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Advanced Driver Scrutiny System

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Abstract: ***Today due to rapid increase in vehicles, there is an exponential increase in crime and accidents hence it has become challenge for governments to limit such crimes especially from professional thieves. This paper proposes designing and development of anti-theft as well as driver surveillance embedded system that uses biometric authentication to access the vehicle. This system contains camera which take the fingerprint of a person trying to get access of vehicle and compare with authorized fingerprints in server and then allowing or denying access. In the case of denial of vehicle access, notification is sent to admin reporting the unauthorized access. Camera will capture the images of the number plate and check for the lapsed data, fine is deducted if any lapsed data is present from the linked account. This will help to catch thieves, also allows the government to monitor vehicle information. The recent work on proposed system is written in this paper.***
Proposed system is conceptually simple, providing low cost less complex, highly reliable and most importantly user friendly to implement as well as easy handling for a lay man. The system is designed and developed using raspberry pi, high resolution camera, finger print sensor and open source software.
Keywords: Raspberry pi 3; Raspbian camera; vehicle security-alert; SMS; driver surveillance and alert, optical character recognition.

I. INTRODUCTION

In biometric authentication-based vehicle door locking system, the biometric authentication plays an important role to provide high security. Nowadays security is very important in order to keep our data confidentially from unauthorized persons. The main aim of this paper is to protect the car from unauthorized people by using the unique id that is finger print authentication. At the place of car door locking system, the finger print scanner is placed to lock and unlock the doors in place of the conventional door locking system. Which gives more protection to the car owner. The entire system is controlled by the Raspberry pi 3 processor. Optical character recognition (OCR) which plays chief role in automatic number plate recognition is among the main aspect of research in artificial intelligence and computer vision and have evolved greatly since its inception. In the recent past, rapid population growth led to a blast in multiplicity of vehicles which make use of the intelligent traffic control highly demanded. This requires extremely strong license plate recognition methods, presenting super-fast results while maintaining its best performance in so many different applications as exuberance of vehicles grows rapidly. They can form the bases for automatic systems steering the access to protected areas, e.g., a car park, route traffic monitoring systems, offences, and crimes on public routes. Extraction of license plate regions out of vehicle images is a challenging task for they are extremely varied in size, shape, color, texture, and spatial orientations of license plate regions in such images. Besides, some additional problems may occur during the recognition procedure along with the above mentioned difficulties such as similar shapes to license plates, bumper stickers, and cluttered backgrounds.
Our VLP Recognition system was based on the following model:

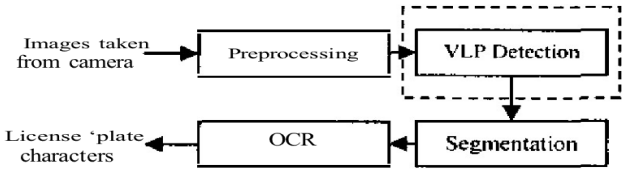


Fig 1. An automatic vehicles' license plates Recognition system

Web services are moving towards mobile world as a new emerging technology for applications communication. Mobile devices can operate as service consumers or service providers. Most approaches nowadays support consuming web services from mobile devices. This paper introduces a new architecture called “Web-based SMS Passenger Application” for providing mobile web services for web applications. In this paper, we proposed a news alert SMS system that distinguishes itself in the aforementioned two points; it is free and novel in that SMS alerts are sent whenever a predefined event is triggered.
The rest of the paper is organized as follows: Section II contains System design, Section III comprises of methodology and Section IV comprises of Applications and Section V comprises of Applications Conclusion.

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II. SYSTEM DESIGN

A. Hardware Design

The block diagram of Raspberry pi and biometric authentication-based vehicle door locking system is shown in Figure-1, have following units, which includes

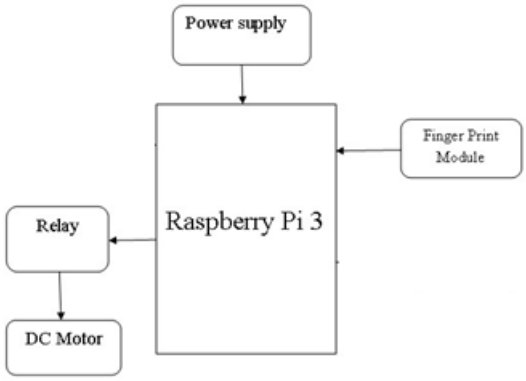


Fig 2. The block diagram of Raspberry pi and biometric authentication-based vehicle door locking system

