

ADVANCED VEHICLE THEFT SECURITY SYSTEM USING CAN TECHNOLOGY

Kamal Batcha M, Mohaideen Basha A, Asik Ahamed A, Nandakumar P and Balaji S

*Kamal Batcha M, ECE/ACET/ Pondicherry University/ Pondicherry India,
Mohaideen Basha A, ECE/ACET/ Pondicherry University/ Pondicherry India,
Asik Ahamed A, ECE/ACET/ Pondicherry University/ Pondicherry India,
Nandakumar P, ECE/ACET/ Pondicherry University/ Pondicherry India,
Balaji S, ECE/ACET/ Pondicherry University/ Pondicherry India,*

kamal.be.94@gmail.com
Hameedmba378@gmail.com
asik0594@gmail.com
nandhakumar.parkunan@gmail.com
balaji.s.acet@achariya.org

Abstract— An economic security system against the theft of vehicle has been proposed in the work done. It involves a vehicle with perfect economic security system which ensures the prevention of vehicle theft and even if the vehicle is stolen, it gives us the location where the vehicle is being held on the owner's request by using GPS which enables tracking the location of the vehicle. In addition to the security system certain features are added to increase the Safe operation of the motor vehicle. Authenticated engine ignition control system deals with remote locking for the vehicle using SMS. In order to overcome theft of vehicles by lifting, accelerometer sensor is used and an alert message is sent to the owner's mobile phone in case of suspicious vibrations. Addition wireless system included helps in signal less area for rapid communication. The implemented communication made with CAN helps is additional wired module attachment for up to forty meters range.

Keywords—Accelerometer; Controller Area Network Bus; Engine Control Unit; Mobile Phone; GPS; GSM; Zigbee Module

I. INTRODUCTION

There is an increasing use for vehicles with perfect security system. Nowadays security systems in vehicles are becoming unreliable. So, there is a need for a reliable and correct security system. This project involves such a security system which cannot be deactivated by an unauthorized person. Further if there is a theft or a chance to theft, the user will be alerted by a text message to the owner's mobile phone. In addition to this security system there are vital adding features which are to be in vehicle which make the vehicle unique.

In case if the vehicle had been theft, the location of vehicle can be tracked/located using GPS Receiver installed in the vehicle. The position has been obtained in terms of latitude and longitude, through RS232 Cable. The latitude and longitude position are unique and different, vary from place to place. This position information has been transferred on

owner's request to the owner's mobile by PIC MICROCONTROLLER, through the GSM Module.

In case of any network delay we can use the wireless module has been introduced. Which alert the owner by changing the vehicles position through the accelerometer. Including the above security system, some features are added to the vehicle, to improve the vehicles performance.

Authenticated Engine Ignition System the vehicle owner can LOCK/UNLOCK with the help of simple SMS. At first, information is passed to the GSM modem which is in the form of the SMS; the microcontroller unit reads the SMS for password verification and compares the password. The password already stored in the microcontroller, after receiving the message it checks the password only if the password matches and depending on control letter the vehicle is locked or unlocked through electromagnetic relay which acts as a switch between battery and the engine. Thus one can control the ignition of the engine; say to lock or stop the engine immediately, with help of an electromagnetic relay.

II. SECURITY SYSTEM



Figure 2.1.ZIGBEE based security module for vehicles

The present day security system used in vehicles involves a sensor module with an alarm setup which is activated and deactivated using wireless ZIGBEE module which is shown

in Figure 2.1. When the vehicle is moved or disturbed, the transducer interfaced to body of vehicle senses the motion or the disturbance which completes the circuit which in turn sounds/activates the alarm in the circuit. The power supply for this circuit is obtained from the battery present in the vehicle.

III ENGINE IGNITION CONTROL SYSTEM

In the present day vehicles there exist an electric starter/ignition switch which ignites the engine through spark plug. It makes use of battery present in the system to provide current to the spark plug, which is controlled by engine starter switch as shown in Figure 2.2. The current flowing through the wires of spark plug ignites engine for fuel combustion.

