



Design of Anti-Theft and Tracking System for Vehicle Protection by Biometric Authentication

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ABSTRACT

This paper displays a framework that adequately and proficiently gives an utilization of biometric validation in vehicle security. In biometric validation based vehicle insurance and following framework, the biometric verification assumes a significant job to give high security to the vehicles. The principle point of this task is to shield the vehicle from unapproved individuals by utilizing the one of a kind id that is unique mark validation and face acknowledgment. The proposed framework incorporates two security modules one is to give security to the entryways and another is to give security to start. The unique mark scanner is set to open the entryways and the face location framework is utilized to enact the start of vehicle. So in this framework just approved people who enrolled their unique mark and face picture in the framework can get to the vehicle. Additionally The GPS module is utilized to follow the vehicle and to get the continuous area of vehicle. The continuous area of vehicle is send to the client as URL connects by utilizing SMS.

Keywords- *Fingerprint Module, Raspberry Pi 3, Web camera, GPS (Global Positioning System) and Relay*

I. INTRODUCTION

In recent years, vehicle robberies are expanding at a disturbing rate far and wide. Individuals have begun to utilize the robbery control frameworks introduced in their vehicles. So in this framework we are endeavoring to improve the security highlights of the vehicle. The utilization of biometric based frameworks has seen an exponential development. This is a direct result of colossal advancement in this field making it conceivable to cut down their costs. Biometrics is turning into another best in class technique for security frameworks. Biometrics are utilized to give tied down access to real working frameworks like ATM, mobile phones, vehicles, workstations, workplaces, and different things that need approved access. Biometric have rolled out huge improvements in security frameworks making them more secure than previously, effective and shabby. Not at all like different methods which utilize passwords and numbers, that are should have been recollected, biometric procedures utilize human body parts like fingerprints, face or even iris of your eyes and as we realize that these things are exceptional to all, consequently it makes biometric frameworks the best over others. In our venture unique finger impression check is utilized, where we can contrast the unique finger impression of the driver and the predefined finger impression. In the event that the unique mark of the driver does not coordinate with the put away finger impression of the proprietor of vehicle then the entryways of vehicle not opened and the proprietor of vehicle gets message as unapproved individual attempting to open the entryways of vehicle. The face location strategy is utilized to initiate the start of vehicle. In the event that the essence of driver coordinated with the put away picture, at that point start will enact generally proprietor will gets the picture of cheat. Additionally the following of vehicle should be possible by utilizing GPS. We can get the accurate area of vehicle utilizing GPS framework. The location of the area of our vehicle is sent as URL interface.

II. LITERATURE REVIEW

In structure and improvement of a GSM based vehicle burglary control framework for a car which is being utilized to counteract/control the robbery of a vehicle. The created framework utilizes an installed framework dependent on GSM innovation. The planned and created framework is introduced in the vehicle. An interfacing portable is likewise associated with the microcontroller, which is thus, associated with the motor. Once, the vehicle is being stolen, the data is being utilized by the vehicle proprietor for further preparing. The data is passed onto the focal preparing protection framework, where by

sitting at a remote spot, a specific number is dialed by them to the interfacing portable that is with the equipment pack which is introduced in the vehicle. By perusing the sign gotten by the versatile, one can control the start of the motor; say to bolt it or to stop the motor right away. Again it will go to the ordinary condition simply subsequent to entering a verified secret key. The proprietor of the vehicle and the focal handling framework will know this verified secret key [7].

Mrinmoy Dey showed a framework dependent on microcontroller that comprises of a GPS and GSM. This investigation likewise contains a bio-metric insurance arrangement of the vehicle and unique finger impression check of the driver of the vehicle is utilized to shield the vehicle from hostile to robbery. At the point when driver gives his checked unique finger impression picture before beginning the vehicle, the framework will be considered as reasonable condition. However, when vehicle's area is changed without unique mark check, the framework will be taken as anomalous condition. At that point the framework will send a SMS to proprietor of the vehicle with a URL of 'GOOGLE MAP' having the arrange of the present area of the vehicle[1].

Anup Kamat showed the utilization of FDS (Face Detection System) to identify the essence of the driver and contrast it and the predefined faces. For instance, in the night when the vehicle's proprietor is dozing and somebody robbery the vehicle then FDS acquires pictures by one small web camera which can be covered up in the vehicle. FDS contrasts the acquired picture and the predefined pictures on the off chance that the picture doesn't coordinate, at that point the data is sent to client. So now proprietor can get the picture of the cheat just as he can follow the area through GPS. With ARM7, the new clever vehicle security framework incorporated a great deal of equipment modules, for example, video catch, GPS situating and remote transmission, the structure of the framework programming utilized the installed programming creating stage on[5].