1) *Finger Print Module:* The fingerprints for matching purposes generally require the comparison of several features of the print pattern. These include patterns, which are aggregate characteristics of ridges, and minutia points, which are unique features found within the patterns. It is also necessary to know the structure and properties of human skin in order to successfully employ some of the imaging technologies. (The USB 4500Reader is an elegant, powerful fingerprint identity machine. With an Executive-class look and feel, the USB 4500Reader is perfect for power users and Shared environments. Its design is sleek and compact to conserve valuable desk space but it stays right where you put it because of its nice heft and special undercoating. Operating System Windows Connectivity Type Wired Body Material ABS Model No. U ARE U 4500 Operating Temperature 0 to +45 Degree Celsius)



Fig 3. Fingerprint Scanner

2) *Raspberry Pi 3 Processor:* The raspberry pi is a shape of rectangular and small size. The Function of Raspberry Pi is almost equivalent to PC. Raspberry pi is a portable size of computer board. Raspberry Pi has built in software that is Scratch which enables user to program and design animation, game or video. In addition, programmers can also develop programming by using Python language, it is main core language in Raspbian operating system. Raspberry Pi 3 is evolution of Raspberry pi 2 with additional Ethernet option. In the present work Raspberry pi 3 is used for wireless communication.
3) *DC Motor:* A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. (High Torque Rated Voltage Current: DC 12V Speed: 5000 RPM Motor Shaft Diameter: 3.17mm Mounting package comes in different package quantity select as per your need. Diameter of the Motor: 36mm Length of the Motor (Body): 50mm Length of Shaft: 16mm)

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Fig 4. DC motor

B. Sofware Design

1) Navicat for MySQL Database: Navicat for MySQL is the ideal solution for MySQL/MariaDB administration and development. It is a single application that allows you to connect to MySQL and MariaDB databases simultaneously. Compatible with cloud databases Amazon RDS, Amazon Aurora, Oracle Cloud, Google Cloud, Microsoft Azure, Alibaba Cloud, Tencent Cloud and Huawei Cloud. This all-inclusive frontend provides an intuitive and powerful graphical interface for database management, development, and maintenance.

Features:

a) Seamless Data Migration: Data Transfer, Data Synchronization and Structure Synchronization help you migrate your data easier and faster for less overhead. Compare and synchronize databases with Data and Structure Synchronization. Set up and deploy the comparisons in seconds, and get the detailed script to specify the changes you want to execute.

b) Diversified Manipulation Tool: Use Import Wizard to transfer data into a database from diverse formats, or from ODBC after setting up a data source connection. Export data from tables, views, or query results to formats like Excel, Access, CSV and more.

c) Easy SQL Editing: Visual SQL Builder will help you create, edit and run SQL statements without having to worry about syntax and proper usage of commands.

d) Advanced Secure Connection: Establish secure connections through SSH Tunnelling and SSL ensure every connection is secure, stable, and reliable. Support different authentication methods of database servers such as PAM authentication.

2) Apache Tomcat Server: The Apache Tomcat® software is an open source implementation of the Java Servlet, Java Server Pages, Java Expression Language and Java WebSocket technologies. The Java Servlet, Java Server Pages, Java Expression Language and Java WebSocket specifications are developed under the Java Community Process. Apache Tomcat, often referred to as Tomcat Server, is an open-source Java Servlet Container developed by the Apache Software Foundation (ASF). Tomcat implements several Java EE specifications including Java Servlet, Java Server Pages (JSP), Java EL, and WebSocket, and provides a "pure Java" HTTP web server environment in which Java code can run.

Tomcat is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation, released under the Apache License 2.0 license, and is open-source software.

Features:

Tomcat 7.x implements the Servlet 3.0 and JSP 2.2 specifications. It requires Java version 1.6, although previous versions have run on Java 1.1 through 1.5. Versions 5 through 6 saw improvements in garbage collection, JSP parsing, performance and scalability. Native wrappers, known as "Tomcat Native", are available for Microsoft Windows and UNIX for platform integration.

