

# GSM BASED SECURITY FOR VEHICLE

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**Abstract**— Car theft is major issue at every place in the world. So, car security has become important for each and every car user. Here, we had made an attempt to solve this problem. “Antitheft security system” utilizes an embedded system design with GSM to monitor and safeguard a car. Upon activation; it automatically demobilizes the car by disconnecting the ignition key supply from the car battery. From the research conducted, it was found out that majority of the existing car security system uses only alarm, and doesn’t send text message to the car owner. But with the use of GSM network, the owner is guaranteed that the car will send text message to his phone, and at the same time, have people around alerted of what is happening. As car owner already lock the ignition of car and demobilize it before leaving car, the car cannot be move. Added to this, owner can track the car location using LAC (location area code) and CID (cell Identification) codes and retrieve it.

**Keywords-** GSM network, Cell phone, Security

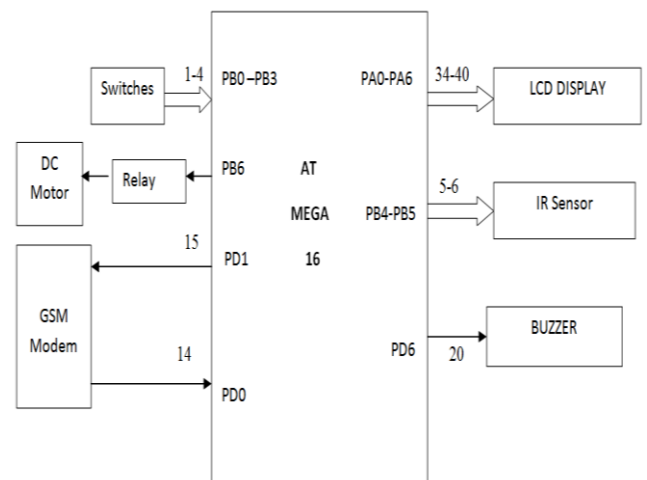
## I. INTRODUCTION

In the present growing economy of world, all the countries face the problem of stealing or attempting to steal a car. Vehicles theft, which is the main concern for the conduct of this project, is one of the biggest problems which are hard to eliminate. From the most recent statistics in US, for 2012, show an estimated 794,616 thefts of motor vehicles nationwide, representing property losses of nearly \$5.2 billion. The estimated number of motor vehicle thefts increased 0.6 percent in 2012 when compared with the 2011 estimates [2]. The above statistics suggests us to take a step against the vehicle thefts in world. In a situation where there is high level of theft, there is need for better security system. The latest trend of Vehicles Theft involves the vehicles being towed away [4]. So, the project is conducted for additional features in vehicles alarm system. When the vehicles alarm is triggered, through forced entry through door or motion sensor detection, the in-vehicles phone will send SMS message to the owner’s mobile phone to alert him or her to check the vehicle. Usually, vehicles owner realizes that their vehicles have been stolen long after the incident, which the vehicles thief probably gotten away, and disables all the security features in the car, or cannibalized the vehicles for spare parts and expensive items [3]. This happens when the owner is far away from the vehicle to hear the alarm. The SMS message gives immediate alert to the vehicles owner, even if the thief gotten away with the car, so that the

owner can immediately take instant actions to notify the local police department.

## II. METHODOLOGY

### I. Block Diagram



**Fig1:** Block Diagram of anti-theft security system for vehicles

### II. Block diagram description

The microcontroller we used here is ATMEGA 16. All the controls signal in synchronization with time are generated by this device. As shown in figure 1, LCD is connected from pin no. 34(PA0) to pin no. 40(PA6) which display different messages indicating status of the system. Four switches are connected to pin no.1(PB0), pin no. 2 (PB1), pin no.3(PB2), & pin no.4(PB3) of Port B. Two IR sensor pair i.e. transmitting and receiving pair of IR are connected to pin no.5 (PB4) & pin no. 6 (PB5) of port B. A pair of IR LEDs can be used as motion detectors. The IR LED is wired to emit infrared radiations and the photodiode is wired to transmit a signal when it receives an IR input. When an object comes within range of the emitted IR, it reflects the IR back to the photodiode and produces a signal. GSM module is connected to transmitter and receiver pin of ATMEGA 16 i.e. Pin no. 14(Rx) and pin no. 15(TX) respectively. GSM module is mode of communication between vehicle and the vehicle owner. It sends and receives the messages from mobile of vehicle owner. It is also used to track the location of vehicle. Relay is used to drive dc motor which indicates the ignition system of car. It is connected to pin no.7 of port B [1].