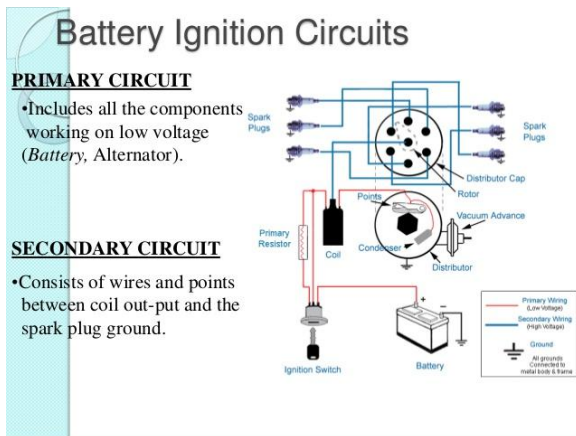


Figure 2.2 Engine ignition system using battery

Sometimes the vehicles parts like engine are removed and stolen. The user did not have any indirect remote control over the operation of the engine of the vehicle. The vehicle can be easily stolen by anyone. It does not provide any alert to the owner of the vehicle and control over it even if it has been stolen.

So nowadays, there is a need for perfect security system in vehicles to prevent the vehicle theft. Even if the vehicle is stolen then that security system in vehicle should have the capability of providing the location information to the owner for retrieving the vehicle.

This system proves to be unreliable when the owner of the vehicle is outside the range within which the sound of the alarm can be heard. The sound of the alarm cannot be heard in case the owner leaves the bike in a distant place. Another main limitation of this system is that the circuit is deactivated if the power supply connection from the battery is disconnected. Thus disconnecting the battery deactivates the entire security system. This makes the present day security system unreliable and inefficient.

In the existing security system there exists only a stand indicator which indicates improper positioning of the stand and produces beep sound alone, thereby it does not have any control over the ignition system of the vehicle .That too it does not have any effective information conveying or control part.

IV ENHANCED SECURITY SYSTEM

Implementation of perfect security system in vehicles is essential nowadays because the vehicle theft is increasing day by day. Many actions are implemented in order to prevent this, yet many vehicles are being stolen. The proposed security system in vehicles can't be deactivated by unauthorized person. In case if the vehicle had been stolen, the position or location of vehicle can be tracked/located using GPS Receiver fitted to the vehicle. The position has been obtained in terms of latitude and longitude.

The latitude and longitude position are unique and different, vary from place to place. This position information has been transferred by PIC MICROCONTROLLER, through the GSM/GPRS Module and ZIGBEE module to the vehicle proprietor's mobile phone by SMS.

The person can also deactivate or prevent the engine of the bike from functioning by just sending an SMS from his/her own Mobile. The security system consists:

- 1) Global Positioning System.
- 2) GSM/GPRS Module.
- 3) ZIGBEE module.
- 4) Accelerometer Sensor.

V GLOBAL POSITIONING SYSTEM (GPS)

GPS stands for Global Positioning System which is a combination of satellites and GPS receiver. GPS unit use to be programmed with maps of specific area, with all the roads and streets. So the position can be located easily with the help of satellite. All the different satellites use to transmit different signals to GPS receivers around the world. To measure the distance between GPS satellite and receiver, travel time of radio signals between the satellite and receiver is measured. With the combination of distance over time of some nearest satellite location, speed and direction of GPS receiver can be located. Data about the location of GPS receiver is very important and it actually gives the vehicle position that the concern possess or to find the position of concern.

