DETECTION OF AUTOMOBILE THEFT AND ENGINE LOCKING USING ARDUINO

Ayush K Sahai[1], Flory Francis[2]

[1]*Engineer, Electronics and Communication Engineering Department, M.S. Ramaiah Institute of Technology, Karnataka, India*
[2]*Assistant Professor, Electronics and Communication Engineering Department, M.S. Ramaiah Institute of Technology, Karnataka, India*

ABSTRACT

Vehicle theft is a common issue which is ubiquitous, irrespective of the location. The main objective of this entire system is to ameliorate the safety of the vehicles and truncate the thefts at insecure parking places. This system can be installed in any car or bike, but the main objective of this system is to prevent the theft of low end cars, which dominate the market in most of the countries. The main feature which makes it preferable is its low cost (around 50$) and can be used by any leading manufacturer of cars or bikes.

There is a paucity of secure parking spaces in many neighborhoods, so a lot of cars are usually parked on the side streets and some insecure parking places, which makes it very easy target for the thieves. This system is designed and developed to reduce the amount of vehicle thefts at such places, usually for the low end cars and the bikes which do not come with any theft prevention system..

This system can be installed in the vehicle and would be helpful in tracking it. If there is a notification of theft, then subsequently the theft can be averted. The user would be notified through a text message as soon as there is a theft, then the user can send back a uniquely configured passkey, which would lock the engine and send back the co-ordinates of the place where the engine got locked. Hence we can get back our vehicle easily. The system is designed using Arduino platform which is interfaced with GSM, GPS, RFID modules.

Keyword: - *Arduino, GPS, GSM, RFID*

1. LITERATURE SURVEY

Champa Bhagavathi.R, Gowri.B.R, Kasturi.R, Pooja.C suggested in their work on " Vehicle Theft Detection and Prevention Using GSM & GPS", International Journal Innovative Research in Computer and Communication Engineering, vol.4, Issue 5, May 2016. The Proposed System consists of Remote ignition cut-off and Vehicle tracking modules. Both of them make use of GSM sub module. Vehicle tracking module further makes use of GPS sub module and Remote ignition cut-off module uses password authentication sub module. User enters the correct password to start the vehicle. If incorrect password is entered three times, an auto-generated message is sent to owner and a buzzer activates alerting the nearby personnel. GSM modem is used to send OTP to owner. The owner is also notified if his vehicle is started. The owner can respond with an SMS. The ignition of the vehicle will be disabled whenever $OFF message is sent. GPS technology is used to track the vehicle. Location co-ordinates of the vehicle are sent to owner whenever $LOC message is sent.

Maheshwari V.Chandravar,Shital Y. Gaikwad suggested in their work on "Anti-Theft Security System Using GSM,GPS &RFID Technology based on ARM7",Intrernational Journal of Engineering Research & Technology,vol.2,Issue 9,September 2013. The vehicle is provided with the RFID reader. The vehicle is developed by using two Direct current motor which would be connected to the microcontroller using Motor Driver integrated circuit for increasing the current. The Door assembly is developed using DC motor which would be controlled using

the relay. When the theft is there, the door will lock automatically. When unauthorized people want to open the door of car then he/she is unable to open without RFID tag.

Prof.R.M.Sahu , SonaliLole suggested in their work on "Vehicle Theft Alert & Engine Lock System Using ARM7", IJARIIE , vol.3, Issue 3, 2017 .In a vehicle tracking system there is an electronic device, installed in a vehicle to enable the owner or a third party to track the vehicle's place. This paper proposed to design a vehicle tracking system that works using GPS and GSM technology. This system built based on embedded system, used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM). This design will continuously watch a moving Vehicle and report the status of the Vehicle on demand and lock the vehicle when requested.

Kunal Maurya , Mandeep Singh , Neelu Jain suggested in their work on "Real Time Vehicle Tracking System using GSM &GPS Technology- An Anti-theft Tracking System", International Journal of Electronics and Computer Science Engineering, vol.1, number3, 2015. This paper proposed to design a vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking and it would work as anti-theft system. It is an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM)

2. PROPOSED METHOD

In addition to the earlier methods, to avert the thief from stealing the vehicle, RFID technology is integrated in this implementation. The system design consists of two modes for theft prevention, namely the USER MODE and the THEFT MODE. An individually traceable RFID reader is installed in the vehicle and a unique RFID key is used for flipping the modes.

The system has two divisions, one division is the access control system which involves the use of RFID technology, and the second division is the engine locking division which consists of GSM and GPS. The role of the second division of the setup comes into play only when the vehicle is triggered in THEFT MODE. A SMS is sent to the registered mobile number in case of any theft. The mobile number is registered with the system during the initial setup which is then notified in case of theft, which in return could revert with the cryptic passkey which could be used for locking the engine of the vehicle. The proposed engine locking method here is Electronic engine locking which is much more efficient than the traditional mechanical engine locking.

