossible or inconvenient to wire cables. Wireless networks are more cost-efficient than wired networks in general. Bluetooth (802.15.1) was the first well-known wireless standard facing low data rate applications. The effort of Bluetooth to cover more applications and provide quality of service has led to its deviation from the design goal of simplicity, which makes it expensive and inappropriate for some simple applications requiring low cost and low power consumption. These are the kind of applications this new standard is focused on. It's relevant to compare here Bluetooth and ZIGBEE, as they are sometimes seen as competitors, to show their differences and to

clarify for which applications suits each of them. The data transfer capabilities are much higher in Bluetooth, which is capable of transmitting audio, graphics and pictures over small networks, and also appropriate for file transfers. ZIGBEE, on the other hand, is better suited for transmitting smaller packets over large networks; mostly static networks with many, infrequently used devices, like home automation, toys, remote controls, etc. While the performance of a Bluetooth network drops when more than 8 devices are present, ZIGBEE networks can handle 65000+ devices.

Fig 4: ZIGBEE module

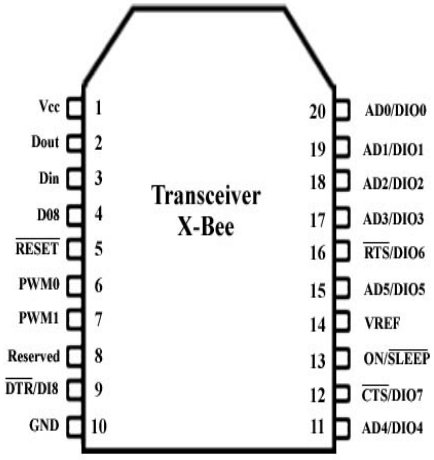

Fig 5: Pin diagram of X-Bee Transceiver

IV. CONCLUSION

In this paper, 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, we can find out the location/junction of the vehicle. And also SMS will be sent to the authorized person. 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.

FUTURE SCOPE: As the entire system is automated, it requires very less human interactions by using IOT devices. With the help of Internet of Things [IOT] we can easily monitor the traffic signals density and emergency vehicles enter and exit on a website. Another application of IOT devices is we can easily control the traffic signals also. Depends on our requirements when VIP persons visit, with in a fraction of time intervals also we can reset the signals as previous.

Also GPS can be placed into the stolen vehicle detection module, so that the exact location of stolen vehicle is known.

REFERENCES

[1] G. Varaprasad and R. S. D. Wahidabanu, "Flexible routing algorithm for vehicular area networks," in *Proc. IEEE Conf. Intell. Transp. Syst. Telecommun.*, Osaka, Japan, 2010, pp. 30–38.

[2] B. P. Gokulan and D. Srinivasan, "Distributed geometric fuzzy multiagent urban traffic signal control," *IEEE Trans. Intell. Transp. Syst.*, vol. 11, no. 3, pp. 714–727, Sep. 2010.

[3] K. Sridharamurthy, A. P. Govinda, J. D. Gopal, and G. Varaprasad, "Violation detection method for vehicular ad hoc networking," *Security Commun. Netw.*, to be published. [Online]. Available: http://onlinelibrary.wiley.com/doi/10.1002/sec.427/abstract.

[4] M. Abdoos, N. Mozayani, and A. L. C. Bazzan, "Traffic light control in non-stationary environments based on multi agent Q-learning," in *Proc. 14th Int. IEEE Conf. Intell. Transp. Syst.*, Oct. 2011, pp. 580–1585.

[5] *ZigBee Specifications*, ZigBee Alliance IEEE Standard 802.15.4k2013,2014.

[6] *Traffic Congestion in Bangalore—A Rising Concern*.[Online].Available:http://www.commonfloor.com/guide/traffic-congestion-in-bangalore-arising-concern27238.html, accessed 2013.

[7] A. K. Mittal and D. Bhandari, "A novel approach to implement green wave system and detection of stolen vehicles," in *Proc. IEEE 3rd Int.Adv. Comput.*, Feb. 2013, pp. 1055–1059.

[8] S. Sharma, A. Pithora, G. Gupta, M. Goel, and M. Sinha, "Traffic light priority control for emergency vehicle using RFID," *Int. J. Innov. Eng. Technol.*, vol. 2, no. 2, pp. 363–366, 2013.

[9] R. Hegde, R. R. Sali, and M. S. Indira, "RFID and GPS based automatic lane clearance system for ambulance," *Int. J. Adv. Elect. Electron. Eng.*,vol. 2, no. 3, pp. 102–107, 2013.

[10] P. Sood. *Bangalore Traffic Police-Preparing for the Future*. [Online].

[11] *Traffic Management Centre*. [Online]. Available: http://www.bangaloretrafficpolice.gov.in/index.php?option=com_content&view=article&id=87&btp=87, accessed 2014.

Author's Profile:

B.BHAVANI currently a PG scholar in ECE Department from Kommuri Pratap Reddy Institute of Technology. She received B.TECH degree from JNTU. Her current research interest includes Analysis & Design of VLSI and embedded System Design.

Y.Vishwasri, M.Tech, received the Bachelor's degrees in Electronics and communication from JNTU,She received the master degree from JNTU. She is currently working as Assistant Professor in Electronics and communication Engineering Department in Kommuri Pratap Reddy Institute of Technology.

B.Chandrakala, M.Tech, received the Bachelor's degrees in Electronics and communication from JNTU,She received the master degree from JNTU. She is currently working as Assistant Professor in Electronics and communication Engineering Department in Kommuri Pratap Reddy Institute of Technology.