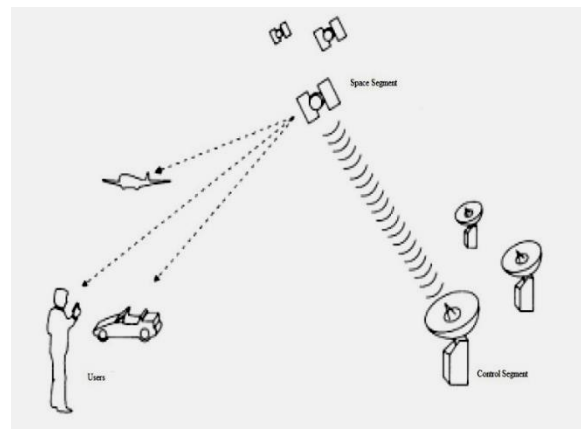


Figure 2.3 GPS System Elements

VI ZIGBEE MODULE

It is the most popular industry wireless mesh networking standard for connecting sensors, instrumentation and control systems. ZigBee, a specification for communication in a wireless personal area network (WPAN), has been called the "Internet of things." Theoretically, your ZigBee-enabled coffee maker can communicate with your ZigBee-enabled toaster. ZigBee is an open, global, packet based protocol designed to provide an easy-to-use architecture for secure, reliable, low power wireless networks. ZigBee and IEEE 802.15.4 are low data rate wireless networking standards that can eliminate the costly and damage prone wiring in industrial control applications. Flow or process control equipment can be placed anywhere and still communicate with the rest of the system. It can also be moved, since the network doesn't care about the physical location of a sensor, pump or valve.

The ZigBee RF4CE standard enhances the IEEE 802.15.4 standard by providing a simple networking layer and standard application profiles that can be used to create interoperable multi-vendor consumer electronic solutions. The benefits of this technology go far beyond, ZigBee applications include:

- Home and office automation
- Industrial automation
- Medical monitoring
- Low-power sensors
- HVAC control
- Plus many other control and monitoring uses

VII GPS Tracking/Working

The simplest and easiest way to explain about working of GPS is that the users just have to insert the GSM card into the GPS tracker, and the object or individual you want to monitor would already have a GPS tracer or receiver. When user activates his account, at that time he can locate that individual or object by using computer or phone which can access internet. As we discuss earlier that GPS tracker uses radio signals to locate the position, the position information is tracked by using the method of triangulation as shown in Figure 3.7. Then software is used to tell us about the location in real times with landmarks, street name and every single detail about the location of the object or individual.

VIII EXPERIMENTAL RESULTS

PERIPHERAL PORTS INITIALISATION AND STATUS DISPLAY

Initially the status of the ports and required analog features (such as ADC, USART) has been displayed on the LCD display for hardware chip condition and verification in sequence. After initialization the microcontroller waits for message as shown in Figure 4.1 (i.e., password), the password is checked and the correctness of password is displayed on the LCD display.



Figure 2.4 LCD Display waiting for message for validating the password

ELECTRONIC CONTROL UNIT STATUS DISPLAY

The status of Engine ignition system (either LOCKED or UNLOCKED) also sent via SMS or indicating on ZigBee automatically to convey user acknowledgement about the vehicle status as shown in Figure 4.2. The response of the microcontroller system is also displayed on LCD.

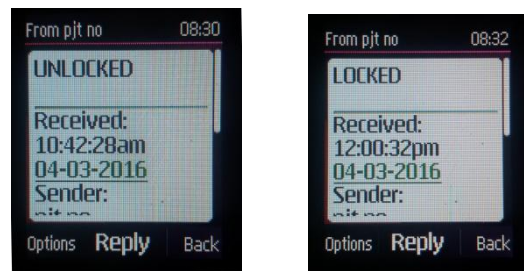


Figure 2.5 Status of Engine ignition system

The position of the vehicle (in terms of latitude, longitude) is sent via SMS on request by the owner of the vehicle as shown in Figure 4.3, which can be used to find the location of a person or vehicle.

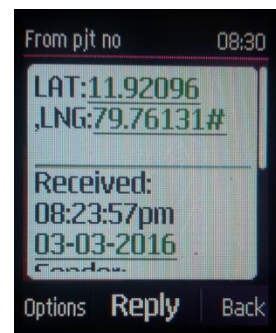


Figure 2.6 latitude and longitude Position

INCLINATION AND VIBRATION DETECTION SYSTEM

The accelerometer (Figure 4.4) is used to monitor the inclination and desired impact or vibration level on the vehicle. If the desired analog voltage is exceeded the SMS sent via GSM MODEM and send notification via wireless module.

