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Anti-Theft Security System for Vehicles

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Abstract –*In these days security is of prime concern in vehicle. The present day's security offers little in terms of safety for the vehicles. The cost of anti-theft security system is also extremely expensive hence an effective alternative is required. This paper addresses the problem of security in vehicles using password to authenticate to turn on the engine. In the proposed security system, when the vehicle is accessed using correct password it sends an SMS to the owner with the address of accessed location. If the wrong password is entered for three times the system sends an SMS to owner saying that someone is trying to access vehicle at particular location and immediately the system disconnects the power supply to the engine ignition system. Here an Arduino is used to control the GSM and the GPS modules. Also emergency calling features as well as easy vehicle accessing features for emergency conditions are included.*

***Key Words*: Anti-Theft for Vehicle, GSM, GPS, Arduino.**

1. INTRODUCTION

These day's vehicle robbery cases are higher than any other time. In Delhi, the capital city of India, for every 24 minute a vehicle was stolen in 2015 and in 2016 & 2017, a vehicle was stolen for every 13 minute. Due to the alarming situation of vehicle theft, people have already started to use theft control systems in their vehicle like immobilizers. But they are now outdated methods which can be hacked easily and also these antitheft vehicle systems are very expensive. This paper discusses a modest antitheft system design & development using an Arduino.

The development of satellite technology has made it easy to identify the vehicle locations. Today GPS is using in cars, cabs, and police vehicles etc. These GPS modules help to found the location of the vehicles. The antitheft system discussing here involves a microcontroller & a GSM module for the communication purposes. The working of important modules used in this work is discussed below.

1.1. Arduino

In this work Arduino Mega 2560 is used for controlling various modules includes GSM and GPS modules, sensors, password keys, motors, power supply to ignition system, display etc. The Mega 2560 uses the ATmega2560 as the main microcontroller. It has the following features: 54 pins (digital output/input),16 pins of which can be used for analog input, a crystal oscillator, a USB port etc.

1.2. GSM Module

GSM is used for voice and data communication. GSM uses 850MHz, 900MHz, 1800 MHz and 1900MHz standard frequency bands. In GSM, TDMA technology is used. In India we use 900 MHz and 1800MHz for 2G communication. In this work 900a GSM module is used, which uses UART protocol to communicate. The UART communication uses only two wires. At the transmission end, UART converts parallel data to serial data and at the receiver end it converts from serial data to parallel data.

1.3. GPS Module

GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position. Using suitable software, the device may display the position on a map, and it may offer directions. In this proposed work GPS module calculates the geographical position of the vehicle and sends the information to the owner with the help of GSM module. In this work neo 6m GPS receiver prototype is used. For interfacing of Neo-6m GPS receiver, the UART protocol is used.

2. RELATED WORK

The development of antitheft control systems were started in early 1990's. Most of the recent systems use GSM and GPS modules to provide vehicle location information to the owner. Kanchana Katta et al, [1] have made an attempt to develop antitheft system using GSM and GPS module. This system sends vehicle location to owner when the vehicle is in motion. The disadvantage is that only after the vehicle is stolen the owner is notified.

Bhumi Bhatt et al[2] have presented an idea which uses the wireless technology effectively for the automotive environments by using the GSM modem provides information to the user on his request. They are using 8051 microcontroller to stop the vehicle. When the thief tries to steal it, the 8051 is triggered and sends the message to the owner. When the owner sees the message, he sends a "STOP" message which stops the vehicle. If the owner does not see the message in time, the vehicle can be taken quite a far distance and it will not stop automatically.

