High security tollgate system and vehicle anti theft control and vehicle locating system based on GSM and GPS

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Abstract— There are huge amount of vehicles passing through Toll Gate Stations every day. The automatic toll booth would pay the toll automatically. In this system camera is used for capturing the image of the vehicles number plate. The captured image would be converted into the text using ANPR and the toll would be cut from the user’s account and then the gate is opened. The system is divided into the design of three modules, Vehicle Module and the Central Database Module, Tollgate station. The three modules communicate via GSM modem connected to each module, stolen vehicle are also identified and alarm would be buzzed. For the identification of the vehicles, the information of the vehicles is already stored on the central database. Data information is also easily exchanged between the motorists and toll authorities, There by enabling a more efficient toll collection by reducing traffic. Currently almost of the public having an own vehicle, theft is happening on parking and sometimes driving insecurity places. Vehicle tracking and locking system installed in the vehicle, to track the place and locking engine motor. The place of the vehicle identified using Global Positioning system (GPS) and Global system mobile communication (GSM). These systems constantly watch a moving Vehicle and report the status on demand. When the theft identified, the responsible person send SMS to the microcontroller, then microcontroller issue the control signals to stop the engine motor. Authorized person need to send the password to controller to restart the vehicle and open the door. This is more secured, reliable and low cost.

Index Terms— Vehicle Tracking, Locking, Microcontroller, GPS, GSM, OCR, ANPR, HSRP, AVC.

I. Introduction

Electronic toll collection system is a technology enabling the automated collection of toll payments from the user. The purpose of the automatic toll booth is collecting the toll according to vehicles and builds the real time application which recognizes vehicles [1] licenses number plate at entry gate. Automatic toll collection is considered as one of the intelligent transport systems. It is aimed at making toll taxation more efficient, reliable, and safe and environment friendly. In the past, customer would have to wait at the toll booth to pay the collector, creating traffic congestion, pollution and of course of a lot of frustration.

Today Automatic toll collection successfully removes unnecessary traffic delays; keep track of on any car that might not be correctly registered and also find the stolen vehicle. This automatic system used the technology of ANPR. The development of satellite communication
technology is easy to identify the vehicle locations. Vehicle tracking systems have brought this technology to the day-to-day life of the common person. Today GPS used in cars, ambulances, fleets and police vehicles are common sights on the roads of developed countries.

All the existing technology support tracking the vehicle place and status. The GPS/GSM Based System is one of the most important systems, which integrate both GSM and GPS technologies. It is necessary due to the many of applications of both GSM and GPS systems and the wide usage of them by millions of people throughout the world [1]. This system designed for users in land construction and transport business, provides real-time information such as location, speed and expected arrival time of the user is moving vehicles in a concise and easy-to-read format. This system may also useful for communication process among the two points.

Currently GPS vehicle tracking ensures their safety as travelling. This vehicle tracking system found in clients vehicles as a theft prevention and rescue device. Vehicle owner or Police follow the signal emitted by the tracking system to locate a robbed vehicle in parallel the stolen vehicle engine speed going to decreased and pushed to off. After switch of the engine, motor cannot restart without permission of password.

This system installed for the four wheelers, Vehicle tracking usually used in navy operators for navy management functions, routing, send off, on board information and security. The applications include monitoring driving performance of a parent with a teen driver. Vehicle tracking systems accepted in consumer vehicles as a theft prevention and retrieval device. If the theft identified, the system sends the SMS to the vehicle owner. After that vehicle owner sends the SMS to the controller, issue the necessary signals to stop the motor. In this paper, the reviewed related technology in section 3. The vehicle tracking and locking systems

II. High Security Number Plates Registration India 2014

The New Age Number Plates [10] which are non breakable and built on 1mm thick aluminium sheet having 7 digit lasers imposed unique code with a Chakra image having 'Ind' - depicting India on left side along with non removable snap lock. High Security Plates are meant to curb thefts of car. As of now, it’s easy to change the number plate of the car by the anti-social elements and drive it easily in inter-state But, when this high security plates will come into existence, it will be almost impossible to change number plate as these high security plates comes with snap lock and any tampering will lead to breakage failing any number plate to remain affix on the car. The major benefit is hence - these high security plates will end up identifying the stolen cars - as in absence of change of registration plate, it would be quiet difficult for running a stolen car.

