



Vehicle Locking Using Radio Frequency Identification with Theft Intimation and Smart Tracking System

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ABSTRACT: This paper presents the use of Radio Frequency Identification for locking the vehicle; along with vehicle theft intimation and smart tracking system. The present vehicle locking systems consists of; mechanical lock and key architecture or Remote Keyless Entry (RKE) architecture. The vehicle intruders can easily gain the access of the vehicle by duplicating keys, breaking mechanical locks and use radio frequency receivers with appropriate decryption algorithms in case of Remote Keyless Entry (RKE) architecture. Moreover, there isn't any provision for remotely communicating with the vehicle for tracing. The proposed system consists of using Unique Radio Frequency Identification cards along with password authorization for locking the vehicle. The driving license number issued by RTO's can be used for Unique Radio Frequency Identification along with password verification to unlock the vehicle and its ignition. Thus protecting the vehicle from intruders. Perhaps, this will also make the use of license mandatory to drive the vehicle. This project also involves a provision for theft intimation to the owner of the vehicle in the form of a call from the GSM module fixed in the vehicle. As soon as, the intruder will open the bonnet of the vehicle to start the ignition; which otherwise is not possible; the bonnet switch is open circuited and a call is initiated to the owners cellphone and GPS co-ordinates are continuously sent as SMS. Thus, vehicle's route can be easily traced on the Google maps.

KEYWORDS: AT- commands, Global Positioning System (GPS), GSM, Radio Frequency Identification (RFID)

I. INTRODUCTION

According to surveys by different organizations in India, it has been observed that vehicle thefts are sharply rising and the number of vehicles recovered is very less. These thefts are mainly because of failure of existing vehicle locking systems. Moreover, these vehicles do not have any provision to trace the vehicle which makes it quite difficult to recover. The following table clearly shows the statistics of the number of vehicles that were stolen and the number of vehicles been recovered. All these vehicles were the so called modern vehicles in India having sophisticated locking and alarming systems. It has been also observed that these stolen vehicles are also misused threatening the national security. Thus, we have come up with a project for securing the vehicle using Radio Frequency Identification cards and password authorization along with a provision for remotely communicating with the vehicle for tracking by using GPS and GSM technology.

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City	Two-wheelers		Motor cars/Jeeps		Buses		Trucks		Others		Total	
	Stolen (S)	Recovered (R)	S	R	S	R	S	R	S	R	S	R
Delhi	8,171	1,938	4,538	709	20	14	71	0	422	88	13,216	2,738
Mumbai	2,460	720	1,307	248	0	0	57	15	251	151	4,075	1,134
Kolkata	518	82	116	68	2	2	22	15	1	0	659	157
Chennai	168	152	60	37	0	0	10	10	25	25	263	224
Bangalore	4,616	1,142	383	139	6	1	17	8	68	62	5,090	1,352
Hyderabad	1,183	300	121	23	0	0	0	0	66	27	1,370	350

Fig.1. Table showing the survey of the number of vehicles stolen and recovered

II. PROPOSED SYSTEM

Proposed system consists of integration of different technologies to enhance the vehicle security. This system also opens a new horizon for remotely communicating with the vehicle.