III. PROPOSED SYSTEM

The figure 1 shows the block diagram of antitheft and tracking system of vehicle. The framework comprises of unique finger impression module R305, web camera, GPS module, relays, supply, LCD and raspberry pi3. The proposed framework incorporates three distinctive security modules the unique mark validation based vehicle entryway locking framework, start control utilizing face acknowledgment, and the vehicle following framework. In this proposed framework Firstly to open the entryways of vehicle client needs to check finger, if the finger of client matches with the put away layout from unique mark library at that point transfer is on and every one of the entryways of vehicle opens naturally. What's more, if the unique finger impression of the client does not coordinate with the put away format from library, at that point entryways of vehicle stays shut and the proprietor of vehicle gets the message as URL connection of area. After that to initiate the start of vehicle client need to put the face before the camera, on the off chance that it matches with the put away pictures, at that point the start will be actuated generally on the off chance that the obscure individual attempting to begin vehicle, at that point the picture of that individual gets by the proprietor. The picture of the individual is send to the proprietor by utilizing mail. Additionally in this undertaking vehicle following should be possible by utilizing GPS(Global positioning system).The GPS module gather the information from satellite and send it to proprietors enrolled versatile no as URL interface. So in this framework we can get the on-going area of vehicle by utilizing the GPS module. The SMS is send to the client utilizing the msg91 online SMS administration. At the point when client taps on that connection he will get the precise area of vehicle with the assistance of Google maps.

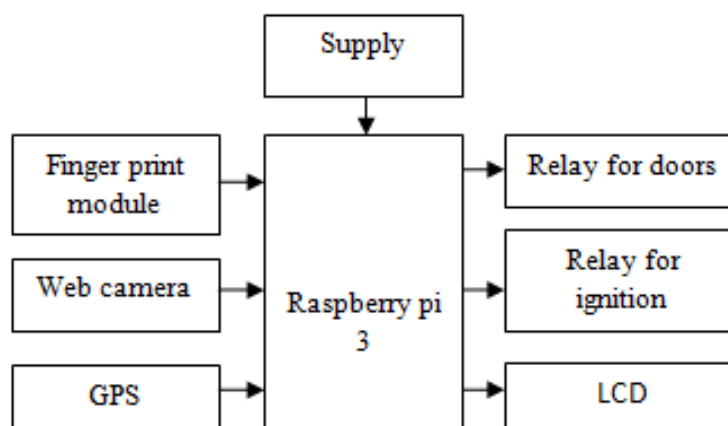


Figure 1:- Block Diagram of Proposed System

The figure (2) shows the complete flow of working of proposed system. How actually the system will work is explained in detail in the given flow chart.

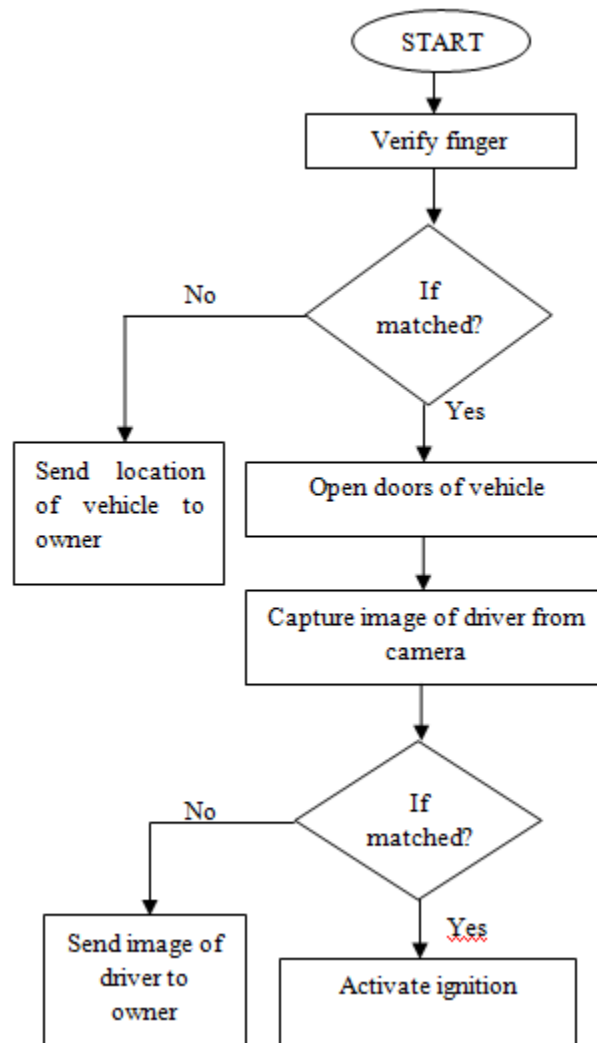


Fig 2: Flow chart of the proposed system

Face Detection

The obtained picture is handled to distinguish the face utilizing the Viola Jones calculation which successfully course finder recognizes the essence of the gained picture and the face locale is extricated. The validation based security framework has the database which stores the face pictures of the approved people under various situations. The face pictures are upgraded by normalizing them to evacuate the undesirable data because of brightening imperatives while obtaining the picture and are put away in the database. Presently the undertaking of face acknowledgment must be performed with the identified face viola and Jones, 2002 which adequately utilizes the course object identification. The figure (3) demonstrates the progression of face location framework. The total progression of the face recognition clarified in the given stream outline.

