

Anti-Theft Control System

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Abstract— Theft security of vehicle in common parking places has become a matter of concern. An efficient automotive security system is implemented for anti-theft using a microcontroller with Global System for Mobile Communication (GSM). This proposed work is an attempt to design and develop a smart anti-theft system. The system contains GSM module, vibration sensor, DC motor, keypad, LCD display and relay. It uses GSM module to send the SMS to the authorized user. The vibration sensor senses the insertion of key and triggers the microcontroller. an SMS is sent to the user. The user enters the password using keypad which is displayed in LCD. If the password is wrong the relay is used to turn off the engine.

Keywords— Microcontroller 8051, GSM, Buzzer, Vibration Sensor

I. INTRODUCTION

As far as vehicle security is concerned many options are available depending upon the technology being adopted. With the development and applications of lots of embedded techniques, car security system design and analyses are continually improving. Many new techniques, such as biometric recognition technique, image processing technique, communication technique and so on, have been included into car security systems. At the same time, the amount of accident of cars still remains high, specially, lost. Statistics show that the number of cars is growing rapidly and so is the number of car theft attempts, locally and internationally. Although there are a batch of car security systems that had been produced lately, but the result is still unsatisfactory as the number of car theft cases still increases. The thieves are inventing cleverer and stronger stealing techniques that need extra powerful security systems.

This proposed project presents an anti-theft-control system for automobiles that tries to stop a vehicle from being stolen. In present days, vehicle theft is increasing rapidly and people have started using anti-theft-control systems in different automobiles"

systems. These anti-theft- control systems are very expensive, but this project is designed cost-effectively by using a microcontroller along with the GSM [1]. GSM system is also installed in the vehicle for sending the information to the owner of the vehicle. The main purpose is to prevent vehicle theft. This is achieved by sending an SMS which is generated automatically.

This SMS is then sent to the owner of the vehicle. Thus in this way crimes can be reduced to a great extent as vehicles today are being stolen in large number. Hence, vehicles today require high security which can be achieved with the help of this application.

When a person tries to steal the vehicle, the microcontroller is interrupted and the command is sent to the GSM modem to send SMS. This GSM modem is interfaced to the microcontroller. This microcontroller on the receipt of the message uses a mechanism that helps to stop the engine. Motor is being used in this project in order to indicate vehicle ON/OFF state. Further enhancement can be done to this project by using a GPS system that helps to find out the exact position of the vehicle with the help of its latitude and longitude which then can be sent to the owner of the vehicle via SMS [2].

An idea of using microcontroller, as the core and GSM

interface through the serial port in the microcontroller is the major functional unit of the system. Loud sound and message sending, which brings the notice of the owner. A keypad and a display is provided inside the vehicle. The commercially available anti-theft vehicular systems are very expensive. Here a modest attempt is made to design and develop a simple, low cost vehicle theft control scheme using an inbuilt microcontroller. This scheme involves a microcontroller and a mobile for the communication purposes.

An Embedded chip that uses vibration sensor which senses the key during insertion. This is followed by the system present in the car asking the user to enter a

correct password. The password consists of few characters and the car key number. If the user fails to enter the password in three trials the message is sent to the owner about the unauthorized usage.

I. LITERATURE REVIEW

In today's world, since there is an increase in vehicles on the road, so there is an increase in vehicle theft. In order to reduce that, users tend to install high-end, expensive, state of the art anti-theft systems. The proposed project tries to increase the efficiency and decrease the cost so that vehicle safety is available to all.

The author Wu Aiping, the author puts forward an idea of using microcontroller in the 2017 paper [1], as the core and GPS and GSM interfaced through the serial port in the micro- controller. However, the system is loud sound and light which brings the notice of the owner and also shares the location of the car if it has moved. The aim is to find the vehicle where it is and also you can stop that particular vehicle by sending a message. A keypad and a display is provided inside the vehicle. Using that we can switch on and switch off the vehicle. And also we can track the vehicle using this GSM modem. If the wrong password is entered, then the location of the vehicle is tracked by the GPS module and the message will be send to the owner of the vehicle.