GSM and GPS technologies are used, which ensure almost the full security of the vehicle as these modules are more reliable and have a vast signal range. GSM module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM system. Global Positioning System (GPS) is a satellite-based system that uses satellites and ground stations to measure and compute its position on Earth.

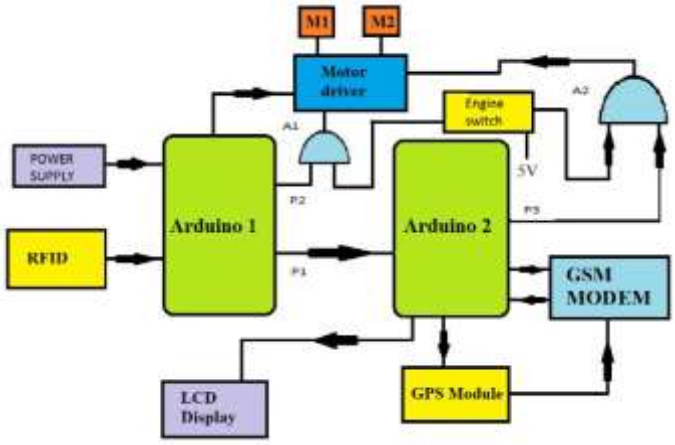


Fig -1: Block Diagram

2.1 Working of the Block Diagram

The block diagram shows the entire system which has been implemented. It consists of two Arduinos, RFID reader, RFID tag, GPS Module, GSM Module, Motor Driver, DC motors. The RFID is used to switch between user mode and theft mode. The authorized RFID tag is stored in the Arduino, so if anyone tries to open with duplicate RFID card it will not switch to user mode, it will remain in theft mode. The Engine switch is the power house of the system, like the key of the vehicle, if the engine switch is off then the vehicle will not move, the vehicle will only start by turning the engine switch on.

In user mode, the output at the pin, P2, connected to the input of first AND gate, A1, will be high and it drives the motors. The second Arduino will be switched off during user mode. When the mode is changed to theft mode then output from Arduino 1 to Arduino 2, P1, is made high, due to which Arduino 2 is switched on and P2 would be made low. This will switch on the GSM as well as the GPS module. When the engine is started in theft mode the GSM module will send an alert message to the owner saying that, "someone has started your vehicle take necessary action, send the pass key to lock the engine". The owner should then send a specific pass key to lock the engine. The received passkey is compared with the stored passkey in the Arduino, if it matches the engine will be locked by making the output pin, P3 as low. The vehicle will be tracked continuously by the GPS module and the coordinates will be sent to mobile through GSM module once the pass key is matched.

2.2 Hardware Implementation

The system consists of mainly Arduino microprocessor as the main unit, GSM module, GPS module, RFID module, Liquid Crystal Display, L293D (Motor Driver IC).

- Arduino Uno R3

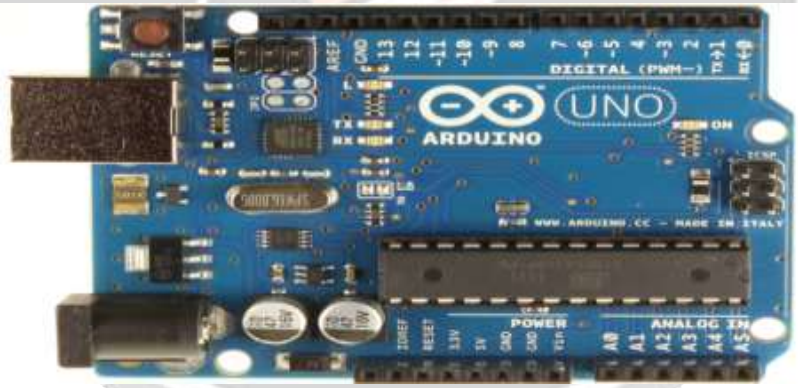


Fig -2: Arduino Uno R3

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board has Digital I/O pins, Analog I/O pins, ground and Vcc(3.3V and 5V) pins. The Digital and Analog I/O pins could be used to interface various electronic devices and sensors such as ultrasound sensor, darkness sensor, IR sensor, Bluetooth module, GSM module, GPS module and so many other compatible electronic devices.

Some Pins and their functions are mentioned:

- LED: This is used for turning ON the LED(PIN 13). The digitally HIGH and digitally LOW levels correspond to the glowing and switching off of LED.
- VIN: This pin is used to gather the input voltage from any DC power source (5V to 9V).
- 5V: This pin gives a regulated output voltage of 5V and can be used for supplying power to other interfaced modules.