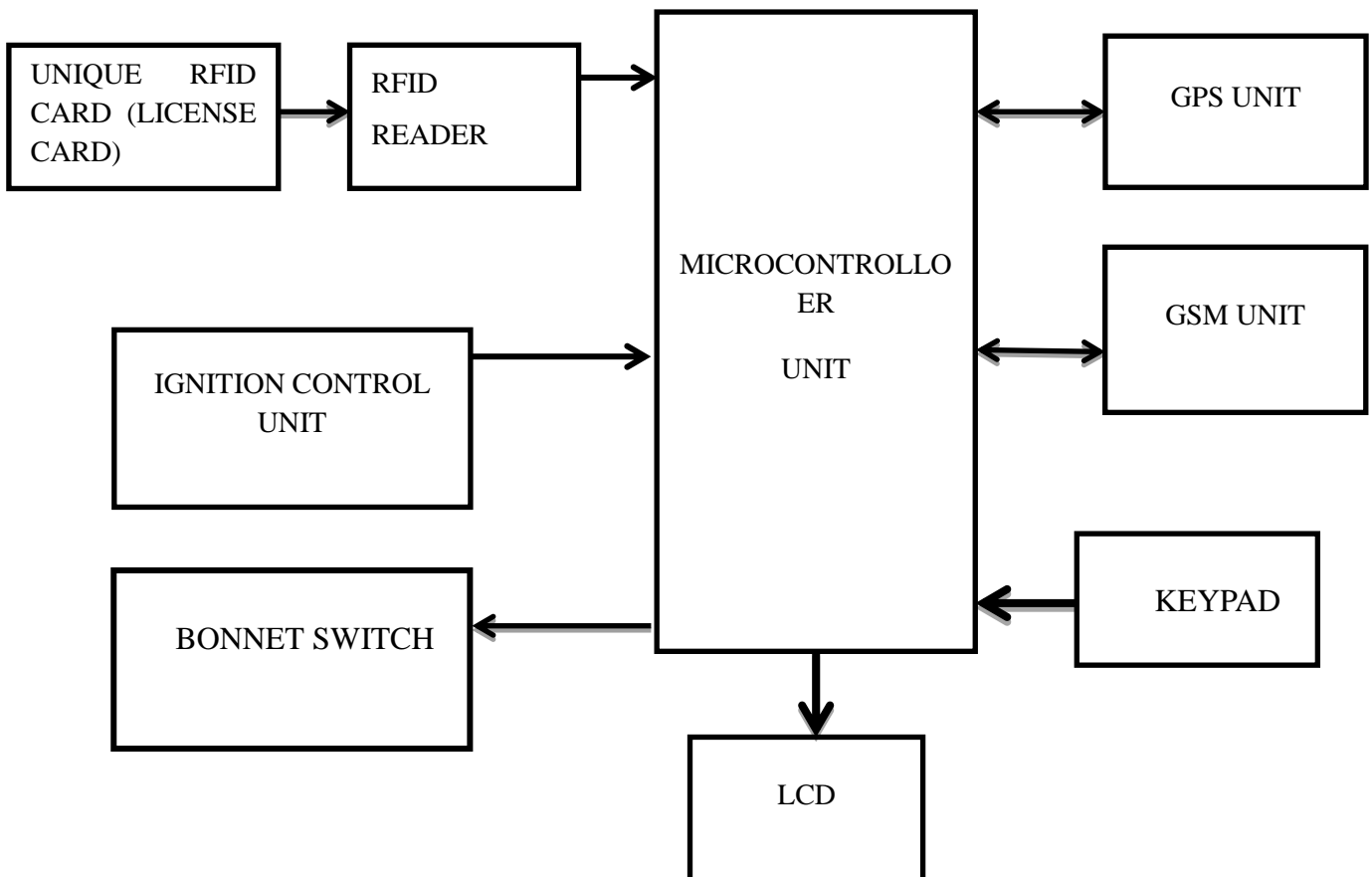


Fig.2. Block diagram of the proposed system

A. UNIQUE RFID CARD (LICENSE CARD) AND RFID CARD READER

When the RFID Card Reader is active and a valid RFID transponder tag is placed within range of the activated reader, the unique ID will be transmitted as a 12-byte printable ASCII string serially to the host microcontroller. This 12-byte code is a unique code which we propose to use as the license number of the owner so that the vehicle can be accessed only by the owner, enhancing the security of the vehicle and making the license compulsory to drive.

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Band	Regulations	Range	Data speed	Remarks
120–150 kHz (LF)	Unregulated	10 cm	Low	Animal identification, factory data collection
13.56 MHz (HF)	ISM band worldwide	10 cm - 1 m	Low to moderate	Smart cards
433 MHz (UHF)	Short Range Devices	1–100 m	Moderate	Defence applications, with active tags
865-868 MHz (Europe) 902-928 MHz (North America) UHF	ISM band	1–12 m	Moderate to high	EAN, various standards
2450-5800 MHz (microwave)	ISM band	1–2 m	High	802.11 WLAN, Bluetooth standards
3.1–10 GHz (microwave)	Ultra wide band	to 200 m	High	requires semi-active or active tags

Fig.3. RFID frequency bands

According to the data available in the table above the RFID cards in ISM band or unregulated band can be used for this application.