### A. Microcontroller Unit- AT MEGA 16

The ATMEGA16 AVR is supported with a full suite of program and system development tools including: C compilers, macro assemblers, program debugger /simulators, in-circuit emulators and evaluation kits. The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers [2].

#### Features:

- Advanced RISC Architecture with 131 Powerful Instructions.
- Two 8-bit Timer/Counters with Separate Pre -scalar and Compare Modes.
- Real Time Counter with Separate Oscillator
- Programmable Serial USART.
- Master/Slave SPI Serial Interface.
- Programmable Watchdog Timer with Separate On-chip Oscillator.
- Operating Voltages is 4.5 - 5.5V (ATMEGA16).
- Operating frequency is up to 16 MHz (ATMEGA16).

### B. GSM Modem

A GSM modem exposes an interface that allows applications such as SMS to send and receive. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an "extended AT command set". A GSM modem exposes an interface that allows applications such as SMS to send and receive messages over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an "extended AT command set" for sending/receiving SMS messages, as defined in the ETSI GSM 07.05 and 3GPP TS 27.005 specifications. GSM modems can be a quick and efficient way to get started with SMS, because a special subscription to an SMS service provider is not required. In most parts of the world, GSM modems are a cost-effective solution for receiving SMS messages, because the sender is paying for the message delivery [1].



**Fig.2:** GSM Modem SIM 300

#### Features:

- Quad Band GSM 850/900/1800/1900 MHz
- Control via AT commands
- Operation Temperature (-20 deg C to +70 deg C)
- Text and PDU mode Power Supply
- Uses AC/DC Power Adaptor
- DC Voltage: 12V
- DC Current: 1A
- Polarity: Centre + ve & Outside – ve
- Current Consumption in normal operation 250 mA, can rise up to 1 Amp.

### C. IR Sensor

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye [2].



**Fig.3:** IR Sensor

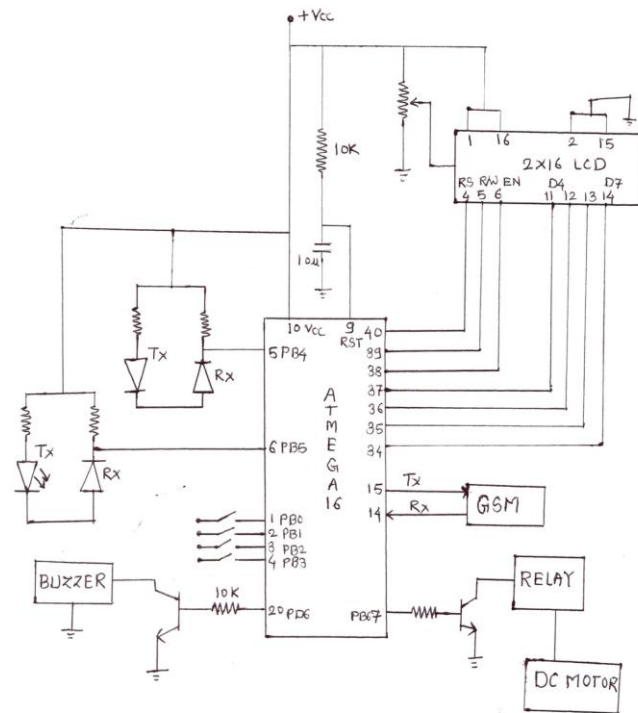
Infrared is light that has a wavelength longer than visible red light. The ranges of infrared include near infrared, mid infrared and far infrared, spanning wavelengths from about 710 nanometres (near infrared) to 100 micrometres (far infrared). All objects emit light according to their temperature - this is called "black body radiation." The hotter the object, the shorter wavelength of light it emits. The Earth emits infrared light at a peak of about nine to 10 micrometres--and so do warm-blooded animals like humans. This light can be used to detect motion or warmth.