- 3V3: This pin gives a regulated output voltage of 3.3V and can be used for supplying power to other interfaced modules.
- GND: Ground pins.
- Reset: Typically used to add a reset button to shields which block the one on the board.

- GSM MODULE (SIM900A)

Fig -3: GSM SIM(900A)

This is a dual band GSM module that works on frequenices of 900/1800 hz. It can be used to communicate with the controller using AT commands. The module comes with RS 232 interface which allows connection with PC and microcontroller. This module could be used for sending messages, deleting messages, make calls, etc. Some of the AT commands are mentioned below.

AT Command	Function
+CMGS	Send message
+CMSS	Send message from the storage
+CMGW	Write message to memory
+CMGC	Send command
+CMMS	More messages to send
ATA	Used to answer the incoming calls

- Liquid Crystal Display(LCD)

This is a basic 16*2 display module. So it can have 32 characters in total. This module is preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical, easily programmable, have no limitation of displaying special & even custom characters.

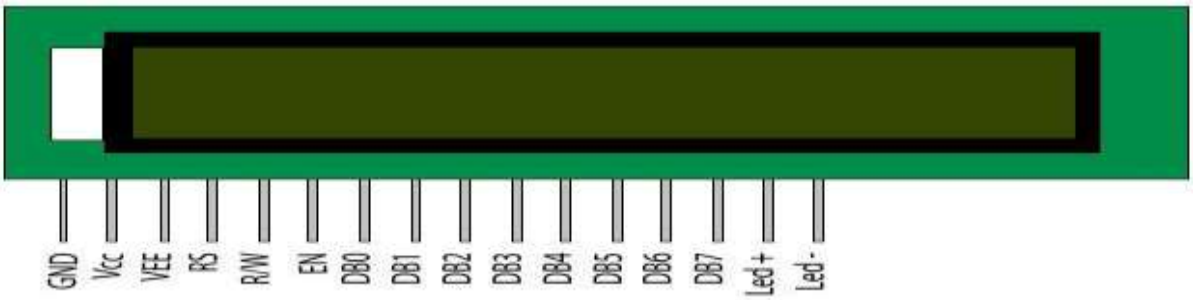


Fig -4: LCD

The pin configurations of LCD are shown below.

Pin	Symbol	Description	
1	V_{SS}	Ground	0 V
2	V_{CC}	Main power supply	+5 V
3	V_{EE}	Power supply to control contrast	Contrast adjustment by providing a variable resistor through V_{CC}
4	RS	Register Select	RS=0 to select Command Register RS=1 to select Data Register
5	R/W	Read/write	R/W=0 to write to the register R/W=1 to read from the register
6	EN	Enable	A high to low pulse (minimum 450ns wide) is given when data is sent to data pins
7	DB0	To display letters or numbers, their ASCII codes are sent to data pins (with RS=1). Also instruction command codes are sent to these pins.	8-bit data pins
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	Led+	Backlight V_{CC}	+5 V
16	Led-	Backlight Ground	0 V

Source: Mutleyshangar.com

- Radio Frequency Identification Tag(RFID)

