ANTI THEFT CONTROL SYSTEM DESIGN FOR AUTOMOBILES

[1] Satyasai Tummala, [2] Dr.R.V.Krishnaiah
[1]PG Student (VLSI&ES), DRK Institute of Science & Technology, A.P., India
[2]Professor, DRK Institute of Science & Technology, A.P., India

Abstract Anti theft control system for automobiles tries to prevent the theft of a vehicle. This paper proposes an anti-theft system to ensure car owners for avoiding car theft and finding car location after stealing. It hence deters thieves from committing the theft. This system makes use of an embedded chip that has an inductive proximity sensor, which senses the key during insertion and sends a text message to the owner's mobile stating that the car is being accessed. This is followed by the system present in the car asking the user to enter a unique password. The password consists of few characters and the car key number. If the user fails to enter the correct password in three trials, a text message is sent to the police with the vehicle number and the location tracked using a GPS module. The message is also sent to the owner about the unauthorized usage. Further the fuel injector of the car is deactivated so that the user cannot start the car by any means. At the same time a secret lock system gets activated and the unauthorized user gets trapped inside the car and only the owner who is equipped with the key to the secret lock system can deactivate the mechanism. The major advantage of this system is that the whole work can be made with a meager amount of investment and can be used in any automobiles and thus bringing in less sophisticated and simple technology.The design is robust and simple.

Keywords- GSM,GPS, Embedded System, Antitheft System, Microcontroller, Sensors

I. INTRODUCTION

In recent years, vehicle thefts are increasing at an alarming rate around the world. People have started to use the theft control systems installed in their vehicles. The commercially available anti-theft vehicular systems are very expensive. Here, we make a modest attempt to design & develop a simple, low cost vehicle theft control scheme using an inbuilt microcontroller. This scheme involves a microcontroller & a mobile for the communication purposes.The Global System for Mobile communications (GSM) is the most popular standard for mobile phones in the world. Over billion people use GSM service across the world.

The recent statistics on car theft in various countries are shown below

Table 1. Recent Statistics On Car Thefts In Various Countries

Rank	Countries	Amount
1	United States	1,246,096
2	United Kingdom	348,169
3	France	301,539
4	Italy	232,564
5	Canada	161,506
6	Mexico	141,007
7	Australia	139,094
8	Spain	134,594
9	South Africa	93,133
10	Germany	70,617

The above table shows the top ten countries where the car theft rate is high.If we consider other countries the total amount equal to 3,597,114 .these statistics necessitates the implementation of anti theft control system for automobiles.We start off exploring the existing scenarios and later we move towards the proposed architecture,describing the various modules in detail and the working methodology.

II. EXISTING SYSTEMS

Various anti-theft control systems have developed over the past few years are given as follows.

A. Alarm System

Alarm systems notify people when a theft occurs.If someone attempts to steal a vehicle,other automotive equipment or personal belongings in a vehicle,the system detects this attempt and issues an alarm to avert it.

B. Immobilizer System

To prevent the theft of a vehicle itself,an immobilizer system disables engine startup or prevents its being moved.The system immobilizes a vehicle either electronically by restricting the operation of electric automotive equipment or mechanically by locking the steering wheel,pedals or gear shift lever.

C. The avialable control system in the market

Data such as global position, speed and velocity of the vehicle is transmitted over the cellular network to the users confidential account.The user can get to know about the vehicle and can give command to the vehicle such as stopping the vehicle ,door lock …etc through the PDA devices or mobile phones.