**Features:**

- Source voltage 0.2~2.5V
- Warm up time 30 sec max

**III. Implementation**

**A.Experimental Setup**



**Fig. 4:** Circuit Diagram

Initially, in our setup security system is alert and car is demobilized. Four switches are placed at the four car doors while IR sensors are fitted at the car wheels. The IR sensor will sense if there is any motion along the wheels of car. The two mobile nos. are feed in program which is named as user1 and user 2. All the communication between GSM modem will be done through these two mobile nos. We have used LCD display which displays various messages such as whether car is "LOCK" or "UNLOCK". The detail working of setup is discussed below:

**I. To start a car**

When car owner wants to start the car, car owner will send SMS "UNLOCK" from either user1/user 2's mobile no. The car will be started and security system will get disabled. This is shown by the ON state of DC motor which is connected to NC (normally closed) pin of Relay. So, when relay is OFF; DC motor will be ON. In this situation IR sensor will not detect motion of wheels if any. Also, if any switch is pressed, it won't break any security as security system has been disabled.

**II. To make a security system active**

When car owner will park the car, he will send SMS "LOCK" from his either (user1/user2) mobile no. The car will get demobilized (car engine will be stop) and security system will become active. This is shown by OFF state of DC motor which is connected to NC (normally closed) pin of Relay. So, when relay is ON, DC motor is OFF. In this case, thief will get caught if security has been broken.