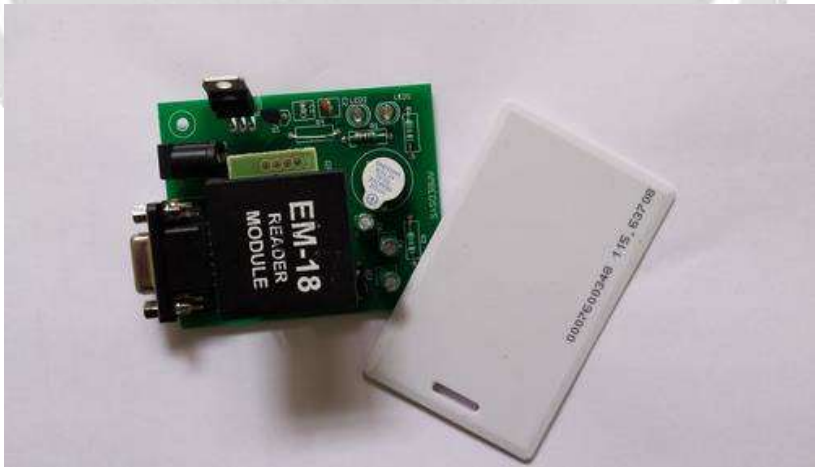


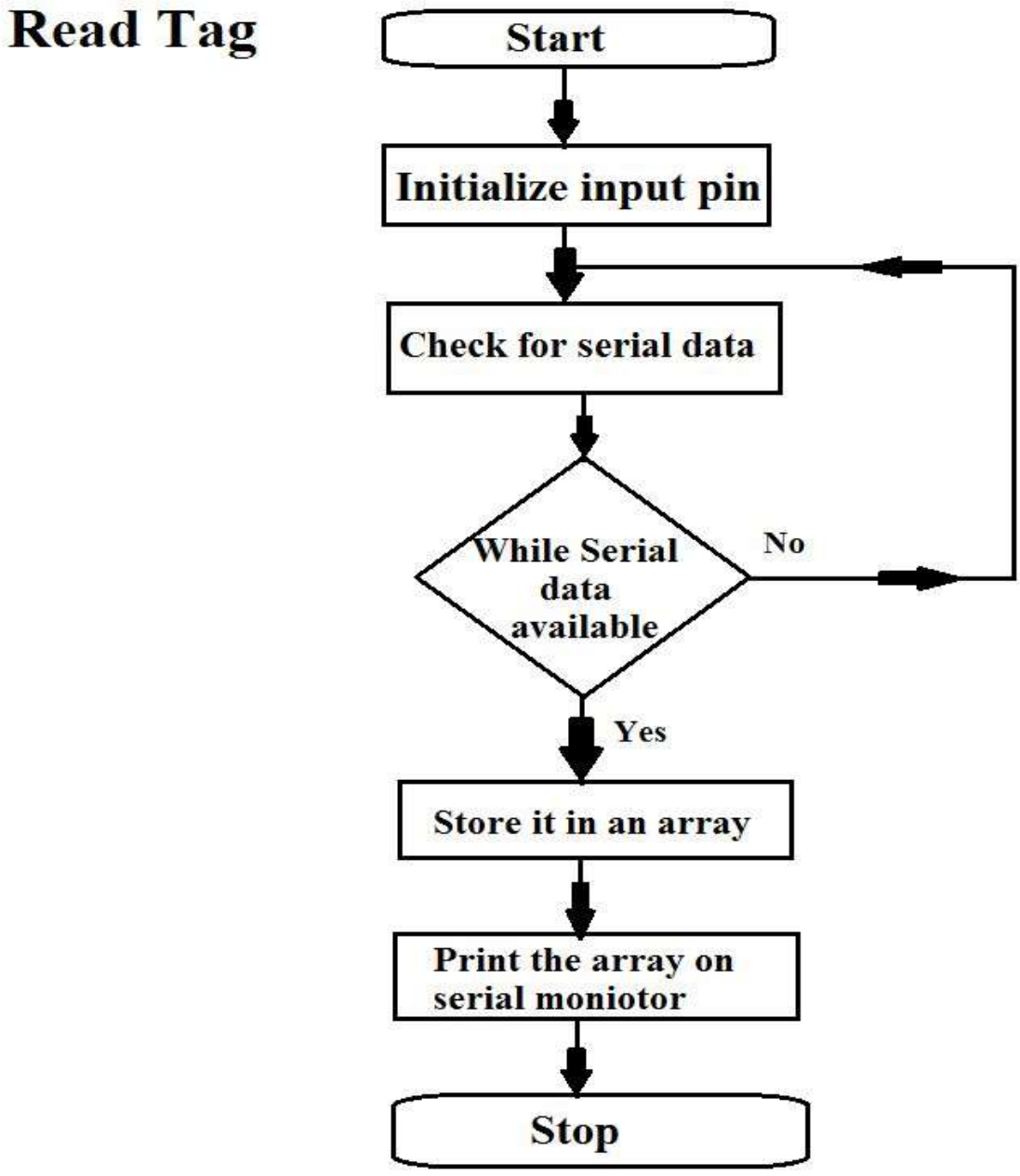
Fig -5: RFID Tag and Reader

EM-18 RFID Reader is one of the most commonly used RFID Reader to read 125 KHz tags. This is used for controlling the access in many projects and industries. Each RFID key could be configured to a RFID module.

2.3 Software Implementation

.The software implementation is divided into four components.