This HSRP number plate will be fixed using Non Re-Usage Snap Lock system to prevent theft. HSRP also will come with Hologram Sticker. These registration plates will be fixed in RTO Office and there are no independent agencies or brokers who can affix this. The HSRP rule should overcome the theft of vehicles, because the Non Re-Usage Snap Lock System is used and there is no chance for the morphing of an illegal number plate.

System Design

The System design can be highly reliable and the system architecture can record the image and recognize it. And the OTP module can be capable of using the login session with security for the toll operators. And the toll operating software uses the TTV for high security.

1 System Architecture

The process starts when a sensor detects the entrance of a vehicle and signals the camera to capture an image of the vehicle. The image is passed on to a computer where software running,
on the computer extracts the license plate number from the image. LPN [1] (License plate number) can then be verified in a central database. If number valid for this system then LPN recorded in a database with other information such as vehicle number, time, balance, personal details. The licence number is used to open the toll gate.

![Fig 2: Structure of the system [1]](image)

The Fig 2 [1] illustrate the overall system architecture in which the vehicle can enters the toll gate at that time the sensors are activated and the license number plate are recognized then the processing of an vehicle classification are carried out and the recognized number plate image are verified in the database for the stolen vehicle identification using the syntax rules. Then the account of a user is updated with the current details.

2 High Resolution Camera Usage in ANPR

It captures the license plates flawlessly in any weather condition in even the dark night and up to speeds of 120 mph.

![Fig 3- High resolution camera](image)

The Fig 3 [1] illustrate the high resolution camera which can capable of take an image even in rainy dark night and the clarity are high compared to normal cameras.
3 Rules For Indian Number Plate
The Indian number plates following the new format can be off lengths 8, 9 or 10. Format of the registration [1] is as shown below. AA 11 BB 1111 Where AA is the two letter state code; 11 is the two digit district code; 1111 is the unique license plate number and BB are the optional alphabets if the 9999 numbers are used up.

4 One Time Password Security
In this system as toll operator point of view provide OTP system. OTP is a password that is valid for only one login session. OTP generation algorithms make use of randomness. It can provide the security for the toll workers to enter their private details with separate ID and password, any toll workers knows ID and password but when enter the private details for login then generate OTP and send to the toll operator register mobile and then login with OTP, ID and password if all details are valid and correct then only login to the toll system.

5 Toll Operating Software
When vehicle enter in the toll booth then toll software automatically start its process first by using the sensor. This application firstly recognizes vehicle licence plate number then check if number is valid then using TTV (text to voice) read the vehicle number in a speaker for driver confirmation. Also check the balance in customer account and at the same time check licence number in police database to identify the vehicle is a stolen vehicle. The TTV can read the number using the speaker which has presented in the recognized number plate it does can be done for the user’s verification, of their number plate. And provide the high security feature.

6 Database Maintainance with RTO and Police Databases
The central database or main database is the heart of the whole database maintenance. Admin database contains details of central database administrator and also the details of all toll station under Construction Company. Centralized database consist record of all toll plazas under that specific construction company. This central database will be maintained by a central administrator.

The User or the Customer has to be registered for this account to use this system. This user information is stored along with the RTO database. When the registered customer will pass through the specified toll plazas then automatically toll will deducted from customer’s account. And Central database will update with this current information at a same time it includes the details of a present toll amount are added to the previous toll details. After toll amount applied to the vehicle, the customer will receive the sms using GSM modem. The customer can capable of see all their transactions on his email account.

Fig 4- Database view with multiple tolls
United database connected to the main database or the central database of the system. United database consist of Police database and RTO database. Police database contains all stolen vehicle records with their FIR number. This database will update automatically during every process. RTO database is maintained by RTO office and it encompasses all registered vehicles details like vehicle owner, vehicle number, licence number, account ID, account balance, current charges, etc. Retrieve the vehicle information from RTO Database and during recognition of a vehicle number plate it will match with customer database and police database. If the vehicle number plate is valid and also find it’s an original vehicle of an owner not a stolen one, then automatically the toll is deducted from user’s account and the sms intimation is carried out for the user verification. All these user’s records are maintained at appropriate toll station and main database of toll construction Company. And these details can be seen by the toll operator by using the account ID, Customers name or number of the vehicle. All toll station records stored at central server and these details could be seen and will be printed at anytime based on the user needs.

