Ethical Driving System

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Abstract —Technology is being used in all aspect of life to implement the smart system for daily life which ensures easy, simple and secure method of completing the job. 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 scans the fingerprint of a person trying to get access of vehicle and compare with authorized person's thumb print image which checks for driving license of the person using centralized database that is updated by RTO and then allowing or denying access. In the case of denial of vehicle access notification is sent to the owner and respective action is decided by her/him. Further if the access is accepted the key latch is opened using DC motor mechanism and engine is started. Adding to which the the owner can authorise people of his convenience by attaching their information in his database provided at the RTO. The project also proposes automatic penalty collection on those who have lapse data such as vehicle insurance, if vehicle is not undergone emission test. This is implemented with the help of OCR number plate recognition. This will help to catch thieves or any unauthorized access.

Keywords— Raspberry pi 0 ; Raspbian; camera ; Biometric sensor ; Vehicle security-alert; Email ; DC motor.

I. INTRODUCTION

In olden days most of the people are illiterate. So in many documents their fingerprints are taken as a signature. But now a day's many people use their signatures instead of thumb impression, because of the literacy. To avoid forgery, the government has implemented a finger print system. The new field of biometric technology, the way to identify people through theirs physical characteristics is attractive. Biometric technologies have great potential in various technical fields such as network security, public security, and financial industry systems. Biometrics has grown into an independent industry, whose standardization is making rapid progress with a large number of standards. These standards have focused on various aspects of biometric industrialization, including data formats, application program interfaces, security issues, system profiles, and evaluation methodologies. Vehicle analysis has attracted much attention recently. It is widely used in various vehicle-centered applications such as intelligent traffic and transportation systems, large-scale vehicle searches, intelligent parking, automatic toll collection and number-plate forgery detection. In intelligent infrastructure systems, the license plate numbers must be in machine-encoded text for easier store and processing, so OCR plays the important role in extracting data from license plate image. Because the complexity of OCR algorithms, the traditional methods usually use a combination of high resolution camera and powerful computer to perform recognition. Extract license plate number in machine-encoded text type from image captured by available camera of that device. Some image processing techniques are used to crop the license plate from image including noise reduction, adaptive binarization, and skew correction. Based on the properties of letters/numbers in the plate, we can separate each of them for recognition. We considered OCR methods: Tesseract engine

The exponential increase in population of vehicles especially two wheelers has led to air pollution, accidents and law violators which leads to troubled driving for the self as well as the other drivers while driving . Almost all of the new features introduced for vehicles are electronically operated, these features are related to luxury, some to comfort which offer heavy charges while few are related to safety measure. But we observe that, these features for luxury and comfort do not reduce crimes like vehicle theft, misuse etc. Which and are increasing day by day nor provide safety for driving. Another major thing is increase in vehicle accidents and there is no such feature which will help in surveillance of driver.
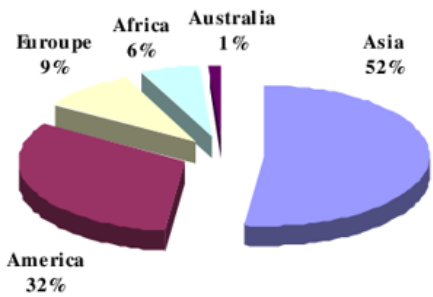

Figure 1. Proportion of Biometric Used in Different Continent.

Biometric Authentication is the efficient way for need in surveillance of driver , since from the Figure1 it is clear that Biometric methods of access are widely used in different continent and since theft increased uncountable with respect to two-wheelers hence security takes a primary concern to protect our belongings like vehicles, house property etc. In the current system vehicles have to be secured from theft protection and hence this system helps in securing the access of vehicle by limiting it with people who owns the vehicle

In the current OCR technology the software used determines the number plate and concludes the details for the driver using the extracted information
but in few places the words of the number plate such as O,0 and J,j is not prominently distinguished which leads to poor efficiency of feature extraction .Hence

the need to enhance the OCR technology is essential which is discussed in this paper .The penalty for all the not undertaking emission test, insurance policy for the vehicle is levied and automatically
Collected from the driver's account from the information stored in the RTO (Road Transport Office).
The private organization and government offices prominently uses the fingerprint authentication.