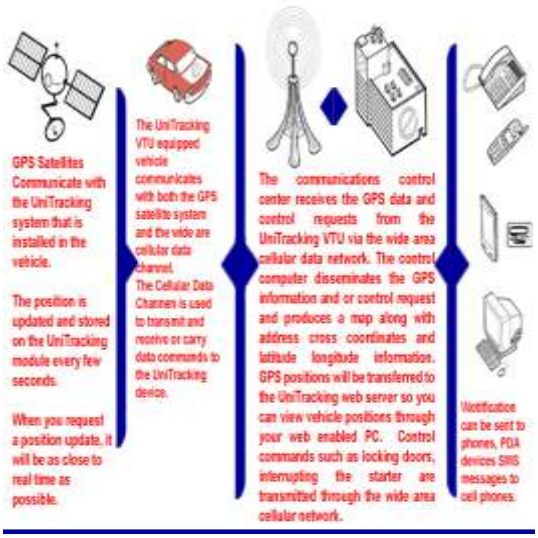

Fig.1:Available control system in the market

D.Disadvantages Of The Existing System

The cellular network is not available in all places throughout the country such as forests deserts and uninhabited areas.Thecost of this system is exorbitant and to implement this system it costs nearly half the cost of the car.We will work on a full-fledged two lock security system that completely eliminates the theft of automobiles taking into consideration the disadvantages of existing systems.

III. PROPOSED SYSTEM

A. Architecture Of The Proposed System

The architecture of the proposed system is shown in fig.2.When the key is inserted inside the keyhole, the proximity sensor detects the obstacle and triggers the microcontroller. A message is displayed on the LCD screen asking to enter the password. At the same time intimation about the usage of the car is sent to the owner's mobile with the help of a GSM

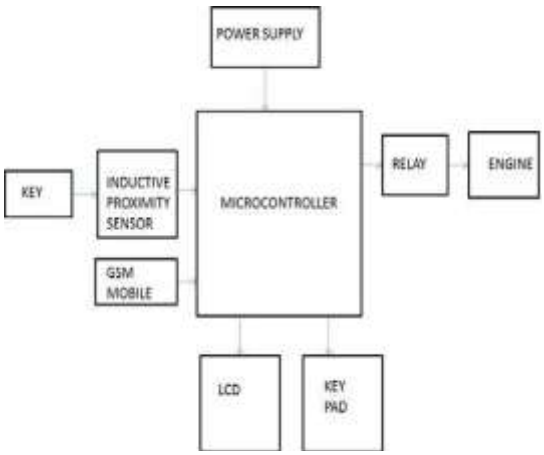

Fig. 2:A Sample Block diagram explaining the principle of anti-theft control system

module. The password is entered in the numeric keypad. Totally three chances would be given for the user to enter the correct password. If the user fails to enter the correct password in three trials, a text message is sent to the police with the vehicle number and the location tracked using a GPS module. The message is also sent to the owner about the unauthorized usage. Further the fuel injector of the car is deactivated so that the user cannot start the car by any means. At the same time a secret lock system gets activated and the unauthorized user gets trapped inside the car and only the owner who is equipped with the key to the secret lock system can deactivate the mechanism.

B.Working Of The Anti-Theft Control System With The Help Of Flow Chart

When the key is inserted in the key hole the inductive proximity sensor detects the key and triggers the microcontroller. A password check message is displayed on the LCD provided inside the car and at the same time the owner is alerted with a message about the usage of his car.

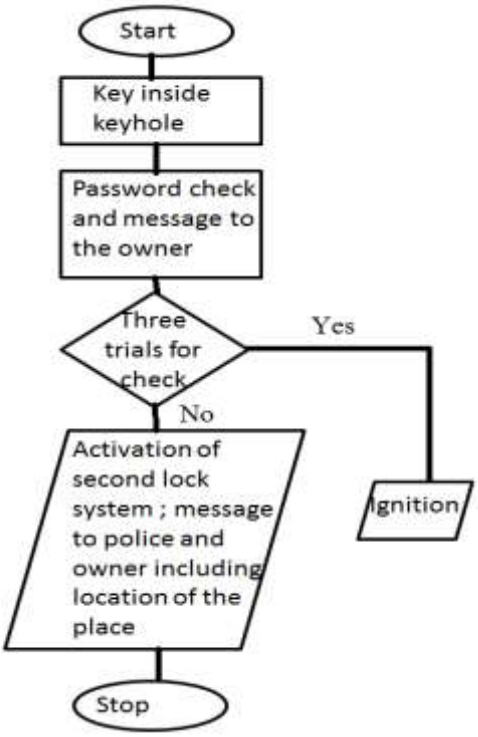

Fig. 3: Flowchart of the Overall system

Totally three trials are provided to enter the correct password. If the entered password is incorrect a second electronic lock system gets activated and the doors are locked. An alert message is sent to the police and the owner about the illegal access of his car. With the help of GPS the exact location of his car is found and the key of the second lock system is available only with the owner hence a total control over the vehicle is established.