III. vehicle locating system Proposed Method
In this proposed work, a novel method of vehicle tracking and locking system used to track the theft vehicle by using GPS and GSM technology. This system puts into sleeping mode while the vehicle handled by the owner or authorized person otherwise goes to active mode, the mode of operation changed by in person or remotely. If any interruption occurred in any side of the door, then the IR sensor senses the signals and SMS sends to the microcontroller. The controller issues the message about the place of the vehicle to the car owner or authorized person. When send SMS to the controller, issues the control signals to the engine motor. Engine motor speeds are gradually decreases and come to the off place. After that all the doors locked. To open the door or restart the engine, authorized person needs to enter the passwords. In this method, tracking of vehicle place easy and doors locked automatically, thereby thief cannot get away from the car.

3.1 Block Diagram
The Block diagram of Vehicle tracking and locking system based on GSM and GPS technology is shown in the figure1. It consists the power supply section, keyboard, GSM, GPS, microcontroller, MAX232driver, relay driver, IR Transmitter, IR receiver, LCD and doorlocker. The GSM board has a valid SIM card with a sufficient recharge amount to make outgoing calls. The circuits powered by +5v Dc.

![Block diagram of Vehicle tracking and locking system based on GSM and GPS](image-url)
Circuit Descriptions
The power supply section is very important for all electronic circuits. The 230V, 50Hz AC mains is stepped down by transformer X1 to deliver a secondary output of 12V, 500 mA. The transformer output is rectified by a full-wave rectifier comprising diodes D1 through D4, filtered by capacitor C1 and regulated by ICs 7812 (IC2) and 7805 (IC3). Capacitor C2 bypasses the ripples present in the regulated supply. LED1 acts as the power indicator and R1 limits the current through LED1.

3.3 GPS Technology
The Global Positioning System (GPS) is a satellite-based navigation system consists of a network of 24 satellites located into orbit. The system provides essential information to military, civil and commercial users around the world and which is freely accessible to anyone with a GPS receiver. GPS works in any weather circumstances at anywhere in the world. Normally no subscription fees or system charges to utilize GPS. A GPS receiver must be locked on to the signal of at least three satellites to estimate 2D position (latitude and longitude) and track movement. With four or more satellites in sight, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the vehicle position has been determined, the GPS unit can determine other information like, speed, distance to destination, time and other. GPS receiver is used for this research work to detect the vehicle location and provide information to responsible person through GSM technology.

3.4 GSM Modem SIM300 V7.03
The GSM modem is a specialized type of modem which accepts a SIM card operates on a subscriber’s mobile number over a network, just like a cellular phone. It is a cell phone without display. Modem sim300 is a tri-band GSM/GPRS engine that works on EGSM900MHz, DCS1800MHz and PCS1900MHz frequencies. GSM Modem is RS232-logic level compatible, i.e., it takes -3v to -15v as logic high and +3v to +15 as logic low. MAX232 is used to convert TTL into RS232 logic level converter used between the microcontroller and the GSM board. The signal at pin 11 of the microcontroller is sent to the GSM modem through pin 11 of max232. this signal is received at pin2 (RX) of the GSM modem. The GSM modem transmits the signal from pin3 (TX) to the microcontroller through MAX232, which is received at pin 10 of IC1 [9].

Features of GSM
- Single supply voltage 3.2v-4.5v
- Typical power consumption in SLEEP Mode: 2.5mA.
- SIM300 tri-band
- MT, MO, CB, text and PDU mode, SMS storage: SIM card
- Supported SIM Card: 1.8V, 3V
IV. Conclusion

In this paper, Thus a system for Electronic Toll Collection system for efficient traffic control system using ANPR [1] based on Indian Condition which is highly reliable and also achieves high security. And this system can remove the traffic congestion by analysing the traffic prior, and it can be used to remove all drawbacks with doesn’t require any tag only required best quality camera and fixed font number plate with condition of HSRP we have proposed a novel method of vehicle tracking and locking systems used to track the theft vehicle by using GPS and GSM technology. This system puts into the sleeping mode vehicle handled by the owner or authorized persons; otherwise goes to active mode. The mode of operations changed by persons or remotely. When the theft identified, the responsible people send SMS to the micro controller, then issue the control signals to stop the engine motor. After that all the doors locked. To open the doors or to restart the engine authorized person needs to enter the passwords. In this method, easily track the vehicle place and doors locked.

V. References


