

# Location Based Locking System for Transportation

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## Abstract:

In the transportation of valuable materials, theft is very common in transit. Petroleum products are stolen from tankers by the people authorized to transport them. Question papers of examinations are sneaked out in transit before the examinations and leaked to the public. Milk, oil and other such products are diluted and adulterated while they are being transported. All these thefts happen only because the locking mechanism is designed in such a way as to provide the authority of entry to the person who has the key. Nothing can be done to prevent theft if the person with that authority is corrupt.

We are proposing a locking mechanism for transport vehicles carrying valued goods where the opening of the lock is triggered only by the complete fulfillment of three factors, namely, the presence of the locked entity in a geolocation fence, RFID authentication, the predefined password and authentication password from the owner or the authorized person.

**Keywords — Geolocation Fence ,Gps And Gsm, Rfid, Password.**

## I. INTRODUCTION

Currently, the transportation of rare and expensive materials is very prone to theft and tampering. Among them one such product is oil and petroleum products. In the present scenario, while transporting the oil and petroleum products we haven't installed any security system in the vehicle. So, it leads to the unauthorized access resulting in theft. Especially, in India there are many such cases which have been reporting under petroleum product thefts. On an average, 10,500 litres of petroleum products are stolen every day on the route from Baitalpur of India to Nepal Oil Corporation [1]. This is just one such example of petroleum theft which results in adulteration of petroleum products as well.

To solve this unpleasant scenario, we are implanting an advanced security system in the vehicle which is used for transportation of petroleum products. In our security system we are making use of both GPS and GSM technologies to avoid the intermediate access to the petroleum products during transportation. Implementation of Pressure sensor in the system which helps to detect the unauthorized access during transportation. To provide additional security we are implementing Keypad. Thus, the security system eliminates the human intervention while transportation and is capable of being accessed only at the source or the destination. Further if any malpractice takes place during transportation,

FRS(Force Sensitive Resistor) pressure sensor[2] is incorporated to detect external pressure and a message is sent to the owner.

Hence, the Location Based Locking System provides an additional layer of security unmatched by other present security systems. Here, the container in the vehicle can only be accessed at a particular location which is predefined. Additionally, RFID authentication, keypad is also present to obtain a pass-code from the person trying to open the container along with an authentication password from the owner through GSM. This system can also be used into other security systems, to provide this added advantage.

## II. OBJECTIVE

The aim and objective of this project is to design and implement a microcontroller based GPS/GSM based advanced security system which will always keep track of vehicle during transportation. System provides the access to the products in the vehicle after authenticating different levels of security.

## III. PROPOSED SYSTEM

Proposed system makes use of GPS & GSM module to keep track of vehicle's geo-location information.

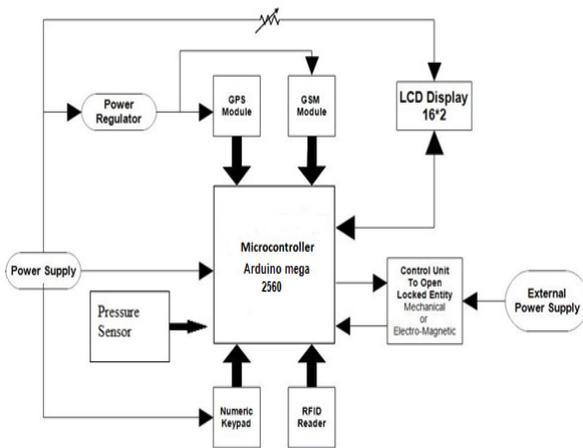


Fig.1 functional block diagram

Fig.1 shows the basic components of location based locker. The location based locker requires a GPS module which gives out the current location, altitude and direction of the locked entity which is carrying the items to be delivered. The system which also uses the GSM Module which communicates the sender and receiver through messages.

When the container gets dispatched from the source, the data which is coming from the gps is compared with a pre-defined dataset to decide whether to move over to the next step of authentication. The processing of the entire system is carried out in a microcontroller, which receives serial data and processes it in synchronization with the GPS module which is in use.

The above setup frames the primary layer of security, while a secondary layer of security is provided by entering the password using a keypad, RFID authentication which is to be authenticated by the system to provide access. The pressure sensor used in this work senses any external force to open the container during transportation and sends a message to the owner to know about it. To implement our design, we use Arduino Mega 2560 microcontroller, GPS module (M-39), FSR pressure sensor, a simple keypad and other required components compatible with the microcontroller.