3) *Tessaract:* Tesseract package contains an OCR engine - libtesseract and a command line program - tesseract. The lead developer is Ray Smith. Tesseract has unicode (UTF-8) support, and can recognize more than 100 languages "out of the box". It can be trained to recognize other languages. Tesseract supports various output formats: plain-text, hocr(html), pdf. [13] The Tesseract engine was originally developed as proprietary software at Hewlett Packard labs in Bristol, England and Greeley, Colorado between 1985 and 1994, with some more changes made in 1996 to port to Windows, and some migration from C to C++ in 1998. A lot of the code was written in C, and then some more was written in C++. Since then all the code has been converted to at least compile with a C++ compiler. [14] Tesseract is available for Linux, Windows and Mac OS X, however, due to limited resources only Windows and Ubuntu are rigorously tested by developers. Tesseract up to and including version 2 could only accept TIFF images of simple one column text as inputs. These early versions did not include layout analysis and so inputting multi-columned text, images, or equations produced a garbled output. Since version 3.00 Tesseract has supported output text formatting, hOCR positional information and page layout analysis. Tesseract can detect whether text is monospaced or

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proportional. The initial versions of Tesseract could only recognize English language text. V3.04, released in July 2015, added an additional 39 language/script combinations, bringing the total count of support languages to over 100. Tesseract can be trained to work in other languages too. Tesseract is suitable for use as a backend, and can be used for more complicated OCR tasks including layout analysis by using a frontend such as OCRopus. In this project, Tesseract is used as the final step for OCR after the image has been sufficiently processed so as to get optimum output

III. METHODOLOGY

A. *Biometric Authentication*

Fingerprint Identification System: Fingerprint Identification Systems consists generally of two processes. Enrolment process consists of saving the fingerprints corresponding to different users and authentication process that compares the input fingerprint with the stored one.

1) *Enrolment Process:* This process consists of taking a person's fingerprint using a fingerprint capturing device. During this process, the system stores the persons' fingerprint into a database. The following figure illustrates the enrolment process.
2) *Authentication Process:* This process permits to authenticate the claimed person. This process consists of comparing a captured fingerprint from the device to stored fingerprint obtained in the enrolment process. The figure below shows the authentication process. Centralized database Administrator (RTO server Admin) One of the main parts in the proposed system is RTO Admin which scan all documents of the user and stored on RTO cloud server in encrypted form and gives the one specific user id and password to particular citizens. Admin also adds the expiry date of particular user documents.
3) *Centralized Database Administrator (RTO server Admin):* One of the main parts in the proposed system is RTO Admin which scan all documents of the user and stored on RTO cloud server in encrypted form and gives the one specific user id and password to particular citizens. Admin also adds the expiry date of particular user documents.

When thumb (finger) is placed on the finger print scanner, the scanner checks whether the connect finger is placed or not, if matches perfectly with finger print data which is already stored, the relay is open and then all the doors of car will automatically unlock. If not matched perfectly, then the relay does not activate and the corresponding owner will receive message as unauthorised person is trying to open the lock. The servo motor is connected to the relay. When the relay is opened then the connected servo motor starts to rotate. The lock system is open then the car lock is open as usual by doing this process once again the car door is unlocked. For every process the message is send to the car owner.

B. *Optical Character Recognition*

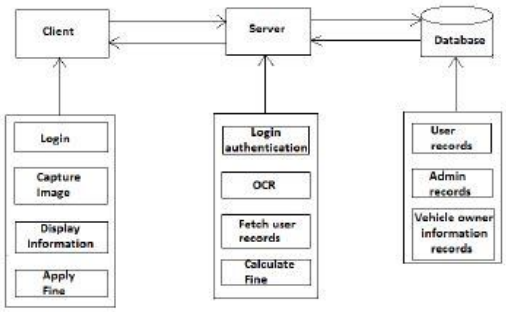


Fig 3. Dataflow

The general block diagram for vehicle number plate detection and recognition system as shown in figure (1). There are four main steps and each step has their own vital role in number plate detection and recognition.

Pre-Processing: The Video or image of the vehicle is captured using camera of 13-megapixel resolution, whose vehicle number plate to be identified. If it was a video, converted into frames and selecting the frame depending video length and time in which frame vehicle is clear. Selecting of frame can be done using equation (1).

F=N*t/T..... (1)

Where F is the required frame or image, N number of frames, t time required and T is total time of video or length of video. The size of image used 120 x 160 or 1200 x 1600. First we need to convert the RGB image to Gray-scale image using equation (2) it will be easier to number plate extraction.

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I = 0.114 *R+0.587*G+0.299*B..... (2)

To enhance the number plate recognition further, we use median filter to eliminate noises but it not only eliminates noise it concentrates on high frequency also. So it is more important in edge detection in an image, generally the number plates are in rectangular shape, so we need to detect the edges of the rectangular plate.