B. MICROCONTROLLER UNIT

Microcontroller unit forms the heart of the system. This unit is responsible for accepting the unique 12-bit RFID code from the RFID reader. The secret password can be entered through the keypad unit in the vehicle. This password is accepted by the microcontroller unit and verified for its authenticity. The Ignition Control Unit is activated only when the RFID code and password is exactly matched. If the intruder tries to open the bonnet of the vehicle by any means to turn on the vehicle; which otherwise is not possible; the bonnet switch goes active low and thus an interrupt signal is initiated and microcontroller sends an AT command “ATD” followed by the owner’s cell phone number to GSM unit and thus a call is initiated. This helps in vehicle theft intimation. The microcontroller unit also retrieves the latitude and longitude co-ordinates from the GPS module fixed in the vehicle and the same are sent to the owner’s cell phone number via SMS. By using GSM module in the vehicle unit, it is now possible to remotely communicate with the vehicle. Certain code words can be used to retrieve the information from the vehicle.

Code Word to be sent from owner’s cell phone	Response sent to the message from the GSM unit in Vehicle
1.Get GPS co-ordinates	Used to retrieve the Latitude and Longitude co-ordinates of the vehicle.
2.Change License and Password	For multi-user compatibility.

Fig.4. Table showing Different codes and its function.

C. GSM AND GPS UNIT

GSM module forms the basic unit to remotely communicate with the vehicle. GSM module receives SMS from the owner’s cell phone and notifies it to microcontroller. Depending on the message code the microcontroller performs the required operation. GPS module continuously notifies the microcontroller about the latitude and longitude coordinates with the NMEA protocol. If the message code is “Get Coordinates” GSM sends the latitude and longitude to the owner’s cell phone.

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Command	Response	Description
AT+CMGF= 0	OK	Specifies the input and output format of the short messages. 0 for PDU mode and 1 for text mode.
AT+CMGS		Sends a message.
AT+CMGR=* n		Reads a message. * is the number of the message.
ATD***** n		***** is the number to call.

Fig.5. AT commands used for GSM module

The National Marine Electronics Association ([NMEA](#)) has developed a specification that defines the interface between various pieces of marine electronic equipment. The standard permits marine electronics to send information to computers and to other marine equipment. GPS receiver communication is defined within this specification. Most computer programs that provide real time position information understand and expect data to be in NMEA format. This data includes the complete PVT (position, velocity, time) solution computed by the GPS receiver. The idea of NMEA is to send a line of data called a sentence that is totally self-contained and independent from other sentences. Each sentence begins with a '\$' and ends with a carriage return/line feed sequence and can be no longer than 80 characters of visible text (plus the line terminators)..

GLL - Geographic Latitude and Longitude

```
$GPGLL,4916.45,N,12311.12,W,225444,A,*1D
```

Where:

- GLL Geographic position, Latitude and Longitude
- 4916.46,N Latitude 49 deg. 16.45 min. North
- 12311.12,W Longitude 123 deg. 11.12 min. West
- 225444 Fix taken at 22:54:44 UTC
- A Data Active or V (void)
- *1D checksum data

D.VEHICLE IGNITION CONTROL UNIT

Vehicle ignition control unit consists of a relay. Relay is controlled by the microcontroller after the verification of RFID card and password. The spark plug which is used to ignite the fuel in the IC engine of the vehicle is powered only after the relay changes its state and the battery is connected to the spark plug after verification of the card and password. Therefore, vehicle cannot be started by the intruder and thus eventually enhancing the security of vehicle.

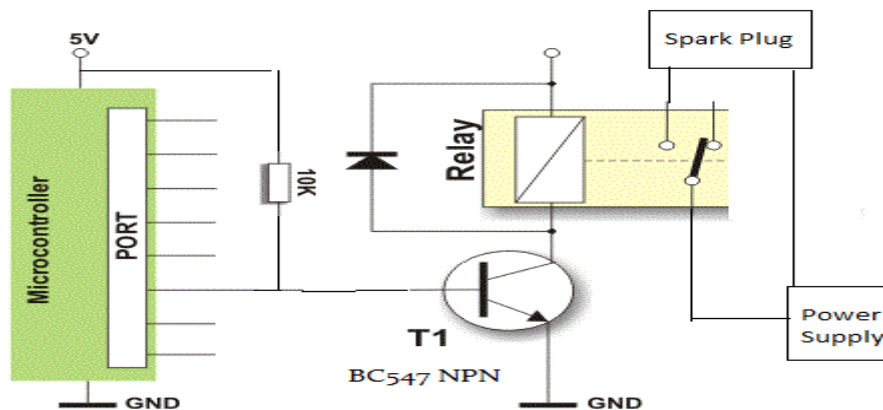


Fig.6. Vehicle Ignition Control using Relay circuit

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III. FLOWCHART OF PROPOSED SYSTEM