IV. MODULES OF ANTI THEFT CONTROL SYSTEM

A. Inductive Proximity Sensor

An inductive proximity sensor has five components; the coil/field sensor, oscillator,

detection circuit/demodulator, flipflop and output circuit. The oscillator generates a fluctuating magnetic field the shape of a doughnut around the winding of the coil that locates in the device's sensing face. When a metal object moves into the inductive proximity sensor's field of detection, Eddy circuits build up in the metallic object, magnetically push back, and finally reduce the Inductive sensor's own oscillation field. The sensor's detection circuit monitors the oscillator's strength and triggers an output from the output circuitry when the oscillator becomes reduced to a sufficient level.

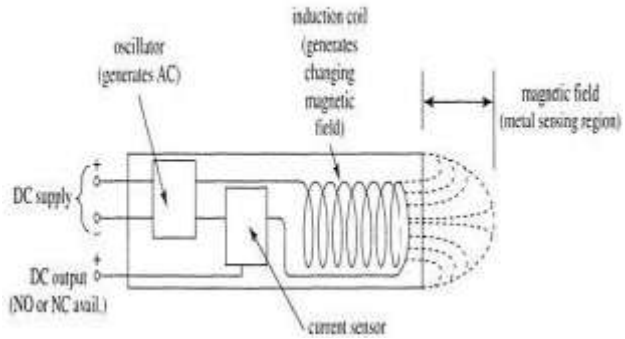

Fig 4.Cross-section view of inductive proximity sensor

The inductance of the loop changes according to the material inside it and since metals are much more effective inductors than other materials the presence of metal increases the current flowing through the loop. This change can be detected by sensing circuitry, which can signal to some other device whenever metal is detected.

B.Microcontroller

Our system employs Arduino ATMEGA 328 which is very simple and compact. An Arduino board consists of an 8-bit Atmel AVR microcontroller with complementary components to facilitate programming and incorporation into other circuits. An important aspect of the Arduino is the standard way that connectors are exposed, allowing the CPU board to be connected to a variety of interchangeable add-on modules (known as shields). Official Arduinos have used the megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, and ATmega1280. A handful of other processors have been used by Arduino compatibles. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the LilyPad run at 8 MHz and dispense with the on-board voltage regulator due to specific form-factor restrictions. An Arduino's microcontroller is also preprogrammed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external chip programmer.

C. Global System For Mobile Communication (GSM)Model

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. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While 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.

D. Keypad

Keypad used here for inputting the data is of the form (4 × 3) matrix board, which is used to connect to the microcontroller (From P3.0 to P3.3 row wise & from P1.3 to P1.5 column wise). It is used to input the password for validation purposes. The Fig.4 shows a (4 × 3) matrix connected to two ports. The rows are connected to an output port and the columns are connected to an input port. If no key has been pressed, reading the input port will yield 1's for all columns since they are all connected to high (Vcc). If all the rows are grounded and a key is pressed, one of the columns will have 0 since the key pressed provides the path to ground. It is the function of the microcontroller to scan the keyboard continuously to detect and identify the key pressed.

Fig.5:Keypad

E. Liquid Crystal Display(LCD)

Here, the LCD is connected to Port2 (P2.0 to P2.7) of the microcontroller. It is used to display messages (either error or accepted). Variable resistor connected to Pin3 of LCD, is used to control the brightness of LCD. A liquid crystal display is a low cost, low power device capable of displaying text and images. LCD's are extremely common in embedded systems; since such systems often do not have video monitors like those that Come standard with desktop systems.

F.Relay

The relay we are using in this is an electromechanical relay.The excitation voltage that is required is +12V DC. It is driven using the relay

driver IC ULN2003 /VLN 2003A. The device is connected to the electro mechanical relay. When the relay is excited by applying the 12V DC the relay gets activated and in the process turns ON the device and when the excited voltage is stopped, the relay gets deactivated and in the process turns OFF the devices. In magnetic relay, insulated copper wire coil is used to magnetize and attract the plunger. The plunger is normally connected to N/C terminal. A spring is connected to attract the plunger upper side. When output is received by the relay, the plunger is attracted and the bulb glows.