In [3][4] a vehicle tracking using GSM and GPS is implemented. In this work the user of the vehicle is alerted when the theft occurs. The location of the vehicle can be accessed whenever owner need through an application using GSM and GPS. Here also the location of the vehicle can be

retrieved after the theft. G.S. Prashanth Ganesh et. Al [4] have described a project in which they have used only GSM and hence the cost is reduced. In the system they have used GSM modules and several components, owner triggers the microcontroller so that to start the vehicle. It sends the messages to the owner and near police station through base station via SMS. When the owner sends a message to the system the microcontroller receives and process the message. It will send the location of the vehicle with a time gap to get current/present location. Here the disadvantage is that owner has to trigger the microcontroller.

Most of the work on antitheft systems includes detection of vehicle location when it theft, but it is good idea to implement a system to prevent unauthorized access. In this paper a new approach to antitheft system is used to avoid unauthorized access using password protection to the vehicle.

3. PROPOSED METHEDOLOGY

The proposed system uses a password to access the vehicle. If the password entered by the driver is correct then the circuit is built-up to the engine ignition system. If the password goes wrong the ignition will not occur. The flowchart shown in figure 1 gives the complete working of the system.

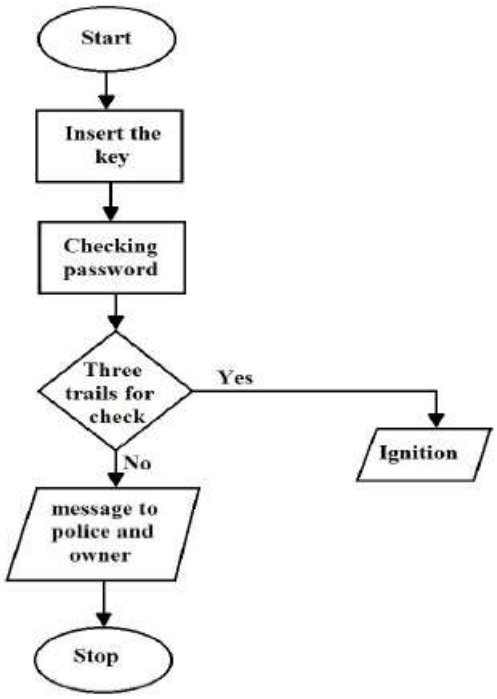

Figure 1: Flow diagram

When the key is inserted in the key hole the IR sensor detects the key and sends a signal to the microcontroller. The microcontroller asks the user to enter the password. When uses enter the password, the system compares the entered password with the original password saved in the controller. If the entered password is correct then it will allow the user to start the vehicle by providing power supply to the ignition system and also the system sends the message that owner as "Your vehicle is accessed" along with the location of the vehicle.

If the password entered by the user is wrong for three times the system will not allow the user to start the vehicle by disconnecting the power supply to the ignition system and also it sends a message to the user saying that "Someone is trying to access your vehicle". In both cases the location of the vehicle is also sent to user through SMS. In such conditions if the owner send a message as "STOP" to the SIM card present in the system, the system reacts to that message and it stops the engine.

In this work an IR sensor is used for the detection of the key, to check whether the key is inserted in the keyhole or not. A 4 X 4 matrix keypad is used to enter the password. The keypad has 4 rows and 4 columns having 16 switches. At the beginning none of the switches are pressed. To determine whether the switch is pressed or not, row and columns are to be scanned. First all columns are made high and all rows are low. If the switch is pressed the corresponding column goes low. To check the row, one by one the rows are made high, if the obtained column is high the correct key pressed can be detected.

LCD Display unit is used for user interface. In this work 16x2 LCD display is used this display contains 32 characters in two rows. Each row contains 16 characters to display. Each character can be represented by 5x8 pixels. It contains two registers: Instruction register which is used to clear the display and shift the cursor and Data register which is used to store the character for display purpose.