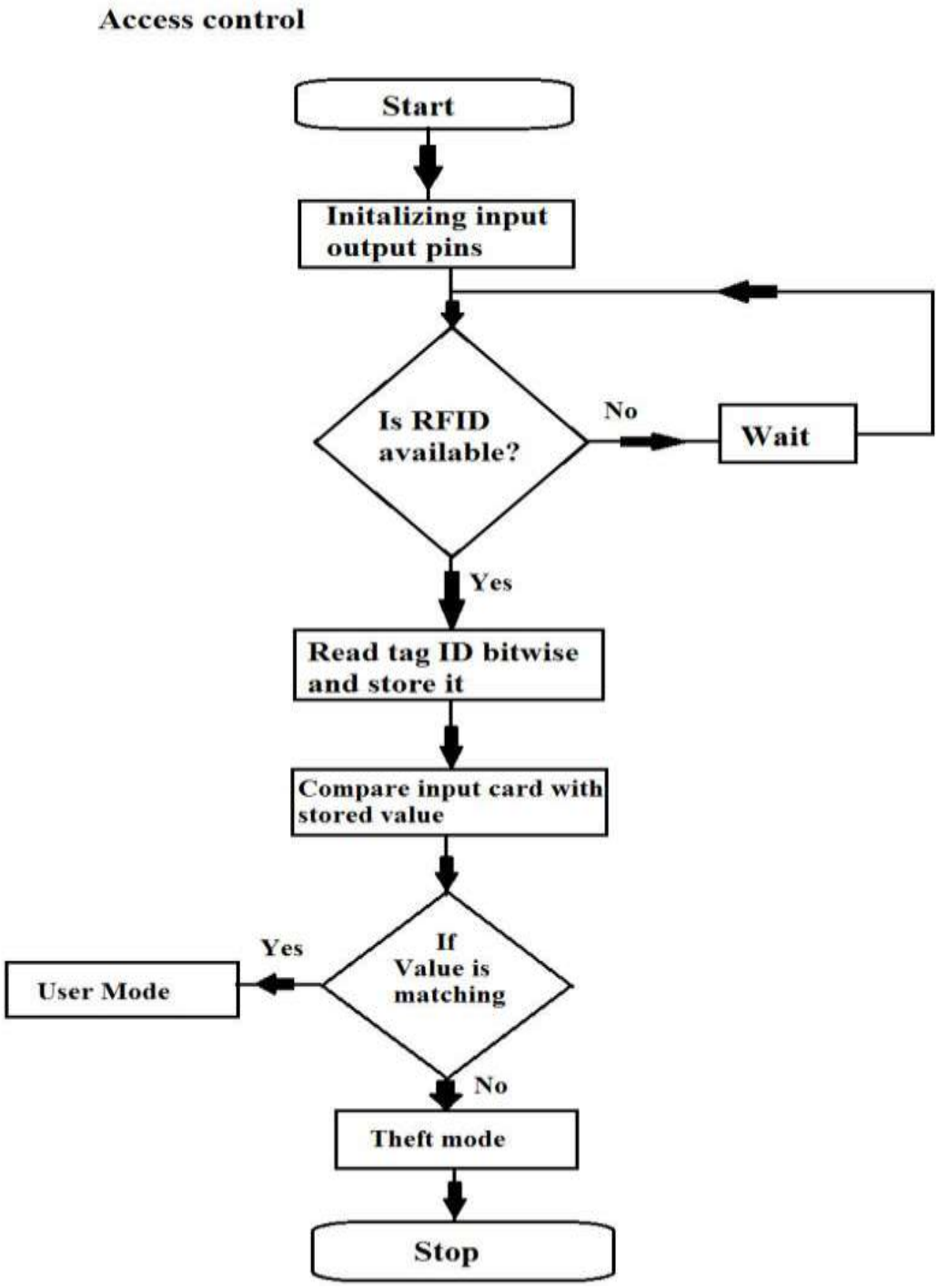
- Read Tag



Flow Chart -1: Read Tag

In the beginning, input pin and count variable are initialized. Then there will be checking for the serial Data. Once serial data is available, counter will be reset to 0. After this each and every character is serially read until and unless count does not exceed 12. At the end the array is displayed on serial monitor.