#### A. Hardware Requirements

1. Microcontroller-Arduino Mega 2560[3]
2. GPS Module[4]
3. GSM Module[5]
4. 16x2 Alpha Numeric LCD[6]
5. FSR pressure sensor[2]
6. DC Motor Driver IC(L293d)[7]
7. RFID Reader[8]
8. 4x4 Keypad
9. Battery

#### B. Software requirements

- A. Arduino ide
- B. Hyper terminals

#### C. System Description

Fig.1 shows the block diagram of the system used in the project. The microcontroller Arduino Mega 2560 acts as a central processing unit and all the other hardware modules are connected to it. The microcontroller controls the modules by sending suitable control signals. GPS Receiver is used to get the GPS Data strings from the GPS satellites which contains information of about 800 bytes. Apart from which microcontroller fetches only the information of latitude and longitude which are under the string \$GPGGA. GSM Modem used is sim300A which supports voice call and data services. This is used to achieve communication with the system for both sender and receiver. RFID Reader is used to read the encoded data on the RFID tag and sends it to the micro-controller for further processing.

The GPS module sends the location, altitude and direction parameters of the locked entity to the Arduino Mega. The microcontroller checks if the received data lies inside a predefined threshold region centered at a precise location, and if true, it provides access to the user to enter password using a 4x4 matrix keypad and allows the owner to send authentication password. If the user password and the authentication password matches with the predefined password, the microcontroller generates control signals to open the lock and provide access to the container. An LCD is used to provide required information to the user to access its functionalities. In case of any malpractice during transportation or if the container is tampered in any other location the FRS pressure sensor used will sense the applied pressure and sends signals to the microcontroller to send message to the user. RFID authentication is used to authenticate valid user. So, only valid user can get access to the system. If this fails then user could't able to get into the system which helps to avoid unauthorized access.

#### c. Working model

Fig.2 and fig.3 shows working model of proposed system.



Fig.2:complete working model Fig.3:working model

#### d. Logical Flow Diagram

The code for the working of location based locking system for transportation has been written based on the logic presented in the flowchart shown in Fig.4

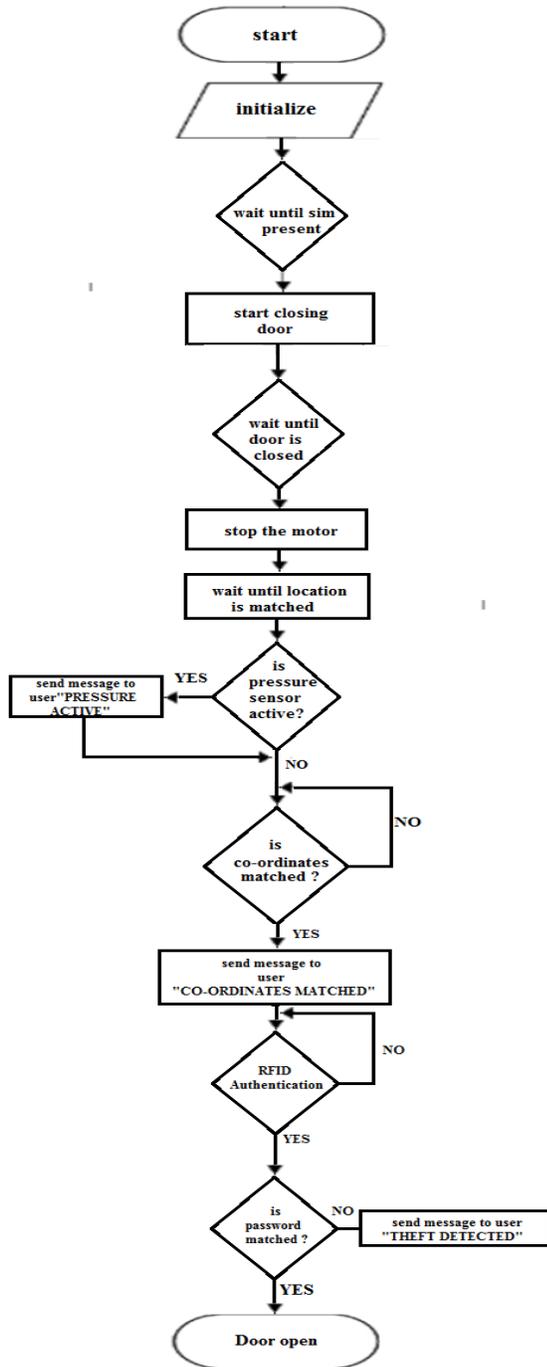


Fig.4: Logical flow diagram

e. Experimental Results

The experiment was carried out in various locations around the SJCE campus. The latitude and longitude information obtained at Ganesha Temple are shown in the Fig.5 and Fig.6.