Biometrics	Accuracy	Cost
Facial recognition	Low	High
Iris scan	High	High
Finger print	High	Low
Finger vein	High	Medium
Voice recognition	Low	Medium
Lip recongnition	Medium	Medium

TABLE I. Different Biometric Recognition Technologies

II .EXISTING SYSTEM

Corruption is one of the main problems that we are currently facing in traffic management and fine payment. If traffic police want to get the full details of vehicle they have to fetch from RTO database.
No proper system that helps the traffic police to track the offenders properly. Even though in some place
Closed Circuit Television can track the rule breakers we are not sure that the vehicles will be traced. The paid fine may profit the traffic police, there is no proper system to pay fine that will ensure that the collected fine will go to the government. The current system also consists a long process of manual checkups about the vehicle in real time details and no proper measures are taken for owners who don't undertake emission testing per 6 months.

DISADVANTAGES OF EXISTING SYSTEM

1. As vehicle ownership has been increasing at an exponential rate,it is difficult to capture crime.

2. Existing system approaches cannot identify vehicle's basic data like ownership, insurance, RC book, emission test, road tax etc.

3. If the vehicle is being caught by the traffic police, then the details of that vehicle has to be fetched from the RTO office only.

4. Internal police corruption is a big challenge to public trust, cohesion of departmental policies and legal violations involving serious consequences.

III .PROBLEM STATEMENT

This paper is deals with security requirements of the Vehicle access, biometric authentication for systematic driving .The unauthorized access of vehicle from a thief and also underage teens has to be stopped and notification regarding unauthorized access will be sent to vehicle owner.

Violating the rules of driving like ignoring PUCC for emission test and timely insurance payment fail-the vehicle has to be strictly control for the betterment of the society and to abide the rules and regulations of RTO.

In cases of few states, confusion occurs in differentiating letters such as O and 0, 1 and J in the existing system, after capturing number plate .hence this system helps in optimizing the OCR technology used in classifying the number plate.

IV Hardware –Software Requirements

Proposed Solution:
- Hardware Model

There is block diagram of rasberry pi with biometric vehicle access system and Camera module for Automatic number plate recognition is shown in figure-3.
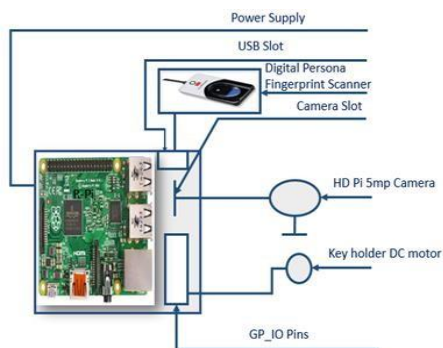

Figure 3: Hardware Schematic with all required components

1.Hardware Description:
a. Pi Camera:

A digital camera of 5 MP was used to capture real time images. The capturing images are then given to the Raspberry pi for further processing of number plate recognition.

b. Raspberry-pi 0:

In Raspberry pi, board image processing based. Speed of Raspberry pi board was very high in real time system as compared to other. The Raspberry pi sends output to microcontroller. 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.
In the present work Raspberry pi 0 is used for Wireless communication.

c. Power Supply:

DC Power Supply for system depends on selection of Microcontroller. We have used pic16F877a which runs on 5V supply and this supply can be derived from raspberry pi board.

d. Fingerprint Module:
The fingerprints for matching purposes generally requires the comparison of several features of the print pattern 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. This is a finger print sensor module with TTL UART interface. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The finger print module can directly interface with 3V or 5V Microcontroller.

The proposed system consists of the above hardware Tools connected to Raspberry pi 0 as the controlling unit and interfaced with the biometric scanner camera module and DC motor through Wired connection . Here the Biometric access takes the fingerprint capture for access and unlocking latch covering the key socket.The extracted information from the camera involves tesseract OCR for classification of information and collects penalty automatically.

2.Software description:

Scanner to server :
1. The client puts forth the request and establishes a TCP connection to a particular port on a specific host.
2. The client sends requests to the server by means of sentences formed by a HTTP method and an URI.
3. The HTTP server listens in on that Server-scanner communication-

Once the request is received, the server sends the line back to the client with its own message-which is comprised of the requested resource , another message,or any other piece of information.