Localization of the License Plate: The main aim of this work is to identify the exact location of the license plate region in the digital image, the result must be a sub-image that contains only the license number plate. This can be achieved in two steps. The advantage of vehicle license number plates lies in having high contrast areas in an image black and- yellow or black-and-white. In license number plate the alphanumeric characters are placed vertically in same line and vary in intensity horizontally. The alphanumeric characters and background in an image have a sharp variation in intensity, it will help for detecting the license number plate region. Sobel edge filter is used to identify the boundaries in an image. It identifies the edges when there is a sharp variation in intensity gradient in an image. Edges having very huge intensity contrast in an images, when a sudden variation occurs in intensity from one pixel to other pixel then edges are detected. Identifying the edges in number plate plays a vital role, it reduces the data and helps in removing the unnecessary information. At the same time, it also preserves the structural properties of an image. Calculating gradient of the image for each pixel position in the image. Where represents magnitude vector, for x direction and for y direction. Sobel Mask (3 x 3).

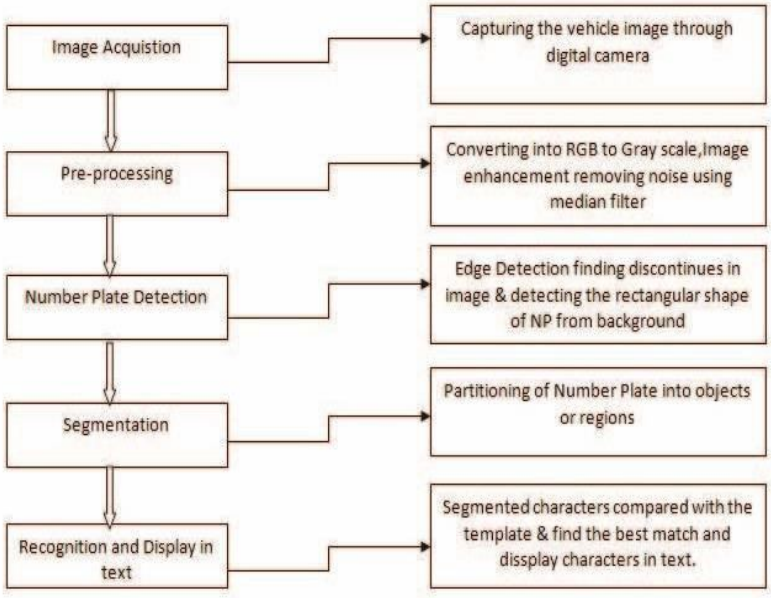


Fig. 3 Process outflow of Vehicle Identification Process

Character Segmentation of the Number Plate: After extracting number plate region, it scans for the connected objects in an image. Once the connected components are identified it will assign a special label to it. Each connected components have different labels in order to differentiate each other. The process of character segmentation, it will divide the number plate into different sub images, each sub image prefers one character. Segmentation is the important part in the vehicle license plate detection system because the character recognition completely depends on segmentation only. If segmentation is not done properly recognition will not be accurate.

1) *Character Recognition of the Number Plate:* After segmenting, the next step is character recognition. The main aim of recognition is to employ conversion of image text to characters. Each character from the license plate is compared completely against with the alphanumeric database which uses template matching. In matching process, the obtained sub-image will be compared against the template images in all possible position in the database and it calculates all numerical index for each character in order to get better matching from template images. To find the similarity between the objects and template images normalized cross correlation is used. Normalized Cross Correlation, are Template image and Input image respectively. If the obtained value of normalized cross correlation is greater than the preferred threshold, then it is updated to the new one. The match score is generated on every template image, if it scores more values than the previous threshold values it will update with the higher one threshold for the better match. The best matched characters are recovered and the output is stored in a text file.

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IV. APPLICATIONS

1) *Parking:* One of the main applications of ANPR is parking automation and parking security. Ticketless parking fee management, parking access automation, vehicle location guidance, car theft prevention, "lost ticket" fraud, fraud by changing tickets, simplified, partially or fully automated payment process, among many others.
2) *Access Control:* Access control in general is a mechanisms for limiting access to areas and resources based on users' identities and their membership in various predefined groups. Access to limited zones, however, may also be managed based on the accessing vehicles alone, or together with personal identity
3) *Border Control:* Border Control is an established state-coordinated effort to achieve operational control of the country's state border with the priority mission of supporting the homeland's security against terrorism, illegal cross border traffic, smuggling and criminal activities.
4) *Law Enforcement:* Automatic number plate recognition is an ideal technology to be used for law enforcement purposes. It is able to automatically identify stolen cars based on the up-to date blacklist.