The authors Kompalli supriya and M.Venkateshwarlu, in the July 2015 paper [2] have mentioned that 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.

Vinoth Kumar Sadagopan, Upendran Rajendran and Albert Joe Francis, proposed an embedded chip that uses vibration sensor, which senses the key during insertion and sends a text message to the owner's mobile stating that the car is being accessed in the 2011 paper [3]. This is followed by the system present in the car asking the user to enter a unique password. The password consists of few characters/ numbers. 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. This technique helps in taking fast steps towards an attempt to steal the. The design is robust and simple.

The authors Wan Lili and Chen Tiejun proposed an automotive remote alarm system. GSM module is combined with microcontroller; vibration sensor and speed sensor are used to achieve Short Message Service (SMS) alarm and dual theft-proof of automobile. The shortcoming of traditional systems including low security and small alarming range is overcome, and the cost of this system is cut down, so it should have good application prospects as mentioned in the 2009 paper [4].

The authors Ms.Padmaja Adgulwar, Prof. Nilesh Chaubey and Prof. Shyam P Dubey proposed in the paper 2007 [5], that in current years, automobile theft are growing at an disturbing rate throughout the world. Commercially present anti-theft vehicular systems are too costly. We mark a modest effort to design & develop a low cost, simple vehicle theft control scheme using an integral microcontroller. The Global System for Mobile communications (GSM) is the most popular standard for mobile phones in the world. This system involves a microcontroller & a mobile for the communication purposes.

II. HARDWARE DESCRIPTION

A. 8051 Microcontroller with AT89S52

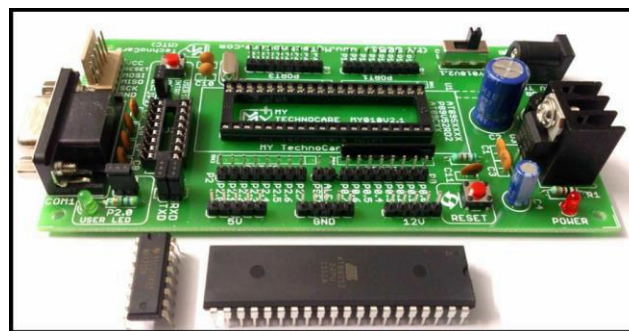


Fig 1: Microcontroller with AT89S52

The AT89S52 comes from the popular 8051 family of Atmel Microcontrollers. It is an 8-bit CMOS microcontroller with 8K as Flash memory and 256 bytes of RAM. Since it is similar to the trust worthy 8051 architecture these microcontrollers are as per industry standard. It has 32 I/O pins comprising of three 16-bit timers, external interrupts, full- duplex serial port, on-chip oscillator and clock circuitry. Most of the ports of the 89S52 have 'dual function'

meaning that they can be used for two different functions. The Microcontroller development board is shown in Fig 1 with the IC AT89S52. The first one is to perform input/output operations and the second one is used to implement special features of the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer

to update the software.

B. Vibration Sensor

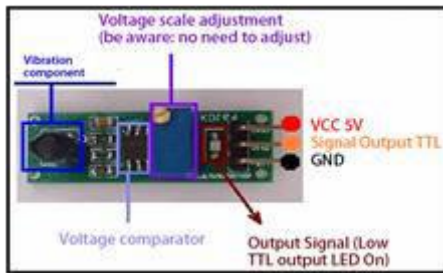


Fig 2: Vibration sensor

The Vibration module based on the vibration sensor SW- 420 and Comparator LM393 to detect if there is any vibration that beyond the threshold. The threshold can be adjusted by the on-board potentiometer. When this no vibration, this module output logic is LOW and the signal indicates LED light, and vice versa. If the module does not vibrate the vibration switch was closed on state and it turns on green light. When the product vibrates vibration switch momentary disconnects and output is driven high and it turns off green light. In Fig 2 the module of vibration sensor is shown.