- Enroll (Record) a new fingerprint.

- Delete one or more fingerprints from the DB scanner.

- Identify that an imprint is already properly stored in the BD scanner.

- Update a fingerprint is composed first by a Delete and then by a Enroll process.

Raspbian OS:
It promotes Python and Scratch as the main programming languages, with support for many other languages.
Usually, you'll boot your Raspberry Pi from the SD card. You might even boot from USB device

But thanks to a new feature, it's now possible to boot your Raspberry Pi over Ethernet, using a central server. Raspberry pi 0 has arrived with better 64 bit CPU. It is a broadcom 900 MHz Quad core CPU. It is ARM Cortex A7 based device. RPi 3 has 700MHz to 1.4Ghz processing speed and on-board memory ranges from 256 MB to 1 GB RAM. The Raspberry pi 0 is powered by a +5.1V microUSB supply. Typically, uses between 700-1000mA depending on peripherals devices connected to it. Raspberry pi which is evolved in consequence of several versions variations in memory capacity and peripheral-device
.This device is a low-cost IoT Raspberry Pi.The inveiglement of Raspberry Pi attain from a succession of the small size computer and comfort price .the credit card sized Linux small size computer exploit to establish a biometric framework has provision of interconnect with cameras, fingerprint scanner etc. Raspberry pi is a wireless, low-cost,remote subscription mode and biometric substantiation can be accommodated on the cloud as a software as service. The Arduino software is published as open source tools, available for extension by experienced programmers.The language can be expanded through C++ libraries.

Tesseract OCR:
 Tesseract package contains an OCR engine lib tesseract 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).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. 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, the OCR positional information and page layout analysis. Tesseract can detect whether text is monospaced or 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 task 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. Tesseract OCR engine, released by HP,is a popular OCR engine has very high correct rate. We can install this engine in almost popular operating systems like Windows, iOS, Android, etc. Furthermore, when combining with Leptonica libraries, it supports to convert from several image

formats into machine-encoded text in over 60 languages.

Python:

It is a widely used high-level, general-purpose, interpreted, dynamic programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C++ or Java. The language provides constructs intended to enable clear programs on both a small and large scale. Python supports multiple programming paradigms, including object- oriented imperative and functional programming or procedural styles. It features a dynamic type system and automatic memory management and has a large and comprehensive standard library.

Python programming language made us enable to write short code snippets for each processing techniques. It also enabled us to develop a multi-level processing mechanism. Thus python thon programming language was indeed very helpful in the digital processing of the stock images by writing simple and easily understandable python codes.

## IV METHODOLOGY

1. Biometric Authentication

- **Feature extraction:**

This is one of the trickiest components in an OCR tool. The main aim is to extract essential characteristics of symbols. There are different techniques for feature extraction such as the distribution of points, transformations and series expansions, and structural analysis. Also, during this process, each character is identified and assigned to its apt character class through classification.

- **Pre-processing:**

This is the 3rd component in every OCR engine. Raw data is processed in different stages which makes it usable by the system. Once the scanner has scanned an image there may be certain amounts of noise in it or the characters may be broken. With pre- processing such defects are resolved once and for all. It includes smoothening and normalizing.

According to the flowchart given in the figure 4, using the biometric authentication we provide the access to three
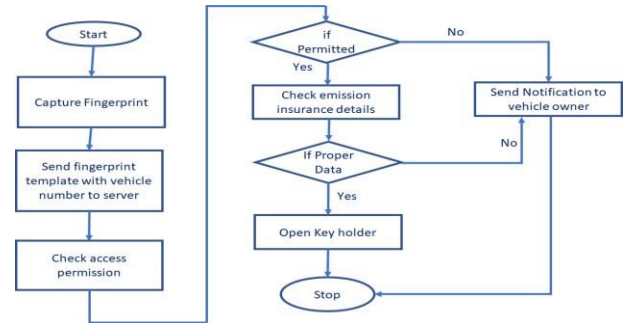
users for accessing the vehicle .This helps in

Figure 4: Flowchart for biometric access

checking the verified users for driving the vehicle. The vehicle is also connected the servo motor used as an enclosure for the vehicle key holder. This enclosure only opens up if the biometric access is denied to the user which would indicate that he is either unauthorized or stealing the vehicle.