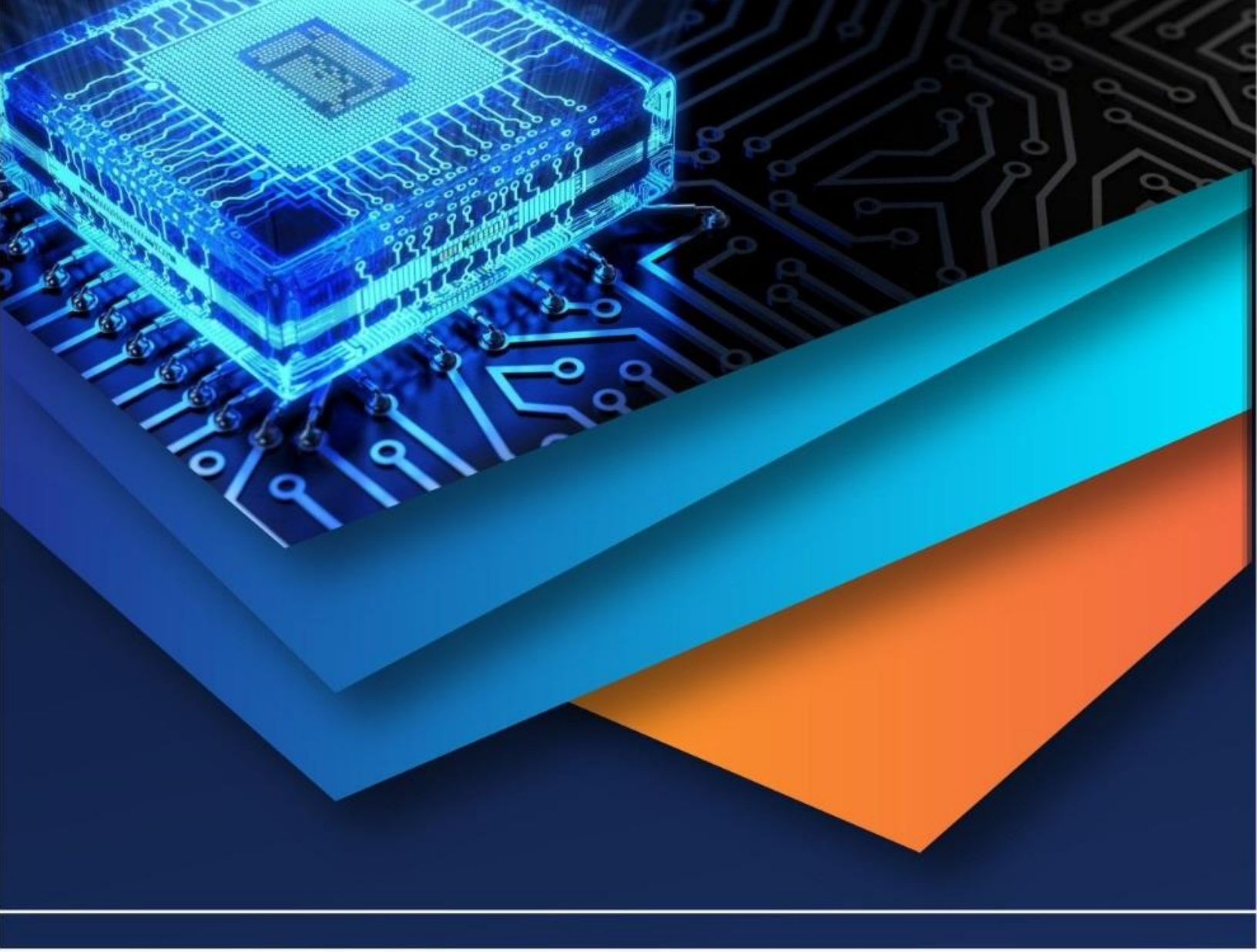
V. CONCLUSION

Raspbian based ethical driving system is a powerful system with high security. We have demonstrated that a workable system can be put together using best-of-breed open source
Technologies. Car locking procedure is only done by authorised finger print which is unique for each user. The hardware design is very easy because of open source hardware. Software code is open source and have so many API for controlling purpose and it helps to develop our source code without difficulty. A simple and efficient system has been developed
to localize the number plates from the image of a captured vehicle containing Indian standard number plate Our system can also be used for solving the real-time problem which takes safe custody of the important documents such as Driving License, PUC, Insurance, RC Book etc. which Verify the Vehicle User Electronically, so result in much more transparency, uthenticity, and also reduce corruption of fake documents and also reduces the administration overhead of RTO Admin by minimizing the use of papers. Although the prototype needs a lot of improvements, we believe that once it is optimized once it goes through several
More rounds of testing and refinements

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