C. LCD



Fig 3: Liquid Crystal Display (LCD) screen

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. 16x2 LCD is named so because; it has 16 Columns and 2 Rows as shown in the Fig 3. The LCD can work in two different modes, namely the 4-bit mode and the 8-bit mode. In 4-bit mode the data is sent nibble by nibble, first upper nibble and then lower nibble. A nibble is a group of four bits, so the lower four bits (D0-D3) of a byte found the lower nibble while the upper four bits (D4-D7) of a byte form the higher nibble. This allows the 8-bit data to be transferred. Whereas in 8-bit mode, the 8-bit data can be sent directly in one stroke since it uses all the data lines. 8-bit is faster and flawless than 4-bit mode. But the major drawback is that it needs 8 data lines connected to the microcontroller.

D. SIM 800 GSM Module



Fig 4: SIM 800 GSM module

The SIM800 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM800 delivers GSM/GPRS 850/ 900 /1800/ 1900 MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM800 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design [6]. Fig 4 shows the GSM module of SIM800.

E. DC Motor



Fig 5: DC Motor

The DC motor device converts DC electrical energy into a mechanical energy. DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field; it experiences a torque and has a tendency to move. This is known as motoring action. If the direction of current in the wire is reversed, the direction of rotation also reverses. When magnetic field and electric field interact they produce a mechanical force, and based on that the working principle of DC motor is established. The image of DC motor is shown in Fig 5. A DC motor is a rotary electrical machine that converts direct electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanisms, either electromechanical or electronic.

F. Relay

Fig 6: Single module relay

A relay is an electrically operated device. It is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. It has a control system and (also called input circuit or input contactor) and controlled system (also called output circuit or output contractor). It is frequently used in automatic control circuit. It is an automatic switch to controlling a high-current circuit with a low-current signal as shown in Fig 6.

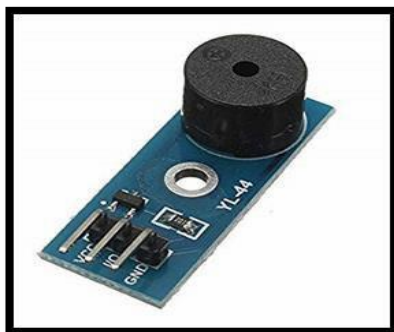
G. Buzzer

Fig 7: Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electrochemical or piezoelectric. The main working principle is based on the theory that, whenever an electric potential is applied across a piezoelectric material, a pressure variation is generated. A piezo buzzer consists of piezo crystals in between two conductors as shown in Fig 7. When a potential difference is applied across these crystals, they push one conductor and pull the other conductor by their internal property. The continuous pull and push action generates a sharp sound wave. They are typically used as an alarm circuits. piezo buzzer can generate a sound in the range of 2 to 4 kHz.

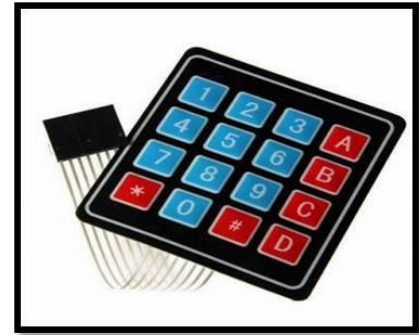
H. Keypad

Fig 8: 4x3 matrix keypad

A Matrix keypad is the most commonly used input device in many of the application areas like digital circuits, telephone communications, calculators, ATMs, and so on. A matrix keypad consists of a set of push button or switches which are arranged in a matrix format of rows and columns as shown in Fig 8. Matrix keypad can be connected to the microcontroller in numerous ways or techniques, but the fundamental logic is same as making the columns as input and the rows as output. So, in order to detect the key pressed from the keypad, the row lines have to be made low one by one and to read the columns.