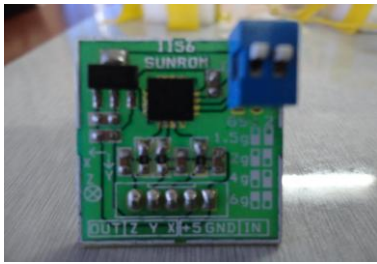


Figure 2.7 Accelerometer sensor

IX CONCLUSION

The proposed system to the design and development of a theft control system for vehicles, which is being used to prevent or control the theft of the vehicle. The security system is based embedded control which provides security against theft. The GSM modem provides information to the user on his request. The user can access the position of the vehicle at any instant. The GPS receiver on the kit will locate the latitude and longitude of the vehicle using the satellite service. Accelerometer sensor used to sense the inclination and impact vibration of/on the vehicle.

The system consists of two modules one is GSM module and the other is Wireless Module. The owner of the vehicle interacts with the GSM module by sending and receiving the messages. And the wireless module should indicate the user while the position of the accelerometer changes. It has been designed and implemented using dedicated sensors and wireless technology. The designed system improves vehicle security and accessibility. Thus with the use of wireless technology vehicle owners are able to enter as well as protect their automobiles with more passive involvement.

The theft security system should control the vehicle engine unit when the system is locked from the owner through the CAN Bus. Since the CAN Bus is used in vehicle network, the transfer of data from one unit to another unit reliable and efficient. Therefore, the integrated system handles different functions such as locking vehicle engine by using the relay, getting location details through GPS network and sending it to owner of the vehicle.

The proposed system can be developed on any automobiles, less expensive and ignition of an engine can be controlled being at the remote place. Therefore, the wireless module security system provides an easier and featured tracking system. And also to communicate from the vehicle to vehicle by the mesh loop system for the future use by the wireless Zigbee Module and to reduce the vehicles theft.

X REFERENCES

- [1] AmbadeShrutiDinkar and S.A Shaikh," Design and Implementation of Vehicle Tracking System Using GPS", Journal of Information Engineering and Applications, ISSN 2224-5758 ,Vol 1, No.3, 2011.
- [2] CAN in Automation (CiA),Controller Area Network (CAN) . Available: <http://www.can-cia.org/>
- [3] Daniel Switkin, "Android Application Development",2010.

- [4] Feng Huang, Shanyu Tang, Senior Member, IEEE, and Jian Yuan, "Vehicle Location Based System", IEEE June,Transactions on no information forensics and security, vol.6, 2, 2011.
- [5] GPSImages[online:]
- [6] HuaqunGuo,JunJieAng and Yongdong Wu, " Extracting Controller Area Network Data for Reliable Car Communications", I Proc. IEEE,2009,pp.1027-1032.
- [7] HuaqunGuo,LekHengNgoh,YongdongWu,LianHwaHiow,Choo nHweeKwek,Feng Tao and Jun JieAng, " Embedded Info-SecuritySolutions for Vehicular Network", I Proc. CHINACOM'08, Hangzhon, China, August 25-27,2008.
- [8] Jing Xu,TaoLu,LinglingGao, " Design and Application of In-Vehicle Terminal for Car Network System Based on ARM9",IEEE International Workshop on Education Technology and Training,2008,p.324-327.
- [9] K Punitha, S Arun Kumar and n Vijay Ganesh, " Control Area network for Reliable Car Communication", I Proc. International Journal of Computer Application(ICVCI),34-38,2011.
- [10] LI Gangyan,Xu Jun, " An Information Acquisition Method of City Bus Integrated Control Network", IEEE Computer Society,2008,722-725.
- [11] Robert Bosch Gmbh Controller Area Network (CAN). Available: <http://www.semiconductor.bosch/en/20/can/indexx/asp>
- [12] R. Parsad, M. Ruggieri (2005) Applied Satellite Navigation Using GPS, GALILEO, and Augmentation Systems,London, ARTECH HOUSE.
- [13] "Real Time Web based Vehicle Tracking using GPS", World Academy of Science, Engineering and Technology 2010 Ph.D. Associate Professor
College of Computer and Information Sciences Prince Sultan University.
- [14] SIMCOM publication, "SIM300 AT Commands Set",1.06.Vehicle Tracking Systems Overview [Online:] 978-1-4673-2594-3/13/\$31.00 ©2013 IEEE <http://www.roseindia.net/technology/vehicltracking/> Vehicle Tracking Systems .
- [15] Vehicle Tracking Systems Overview [Online:] <http://www.roseindia.net/technology/vehicltracking/> Vehicle Tracking Systems .