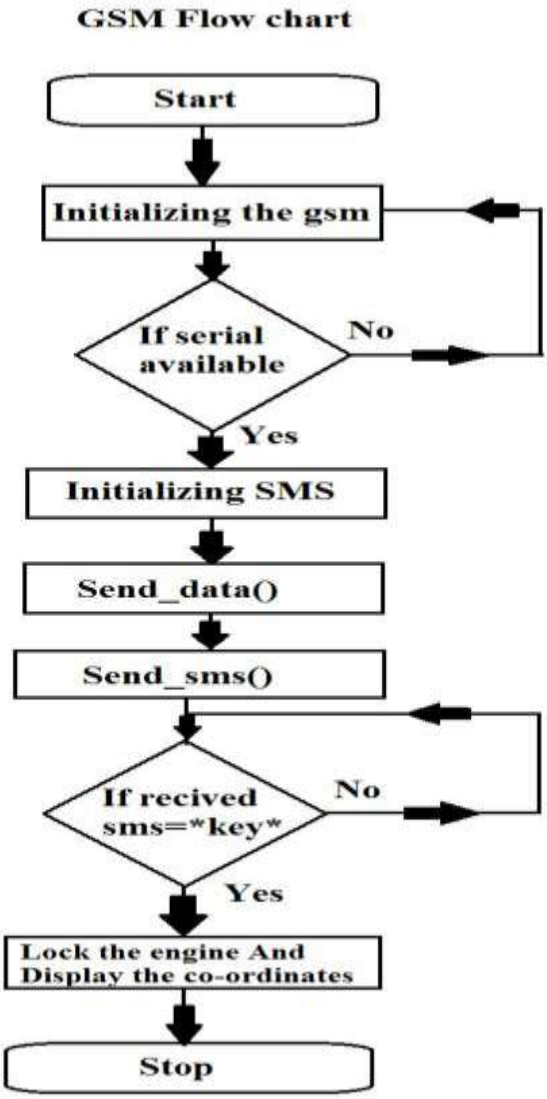
- Access Control Part



Flow Chart -2: Access Control

Input and output pins are initialized in the beginning. There will checking for the RFID. If it is available tag ID is read bitwise and stored in the array. Input card is compared with stored value. If they match, RFID will be turn on USER mode, otherwise theft mode.

- GSM functioning.



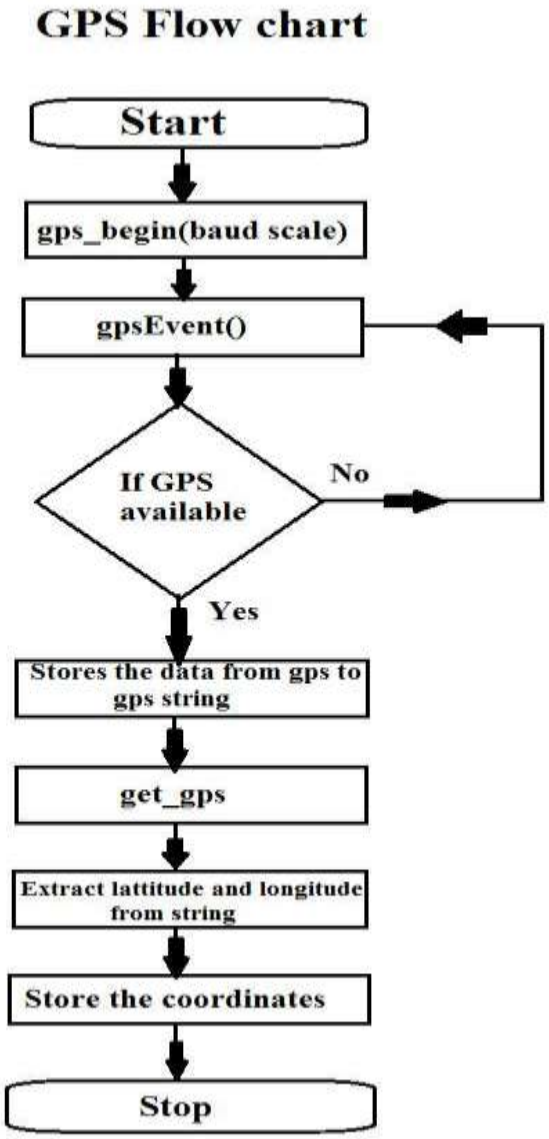
Flow Chart -3: GSM Functioning

Functions used are

1. gsm_init();	Checks for the availability of GSM module and initializes GSM.
2. init_sms();	Initializes the SMS to be sent to the number.
3 .send_data(message);	Stores the data to be sent.
4. send_sms();	Sends the message to mobile number.
5. AT+CPIN?	Checks for network availability.

GSM switches on using 12V power supply. gsm_init(); initializes GSM. If serial data available then it initializes the SMS to be sent to the number using init_sms();.Data to be sent is then stored and message is sent to the mobile number If SMS matches with the pass key then engine is locked, otherwise it waits for the correct pass key.

- GPS functioning



Flow Chart -4: GPS Functioning

Functions used are:

1.gps_begin(9600); Used to initialize GPS module with Baud scale.
2.get_gps(); Used to extract co-ordinates from receiving string($GPGGA).
3.gpsEvent(); Used to receive GPS data into Arduino.

GPS Module switches on with 5V power supply. gps_begin(Baud scale); function will initialize GPS Module with Baud rate of 9600. gpsEvent(); is used to receive GPS data into arduino. It then checks for GPS availability. If GPS is available then it stores data from gps into gps string. get_gps(); then extracts co-ordinates from received string and co-ordinates are stored.

3. CONCLUSIONS

A real time automobile tracking system via google maps is presented. The mode switching is done for authorization, GSM messaging for alerting the owner and GPS for tracking the vehicle.

Case i: User Mode:
When the system is in user mode the user can drive the car without any issue.