**III. Security system being alert**

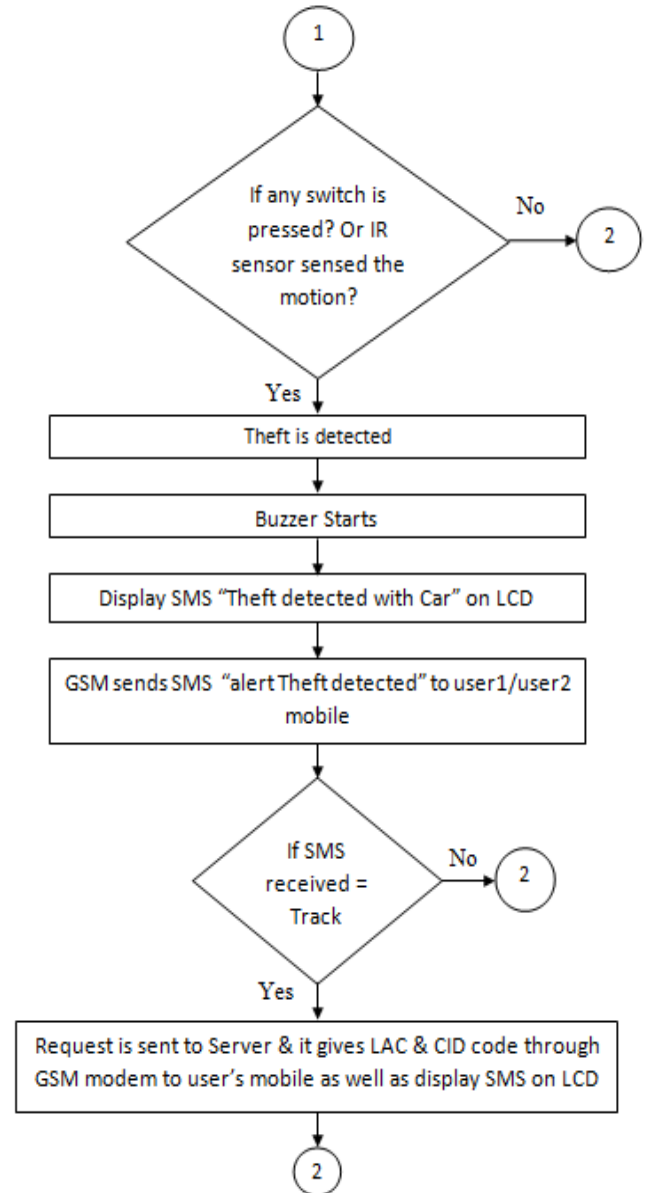
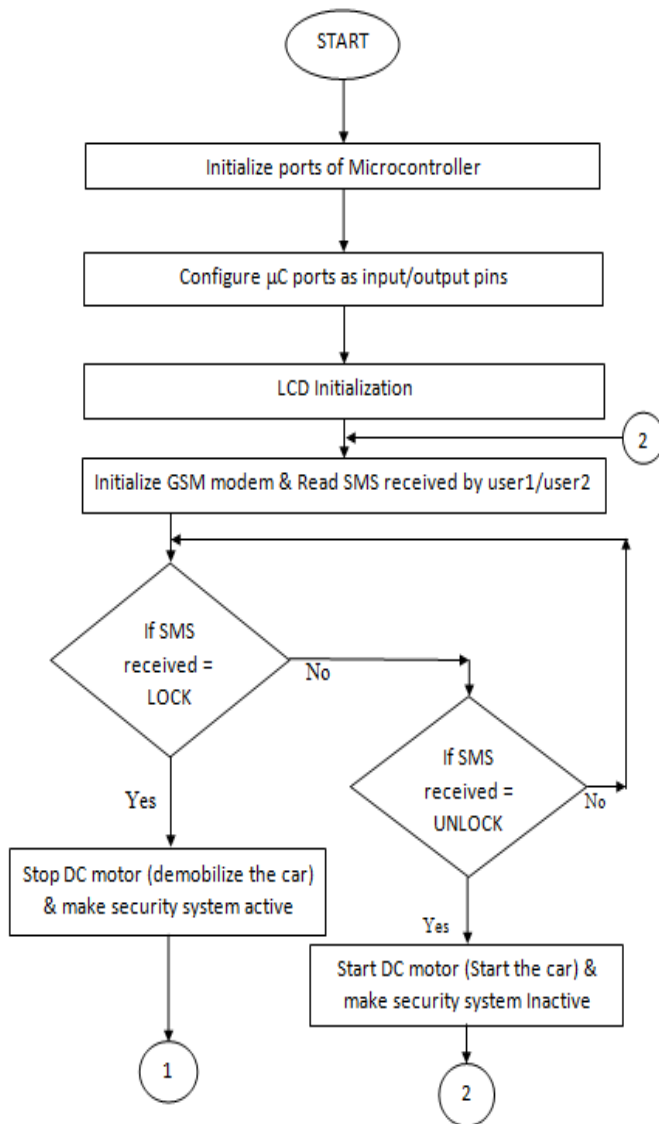
If any thief tries to open any of the car doors, switch at that door will get pressed. Microcontroller generates HIGH pulse at pin PD6 where buzzer is connected. The buzzer will get started and GSM will send SMS "Alert Theft with Car detected" to the car owner's mobile (user 1/user 2). Similarly, if thief tries to pull the car with help of rope; wheels of car will rotate. This motion of wheels will be detected by IR sensor as the IR LED will continue reflect the infrared radiations. If any object comes in front of IR sensor, the radiations will be reflecting back which will be absorbed by photodiodes. As soon as IR sense the motion, again, microcontroller generates HIGH pulse at pin PD6 where buzzer is connected. The buzzer will get started and GSM will send SMS to car owner's mobile.

**IV. To track a location of car**

If user want to get the location of car, he will send "Track" SMS to the GSM module. It will give request the server to get LAC (Location Area Code) & CID (Cell Identification) codes which are used to find latitude and longitude position of car. For this purpose, we use Profane GSM Tracker website.

Open website <http://cellphonetrackers.org/gsm/gsm-tracker.php> . Mobile country code is +91. Write down the LAC & CID codes in the required field given in the page. Click on "Track it" and we will get latitude & longitude positions. Now, we can track the vehicle from google maps.

**B. Flow Chart**



The above is flowchart of the working of project “Anti-Theft Security System for Vehicles”. Initially the ports of microcontroller are initialized. The pins are configured as input/output pins. Then LCD and GSM module is initialized. GSM receives SMS from two particular mobile no’s, these two user mobile numbers are defined in the program.

If any user sends the message as “LOCK”, then dc motor stop rotating i.e. car is demobilized and the security system is enabled. If anyone tries to break the security then buzzer starts sounding and GSM module sends the message to car owner.

If we send the message as “UNLOCK”, then dc motor starts i.e. Car is running and security system is disabled. If user want to track the position of car when car security gets break; then user sends SMS “Track”, it will send LAC (Location Area Code) and CID (Cell Identification) no. on user’s mobile. User can get latitude and longitude position from these codes by using gsm tracker website. The program developed here is in C-language and is loaded into the ATMEGA16 using AVR studio4 Software. The details of programming in AVR studio software is explained further.