G. Engine Control Unit

An engine control unit (ECU)(diesel engine), also known as power-train control module (PCM), or engine control module (ECM) is a type of electronic control unit that determines the amount of fuel, ignition timing and other parameters an internal combustion engine needs to keep running. It does this by reading values from multidimensional performance maps (so called LUTs), using input values (e.g. engine speed) calculated from signals coming from sensor devices monitoring the engine. Before ECU's, air/fuel mixture, ignition timing, and idle speed were directly controlled by mechanical and pneumatic sensors and actuators. In the case of

Fig.6:Engine control unit

Ignition Control Unit(petrol engine) ,the ignition coil is the coil in the vehicle ignition system used to convert sufficient voltage to spark, in the spark plug Thus we can control ignition control unit by controlling the electric current used by the ignition coil.

V.COST ANALYSIS OF THE PROPOSED SYSTEM

Microcontroller Unit	= Rs. 200
Keypad	=Rs. 50
LCD Screen(16*2)	=Rs. 40
GSM Module	=Rs.2000
GPS system	=Rs.5000

The sum of Rs.7300 is a meager amount compared to the cost of the existing anti theft system(approximately 83,000) being sold in the market.

VI. CONCLUSION

Hence a modest attempt is made to bring in a lowcost and effective vehicle theft control system. The major advantage of this system is that the whole work can be made with a meager amount of investment and can be used in any automobiles and thus bringing in less sophisticated and simple technology.

In future, there is no doubt, that all of the vehicles will be embedded with this unique kit. In addition to the above features we can also add extra features like thumb/face recognition to ascertain more security of the vehicle.

REFERENCES

[1] B.G.Nagaraja, Ravi Rayappa, M.Mahesh, Chandrasekhar M Patil, Dr TC Manjunath:'Design and Development of GSM based vehicle theft control system' Advanced Computer Control ICACC '09 International conference.pp 148.

[2] Islam,S.Ajmal,F.Ali,S.Zahid,J.Rashdi,A..: Secure end-to-end communication over GSM and PSTN networks', IEEE International Conference on Electro/Information Technology, 2009, pp-323

[3] Huaqun Guo Lek Heng Ngoh Yong Dong Wu Teo, J.C.M: 'Secure wireless Vechile Monitoring and control', IEEE Asia-Pacific Conference on Services Computing APSCC 2009, pp-81

[4] Jung-Hsuan Wu Chien-Chuan Kung Jhan-Hao Rao Pang-Chieh Wang Cheng-Liang Lin Ting-Wei Hou Y.: 'Design of an In-Vehicle Anti-Theft Component ', International Conference on Intelligent Systems Design and Applications IDSA 2008 , pp 566

[5]Recent car theft statistics as given http://www.nationmaster.com/red/pie/cri_car_the-crime-car-thefts

[6] Raj Kamal "Embedded Systems – architecture , programming and design"Second Edition 2009

[7] Anti Theft Control System available at the market http://www.unitracking.com/howitworks.html

[8] Car Cost analysis given by http://cars.about.com/od/helpforcarbuyers/tp/Cheapest_09.htm

[9] P. H. Dana. Global Positioning System Overview. http://www.colorado.edu/geography/gcraft/notes/gps/gps_f.html

[10] Immobiliser, WHATCAR. http://www.whatcar.com/news-special-report.aspx?NA=220071

Biography

Satyasai Tummala is pursuing her masters from DRK Institute Of Science & Technology, Bowrampet, Hyderabad with specialization in VLSI&ES.

Dr.R.V.Krishnaiah received his B.Tech degree in ECE from Bapatla Engineering College. He received his M.Tech degree in Computer Science Engineering from JNTU and also M.Tech-(EIE) from NIT,Warangal. He did Ph.D (MIE, MIETE, MISTE) from JNTU Ananthapur.