Case ii: Theft Mode:
When the system is in theft mode, and someone tries to start the car the user will receive a text message saying that someone has tried to start the vehicle as shown in the fig -6 and user has to reply with an passkey.

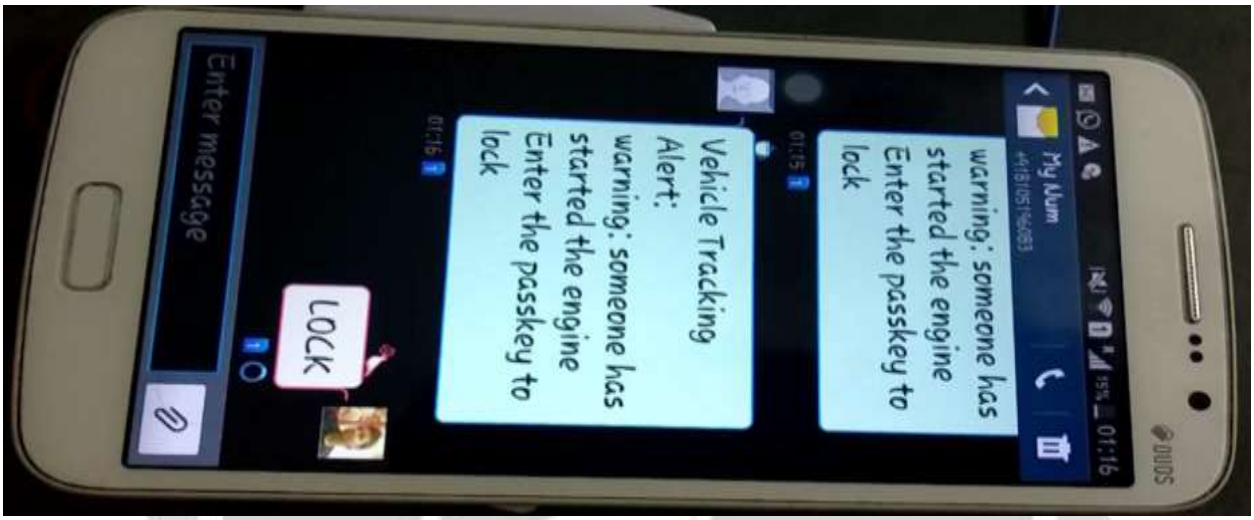


Fig -6: Theft notification

After the passkey is sent the system switches off the engine and sends the co-ordinates to the user as shown in the fig -7 by which the user can track the vehicle by using Google maps.