**C. Software Description**

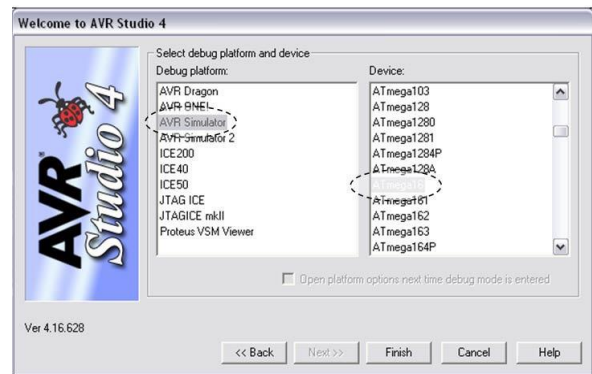
**I. AVR Studio 4**

AVR studio 4 provides an Integrated Development Environment (IDE), combined with two other supporting software, AVR Tool chain and Win AVR. AVR Tool chain

installs the Library for AVR studio. AVR Tool chain is a must to run AVR studio. If we install AVR Studio and AVR Tool chain, we'd be able to write program in assembly language. To write a program in C, we need to install Win AVR. We can write our programs in the AVR studio and we can instantly download & verify it too. Here we are using AVR studio for programming of ATMEGA 16. The steps to transfer and compile the program is as below:

**Step 1:** AVR studio is an Integrated Development Environment (IDE) by ATMEL for developing applications based on 8-bit AVR microcontroller. Prior to installation of AVR Studio we have to install the compiler Win AVR. This will allow AVR Studio to detect the compiler.

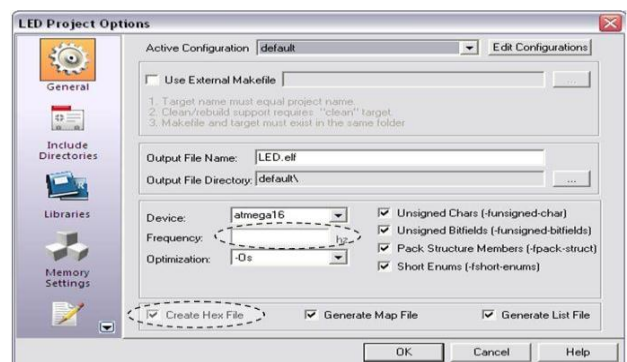
**Step 4:** Click on AVR Simulator in left block and then select our controller (e.g.: ATMEGA16).



**Step 5:** Write the code in main body area. Save the project file.

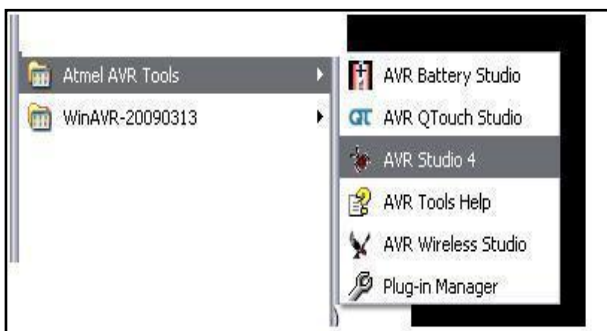


**Step 6:** We have to write the crystal frequency if we are using external crystal for frequency. Check the box to Create Hex File and then click on OK. Save the project again.