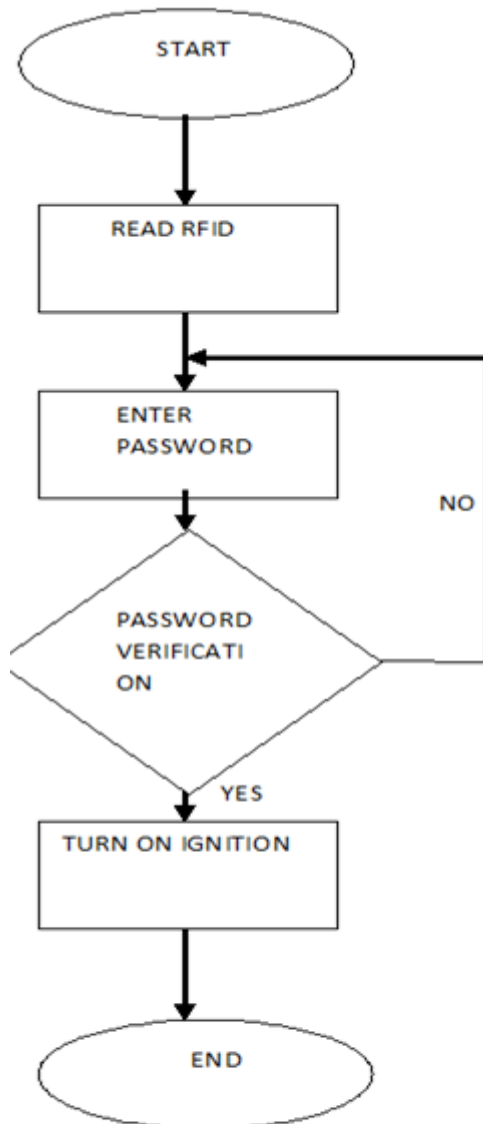


Fig.8.-Flowchart of ignition system

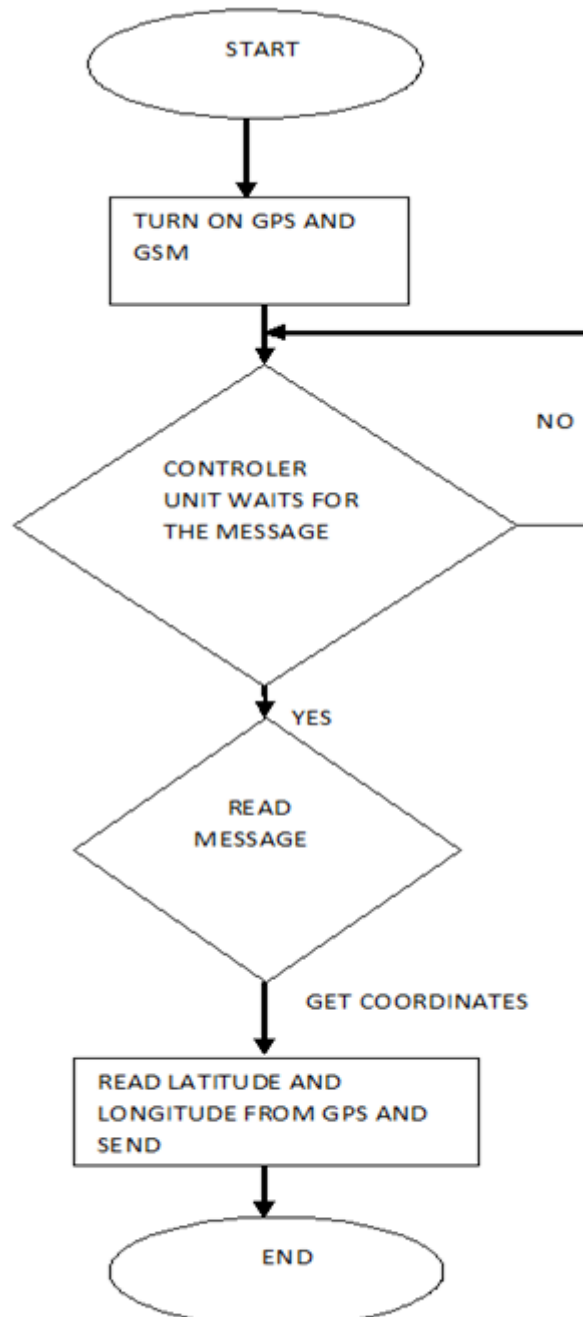


Fig.9. Flowchart of tracking system

IV. RESULTS

The below images show the actual working of our system. The access of the vehicle is granted only after the verification of the RFID card and correct password. Using our system we can remotely communicate with the vehicle.

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If vehicle is stolen we can trace it down using GSM and GPS modules. The coordinates received from GPS module can be plotted on Google maps and thus exact location of stolen vehicle will be known

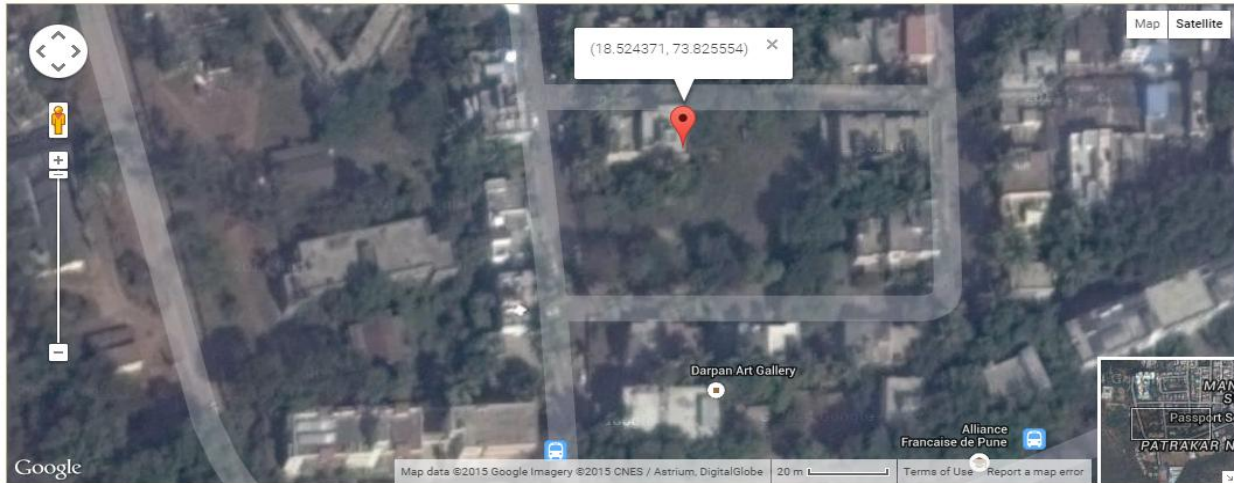


Fig.9. Figures showing the result of actual implementations

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Lat Long	GPS Coordinates	Map Mouse Over Location
(18.524371, 73.825554)	18° 31' 27.7356" N 73° 49' 31.9944" E	(18.524696, 73.824680)

Fig.10. GPS coordinates received and traced on Google Maps

Table I-Result Description

FIGURES	DESCRIPTION
Fig a	When system turned on it will tell to 'scan license'.
Fig b	When license is correct it will tell 'you can proceed'.
Fig c	After that we have to enter vehicle security code; therefore it will ask to 'enter password'.
Fig d	Password displayed. If password is correct then only vehicle ignition will be on.
Fig e	Shows password was incorrect.
Fig f	Latitude and longitude coordinates received after code 'Get Coordinates' was sent through user's mobile phone.
Fig 10	Shows coordinates traced on Google maps.

V.CONCLUSION

This approach described here presents a technique to prevent the vehicle theft by implementing Radio Frequency Identification and password verification. Since we are proposing to use driving license number for Radio Frequency identification; use of license will be mandatory while driving the vehicle. This system can also be used for tracking the vehicle by the owner at anytime from anywhere.

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