III. SOFTWARE DESCRIPTION*A. Keil μ Vision IDE*

μ Vision is a window-based software development platform that combines a robust and modern editor with a project manager and make facility tool. It integrates all the tools needed to develop embedded applications including a C/C++ compiler, macro assembler, linker/locator, and a HEX file generator. The μ Vision IDE and Debugger is the central part of the Keil development tool chain and has numerous features that help the programmer to develop embedded applications quickly and successfully. The Keil tools are easy to use, and are guaranteed to help you achieve your design goals in a timely manner [5].

B. MC Programming Language: Embedded C

Embedded C is the most popular embedded software language in the world. Most embedded software is written in Embedded C. Embedded C is very similar to C. Embedded languages in general requires a different kind of thought process to use. Embedded systems, like cameras or TV boxes, are simple computers that are designed to perform a single specific task. Embedded C lies somewhere between being a high level language and a low level language. Embedded C, unlike low level assembly languages, is portable. It can run on a wide variety of processors, regardless of their architecture. Unlike high level languages, Embedded C requires less resources to run and isn't as complex. Another advantage of Embedded C is that it is comparatively easy to debug. Historically, embedded C programming requires

nonstandard extensions to the C language in order to support exotic features such as fixed- point arithmetic, multiple distinct memory banks, and basic

I/O operations. In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed- point arithmetic, named address spaces, and basic I/O hardware addressing. Embedded „C“ use most of the syntax and semantics of standard C, e.g. main () function, variable definition, data type declaration, conditional statements (if, switch. case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, unions, etc.

The „C“ Programming Language was originally developed for and implemented on the UNIX operating system, by Dennis Ritchie in 1971. One of the best features of C is that it is not tied to any particular hardware or system. This makes it easy for a user to write programs that will run without any changes on practically all machines. C is often called a middle-level computer language as it combines the elements of high-level languages with the functionalism of assembly language. To produce the most efficient machine code, the programmer must not only create an efficient high level design, but also pay attention to the detailed implementation.

C. Novuton ISP-ICP

Novuton has been committed to building the customer- oriented MCU eco-System from rich platform products, evaluation boards, device drivers, BSP, own-developed debugging tools, software developing tools, integrated development tools, and mass production supporting tools, and the operating system software to fulfill customers“ needs from product selection, development and mass production stages.

Nuvoton provides both hardware and software development tools to customers to shorten the product development time using Nuvoton NuMicro® Family, 32-bit Cortex-M0/M4 Microcontrollers. The simple, easy-to-use and real-featured development system provides a quick and easy way for product development and debugging. With ISP, ICP, On-line/Off-line programming capability, abundant hardware tools including the NuTiny, Nu-Link (ICE Bridge), Nu-LB (development learning board), standalone writer and gang- programmer are available to help customers shorten the time- to-market for product development and production. Besides the tools provided by Nuvoton, Keil RVMDK and IAR EWARM also supports the complete development tool chain with project manager, editor, compiler tools for the NuMicro® Family.

IV. METHODOLOGY

The main purpose of this project is to prevent vehicle theft. Here the microcontroller AT89S52 is used to interface the components. Embedded C code is written

and dumped into the microcontroller using Kiel software and Novuton ISP-ICP respectively. The block diagram of the proposed system is shown in the Fig 9.

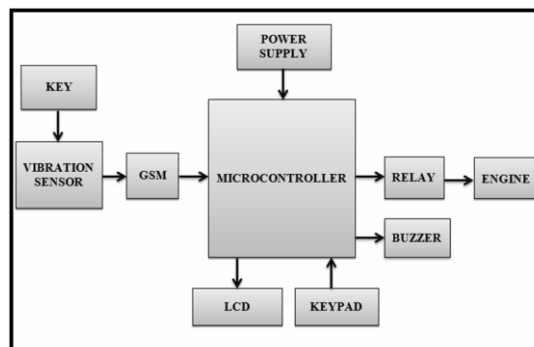


Fig 9: Block diagram of anti-theft control system

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. The SMS is sent to the owner of the vehicle and the recovery contacts (ex: police and other recovery contacts). Thus in this way crimes can be reduced to a great extent as vehicles today are being stolen in large number [2].