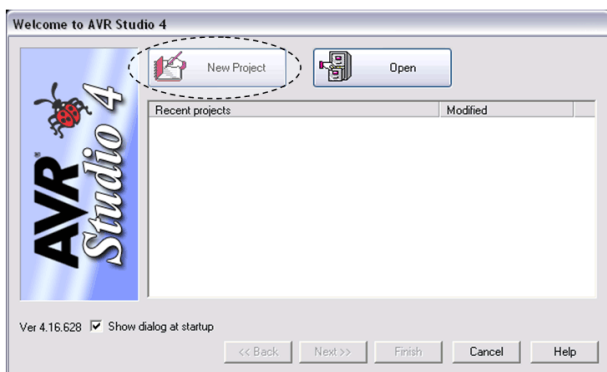


**D. Code for sending an SMS**

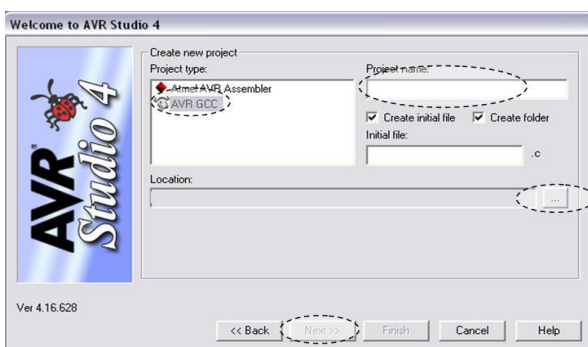
```
void sendmessage(char msg[], char num[]);
{
int i=0,j=0;
puts("AT+CMGF=");
putchar(49); // sends the ASCII value of '1'
puts("AT+CMGS=");
```



**Step 2:** Click on new Project



**Step 3:** Click on AVR GCC  
Write the project name  
Select our project location.  
Click on Next>>

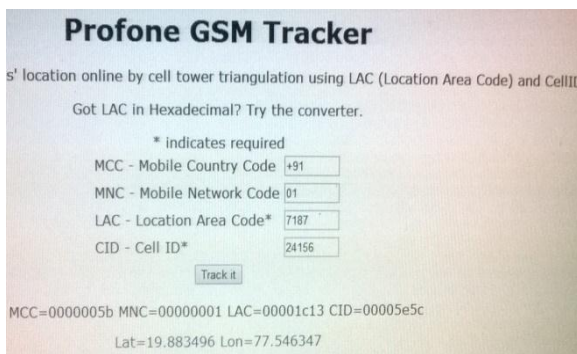


```

putchar('\n');
while(num[i]!='\0')
{
j=(int)num[i];
putchar(j); //sends the ASCII values of the numbers
i++;
}
puts("Hello World");
putchar('26'); //sends the ASCII value of <Ctrl>+<Z>
}
    
```

#### IV. RESULT

It informs immediately about the car theft to the car owner through SMS, if someone tries to open door of car. As we have used buzzer in the project, if security get break, buzzer will start. So, it alerts car owner about thief. As a result, he can report about thief to nearest police station and thus, our car will be protected.



**Fig.5:** Latitude and Longitude position using LAC & CID code

If somehow any thief stole the car by pulling it using rope. Owner would get alert but if he could not reach to the car within time, he can find out car location. Car owner will send one SMS to get LAC and CID (Location Area Code and Cell Identification) codes. These codes are used to find latitude and longitude positions.

#### V. CONCLUSION

The aim of the project was to design and construct anti-theft system that has high performance and good reliability. As we know, all the existing anti-theft systems are based on a warning system during robbery. In addition to these warning, in the proposed system, car owner will receive immediate alert on his mobile about the theft. It is an easy way for theft detection by sending SMS alert to car owner through GSM modem. Also, we have used IR sensor to detect the motion of car in case of vehicle being towed away. In this project, we have improved security by deactivating the ignition system whenever theft takes place. All existing system include GPS tracker to trace the car location. But in our project, the location of car is provided with the help of Location Area Code (LAC) & Cell Identification (CID) without

using GPS model. Thus, the cost of GPS model has been reduced. This project can be further enhanced by using switch or digital lock concept instead of sending this message. Thus, the extra cost of LOCK and UNLOCK message can be reduced. The project is all about controlling theft of a car making it more secure. It is an easy way to protect our car from theft, thus facilitating immediate detection and quick recovery of the stolen vehicle.

#### VI. FUTURE SCOPE

As we need to send SMS each time when we want to drive the car or keep the car in parking area, it includes daily expense of SMS. This cost can be reducing by using alternate way such as switches, or digital lock. If we use switch, this switch is known only to owner or driver of the car. By using this switch, we can lock or unlock the car within some specified delay. Hence, we can mobilize and demobilize the car using switch which will be fitted inside the car. Location of switch will be known to owner of car to maintain the security of the car. Thus, cost of SMS will get reduced. The facility of switch will be an alternate way of SMS.

#### REFERENCES

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