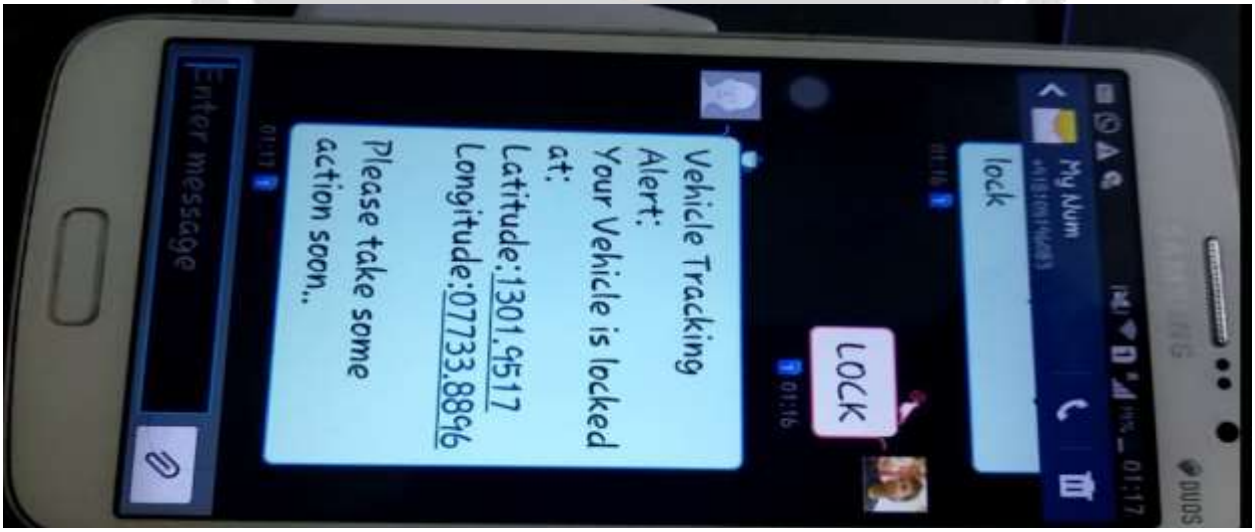


Fig -7: Engine lock notification with gps co-ordinates

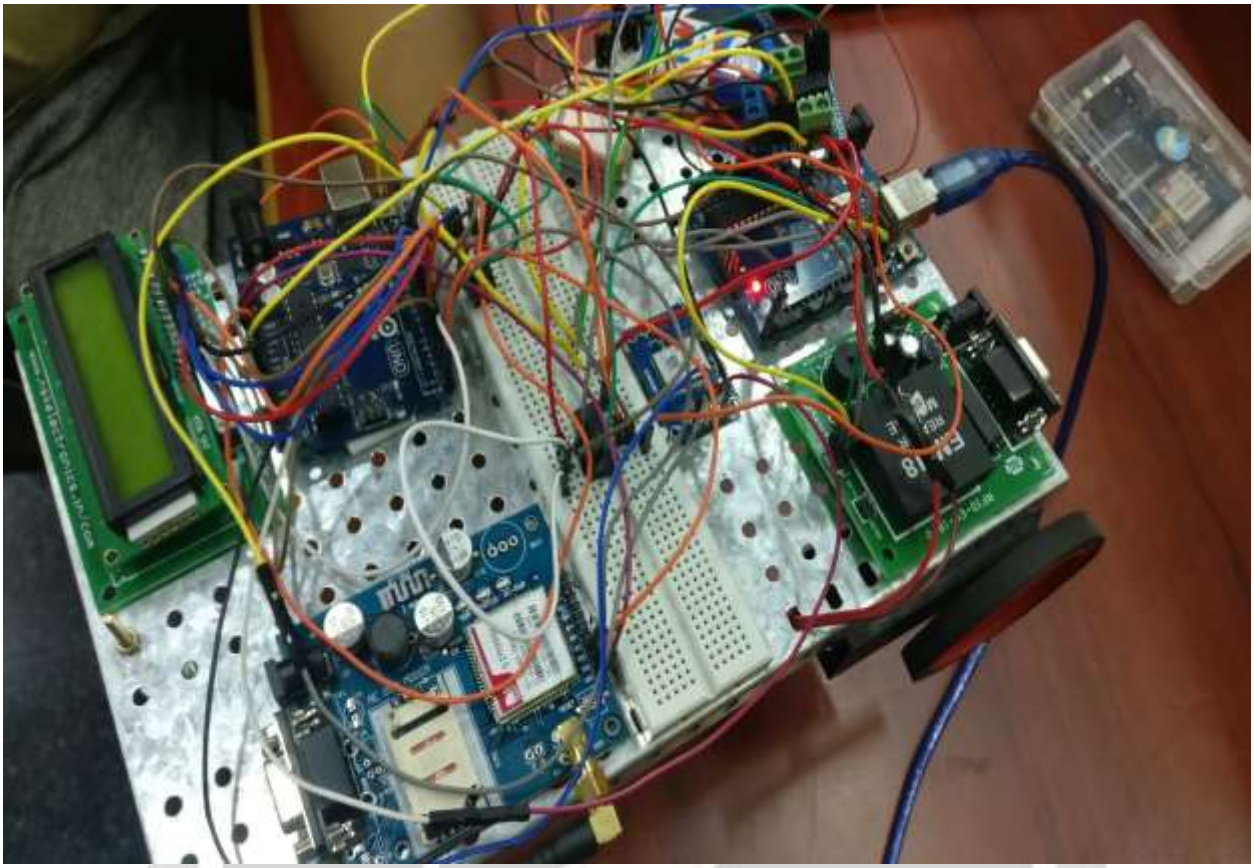


Fig -8: Final Prototype

4. ACKNOWLEDGEMENT

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5. REFERENCES

[1] Champa Bhagavathi.R, Gowri.B.R, Kasturi.R, Pooja.C "Vehicle Theft Detection and Prevention Using GSM & GPS", International Journal Innovative Research in Computer and Communication Engineering, vol.4, Issue 5, May 2016.

[2] Maheshwari V.Chandravar,Shital Y. Gaikwad "Anti-Theft Security System Using GSM,GPS &RFID Technology based on ARM7",Intrernational Journal of Engineering Research & Technology,vol.2,Issue 9,September 2013.

[3] Prof.R.M.Sahu , SonaliLole "Vehicle Theft Alert & Engine Lock System Using ARM7", IJARIIE , vol.3, Issue 3, 2017.

[4] Kunal Maurya , Mandeep Singh , Neelu Jain "Real Time Vehicle Tracking System using GSM &GPS Technology- An Anti-theft Tracking System", International Journal of Electronics and Computer Science Engineering, vol.1, number3, 2015

[5] The 8051 Microcontroller and Embedded Systems Using Assembly and C 2nd Edition, Kindle Edition by Muhammad Ali Mazidi (Author).