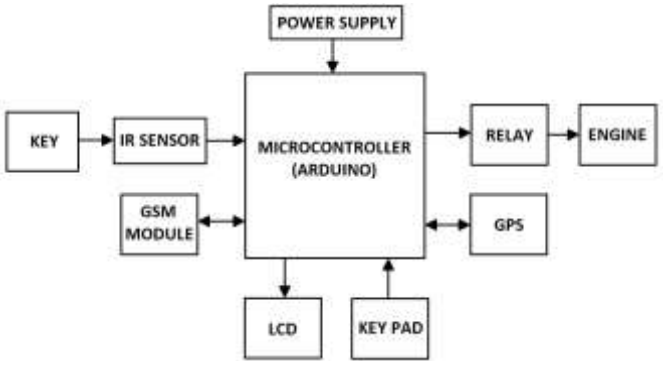

Figure 2: system interfacing

Figure 2 gives the detailed connection of various modules in the proposed system. Here 5V battery is used as power supply, GSM and GPS modules, Keypad, sensor for key detection are directly connected to an Arduino controller. A relay is connected between engine and the controller. Whenever the system needs to avoid engine to start the relay remains in open condition, this happens when user fails to give correct password. If user gives correct password the relay goes to closed condition and ignition system is allowed to start the engine.

4. ADDITIONAL FEATURES

As Sim900a GSM Module is using, the feature of dialling phone calls at emergency situations and be implemented. To do this an additional MIC and speakers are used. During emergency situations if the driver's phone is not working then he can make use of the GSM support used in this security system to make calls to few saved numbers.

During any accident if the driver is not in a position to move a vehicle, someone must access the vehicle to avoid road traffic. To do this a default password is saved in the system and same is displayed near the keypad so that someone can access the vehicle to clear traffic. A special feature is introduced with default password. When the default password is pressed the system allows the vehicle to move only some minimum fixed distance, after that it turn off the engine automatically. To measure the distance moved during default password Hall effect sensor id fixed at the wheel, by determining the number of wheel rotations the engine turns off. In this work 25 wheel rotations are allowed during default password conditions.

5. RESULT AND DISCUSSIONS

The snapshots taken during the system working are shown in this section. Figure 3 shows the prototype where the antitheft module is implemented on vehicle. Here a small 4 wheel robot is used in the place of a vehicle.

Figure 3: Prototype of the project.

Figure 4 shows the LCD display, in which the system is asking to enter the password after sensing the key. If the user enters the correct password the system displays a message SUCCESS on the display as shown in figure 5, if the password entered is incorrect for three times the message ACCESS DEINED is displayed as shown in figure 6

Figure 4: system asking for password

Figure 5: Message for correct password

Figure 6: Message for incorrect password

Counting the number of wheel rotations during emergency condition to move vehicle for certain distance using default password id shown in figure 7.

Figure 7: Message during default password

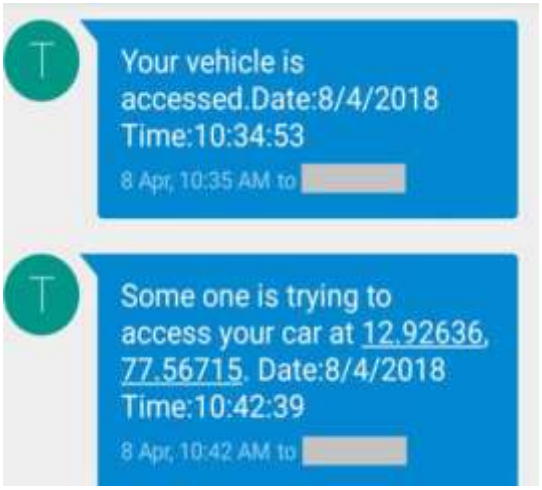

Figure 8: Messages received by owner

The messages received by the owner during correct and incorrect password entries are shown in figure 8

6. CONCLUSION

A modest effort in improving the anti-theft security system for vehicles has been done. Extra features such as stopping the vehicle from the registered mobile number when someone theft the vehicle and also emergency calling feature

are being demonstrated in this work. Hence, this helps in improving the safety and the accessibility of the vehicle.

6. REFERENCES

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