2. KNN Algorithm for OCR

The intuition behind the KNN algorithm is one of the simplest of all the supervised machine learning algorithms. It simply calculates the distance of a new data point to all other training data points. The distance can be of any type e.g. Euclidean or Manhattan etc. It then selects the K-nearest data points, where K can be any integer. Finally it assigns the data point to the class to which the majority of the K data points belong.

- In **k-NN classification**, the output assumed as a class membership. An object is segregated by a majority vote of its neighbors, with the object is being allotted to the class most common between its k nearest neighbors (k is a positive integer, typically small). If k = 1, then the object is simply allotted to the lass of that single nearest neighbor.

- In **k-NN regression**, the output is the property value for the object. This value is the average of the values of its k nearest neighbors. Need to allot the weight to the contributions of the neighbors, both for classification and regression process, so that the nearer neighbors contribute more to the average than the more distant ones.

V .RESULTS

The project model showcased below in figure 5 with hardware components including Biometric sensor (Digital Persona), Servo motor , Ultrasonic sensor, Raspberry pi 0 , Pi camera module fitted on a vehicle device connected to two wheels underneath it . This setup also involves Nodemcu along with L293D driver circuit for motion of the vehicle model.
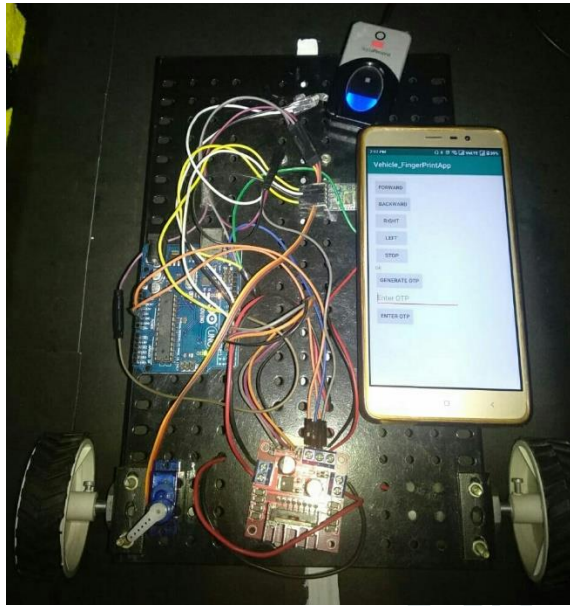

Figure 5 : Vehicle Model of the proposed system

The Figure shows the verification provided with fingerprint where if it matches then access is verified and else the access is denied and not verified. This unauthorized access is sent to the owner as a SMS symbolizing the access notification

The proposed system helps in Biometric Authentication system for the vehicle , which links the fingerprint of the driver with the RTO database to check for license information and enables the user access for driving only after the details are matched Along with the user, access is provided three others of his choice to drive the vehicle which continues the same verification as that of the driver . The latched remains closed if the verification is found invalid. This improves the security access of the vehicle and also gives responsible driving condition for the vehicle user ,which can be implemented in many areas for security purpose.

The figure 6 shows the verification provided with fingerprint where if it matches then access is verified and else the access is denied and not verified . This unauthorised access is sent to the owner as a SMS symbolising the access notification.
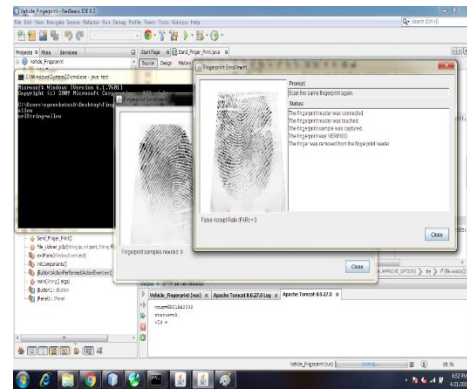

Figure 6: Biometric verification for vehicle access.