This system makes use of an embedded chip that has a vibration sensor, which senses the key during insertion and triggers the microcontroller. Then it sends a text message through GSM 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. In this proposed system DC motor is used as vehicle engine. Only if the user enters correct password within three trials, the engine will start. Here the relay switch is used to ON/OFF vehicle engine. If the user fails to enter the correct password in three trials, a text message is sent to the owner about the unauthorized usage and also microcontroller activates buzzer to alert owner and the people nearby.

V. EXPERIMENTAL RESULTS AND DISCUSSIONS

The experimental setup is shown in the Fig 10. When the user inserts the key, the microcontroller generates the vibration and initializes the GSM and then sends an SMS to the concerned authority over GSM modem. Fig 11 shows LCD screen messages.

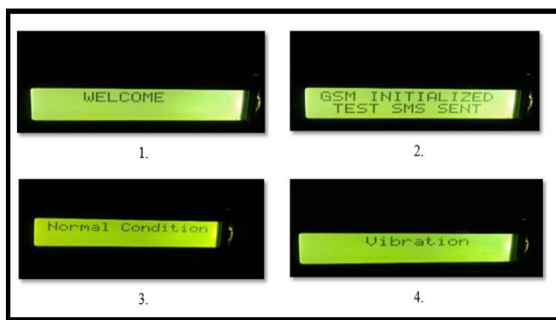


Fig 11: LCD screen messages

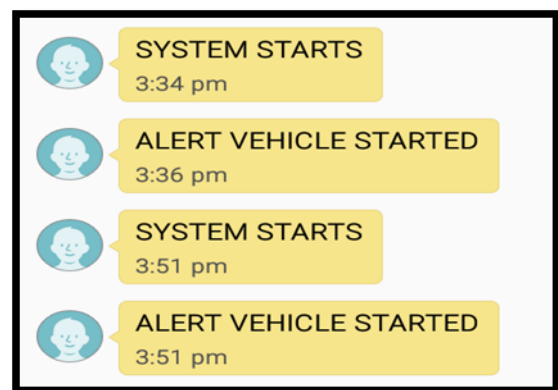


Fig 13: Screenshot of mobile messages

Description:

1. Welcome message is displayed when micro-controller activates.
2. Micro-controller initializes the GSM and SMS is sent.
3. Normal condition is displayed on screen when the car is in stable mode.
4. Vibration is displayed when user inserts the key.

And a text is displayed on LCD screen to enter the password as shown in the Fig 12. Owner has to enter the password within three trials. If the password entered is correct the engine will start. The relay is connected to the Vehicle Engine Unit of the Automobile.



Fig 12: Password result displayed on LCD screen

If the owner fails to enter the correct password, the buzzer will turn on to create a noise to panic the culprit, followed by sending a message "ALERT VEHICLE STARTED" through GSM modem to the owner's mobile for further action for prevention of his vehicle, which will make a loud sound to alert people nearby about the vehicle theft. Fig 13 shows short messages received by mobile phone.

VII. CONCLUSIONS AND FUTURE SCOPE OF WORK

The anti-theft control system is a breakthrough in today's world where automobile theft has increased rapidly. Today, majority of the communication and its applications are used by using GSM. The combination of GSM in anti-theft control system ensures efficiency and security as is required by it. The GSM also ensures that the effectiveness of the system is not just restricted to local use but can be covered over a wide range. With smartphones proliferating, it will become possible to disable the automobile remotely. This can deter thefts unless the software gets hacked or disabled. And such systems can take over the car-alarms used usually nowadays.

Presently, only the SMS feature is available. For ease of operation, developments can be made to include the Call Feature. Microphone can also be interfaced to the GSM module so that during theft activity, voice call could be established with the owner.

In future, this security system can be improvised to function as an integrated-data-security system for car communication systems. It would ensure that all the data exchanged within the vehicle and outside the vehicle is protected.

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