Fig.5

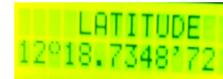


Fig.6

Fig.4 shows the result status after comparing the co-ordinates with stored data. When current and stored co-ordinates match each other then controller displays the status "co-ordinates matched".



Fig.7



Fig.8

Fig.5 shows the pressure active status when external pressure is applied. The pressure sensor is activated after initialising the system. The external pressure is checked at every instant of time till the system reaches the end of the program. Meanwhile, if any pressure is detected it sends pressure active information to the sender which helps to avoid theft/tampering during transit.

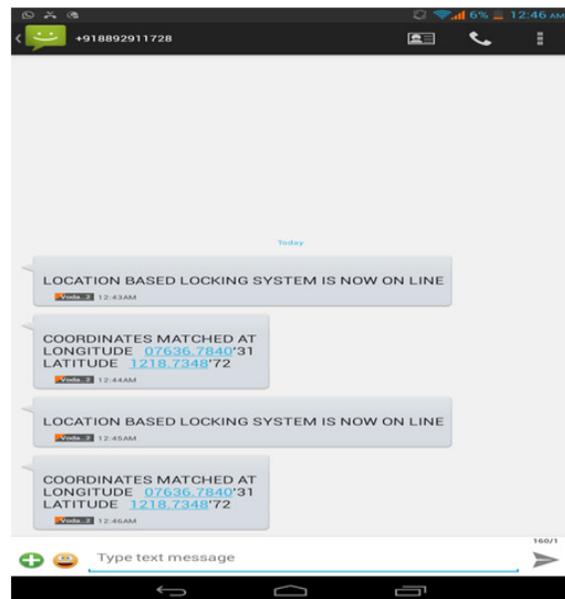


Fig.9

Fig.6 shows the GSM communication through messages. When GPS current co-ordinates matches with the

stored co-ordinates GSM sends Those co-ordinate values to the sender via SMS.

#### **f. Applications**

The location based locking system finds its applications in the present transportation scenario. This system is highly versatile and can be integrated into any other system at a low cost and to improve its existing security. It can be used for the following:

1. Oil and petroleum transportation.
2. Milk transportation vehicles.
3. Couriers.
4. Transportation of currency between banks.
5. Transportation of confidential government and company documents.
6. Transportation of nuclear (radioactive) materials.
7. Military and defense applications.

#### **g. Future Enhancements**

In the project, GPS receiver skg13c is used to track a vehicle but it gives the GPS fixed data information practically by using 5 to 21 satellites only. So, there was a chance of getting no signal for brief period of time which is undesirable to the system performance. Hence, high precision, higher capacity GPS receivers are preferable in practical systems. Those receivers gives GPS information by make use of some minimum of 65 satellites which reduces the chance of signal loss. In this project, both sender and receiver gets the information of transported goods via sms using GSM modem. If GSM goes out of coverage area then there would be no more communication is possible results in system failure. So, to overcome this some special network facility has to be provided particularly for these kind of systems in order to avoid the GSM to go out of coverage.

### **IV. CONCLUSIONS**

In the transportation of valuable materials, theft is very common in transit. One best example is adulteration of petroleum products which incurs loss to Oil and Petroleum companies. This is greatly undesirable for developing countries like India which indirectly affects the countries economic growth. In the same sense when we are transporting some confidential products, security is of prime importance. Current system wouldn't have such facilities. So, our project will full the requirements by providing necessary security while transit.

The implementation of GPS/GSM Based Advanced Security System uses a Arduino Mega 2560. The project has many applications for the many transportation systems because it provides the security for each transporting material. The cost of implementing the projects is void. This can be utilized in various fields including military, hospitals, banking, oil and

petroleum transportation. This project has the potential to adapt to existing system without many requirements.

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