The automatic number plate recognition method using Tesseract from a video is performed.The captured image is extracted for required information and the output using the OCR we will be analyzing the text with RTO database and then the details of the vehicle and their owner details will be available .Using this information penalty is levied for the driver /vehicle owner and collected automatically from his/her account prior to which a notification message is sent.
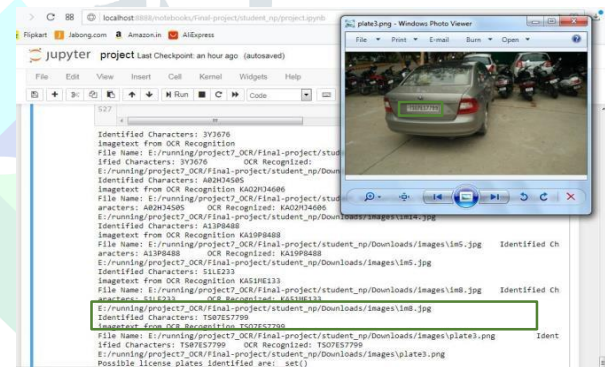

Figure 7: Number Plate recognition using OCR tesseract.

The number plate of the vehicle is captured as a still from the video and processed for noise reduction, accurate cropping by using KNN algorithm and tesseract for differentiating O and 0 sylables. This is also restricted to the standardised number plate format such as given in figure 7.
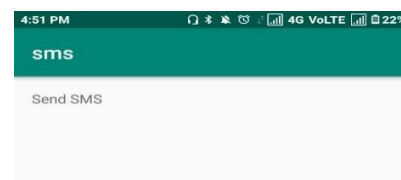

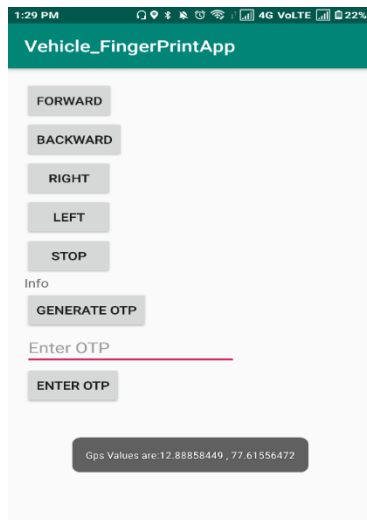Figure 8: SMS Application to send Penalty notification.

Figure 9: Vehicle_FingerPrintApp to control vehicle model, OTP generation, Notify vehicle Location with access status
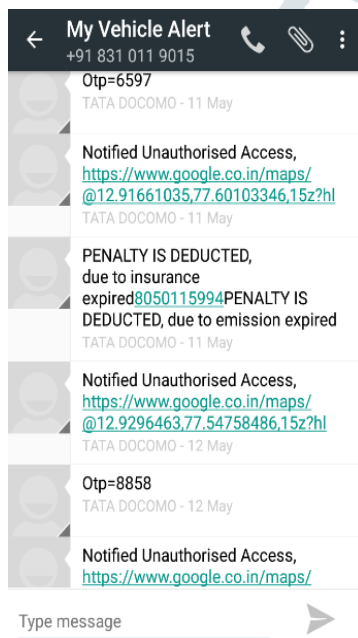

Figure 10: Notifications and alerts sent to vehicle owner

For the verification process of finger print of vehicle we need to record and link the fingerprint with the DL and stored with vehicle number plate for higher degree of authentication. Figure 6 shows the verification of fingerprint in vehicle (ALLOW message on command prompt indication of valid user). The verification of finger is also indicated as OK or NOTOK message in application developed for the project. App consists of auto generated OTP in case of emergency. If status of verification is NOTOK i.e. unauthorized person tries to access the vehicle then the vehicle owner gets a SMS alert for unauthorized access along with the vehicle. The complete process ensures authentication process is 100% efficient and user friendly

VI CONCLUSION

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. Vehicle locking procedure is only done by authorized finger print which is unique for each user.

Our system can also be used for solving the real-time problem which takes safe custody of the important documents such as Driving License, PUCC, Insurance, which verify the Vehicle User Electronically, so result in much more transparency, authenticity, and also reduce corruption of fake documents and also reduces the administration overhead of RTO Admin by minimizing the use of papers.

VII FUTURE SCOPE

Our system can be futher enhanced in area of object detection for live tracking of vehicle using RFID. Dashboard implementation in vehicle with embedded biometric system for user friendly.

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