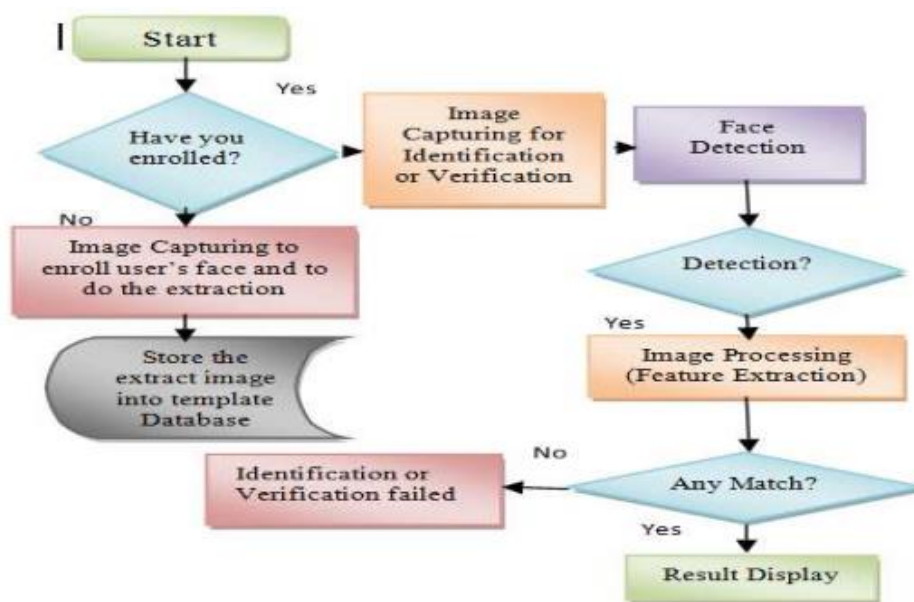


Fig 3: flowchart of the face detection system

Face recognition

A facial acknowledgment framework is an innovation equipped for recognizing or confirming an individual from an advanced picture. In this by contrasting chosen facial highlights from given picture with countenances inside a database. It gauges generally facial structure, removes between eyes, nose, mouth, and jaw edges. These estimations are held in a database and utilized as an examination when a client remains before the camera. One of the most grounded positive parts of facial acknowledgment is that it is non-meddlesome. In face recognition framework on the off chance that the substance of the driver matches with the put away picture, at that point the start will be enacted, in the event that not matches with put away picture, at that point the picture of the individual gets by the proprietor. The picture of the cheat is send to the proprietors mail ID. The algorithm for face recognition is:

1. Capture the image of driver using webcam.
2. Image acquisition
3. Resize the captured image.
4. Convert the image from RGB2GRAY
5. Histogram equalization (CLAHE) is applied on image.
6. HAAR classifier (face detection) is used to detect the image.
7. Region of interest is applied to know the boundaries of image.
8. Extract LBP features of the image.
9. train/predict S.V.M

The above algorithm used for the face recognition, in which initially the picture of the client catch through the camera then the picture procurement connected on the picture and afterward picture will be resized. After that the picture will be changed over from RGB to GRAY. At that point the histogram levelling connected to upgraded the picture, after that the HAAR classifier is utilized for face discovery. The district of intrigue is connected to know the limits of the picture. By extricating the LBP highlights of the picture, the SVM is prepared to locate the coordinated consequence of the picture.

HAAR Classifier Algorithm

The face identification calculation proposed by Viola and Jones is utilized as the premise of our structure. The face discovery calculation searches for explicit Haar highlights of a human face. When one of these highlights is discovered, the calculation enables the face contender to go to the following phase of location. A face up-and-comer is a rectangular area of the first picture called a sub-window. For the most part this sub-window has a fixed size (ordinarily 24×24 pixels). This sub window is frequently scaled so as to get a wide range of size appearances. The calculation filters the whole picture with this window and means each individual area a face applicant. The calculation utilizes a vital picture so as to process Haar highlights of a face up-and-comer in consistent time. It utilizes a course of stages which is utilized to dispense with non-face applicants rapidly. Each stage comprises of a wide range of Haar highlights. Each element is ordered by a Haar highlight classifier. The Haar highlight classifiers produce a yield which would then be able to be given to the stage comparator. The stage comparator entireties the yields of the Haar highlight classifiers and contrasts this worth and a phase limit to decide whether the stage ought to be passed. On the off chance that all stages are passed the face applicant is finished up to be a face. These terms will be examined in more detail in the accompanying areas.

Integral Image

The simple rectangular features of an image are calculated using an intermediate representation of an image, called the integral image. The integral image is an array containing the sums of the pixels' intensity values located directly to the left of a pixel and directly above the pixel at location (x, y) inclusive. So if $A[x, y]$ is the original image and $AI[x, y]$ is the integral image then the integral image is computed as shown in equation 1 and illustrated in Figure 3.

$$AI[x, y] = \sum_{x' \leq x, y' \leq y} A(x', y') \quad (1)$$

The features rotated by forty-five degrees, like the line feature shown in Figure 5, as introduced by Lienhart and Maydt, require another intermediate representation called the rotated integral image or rotated sum auxiliary image. The rotated integral image is calculated by finding the sum of the pixels' intensity values that are located at a forty five degree angle to the left and above for the x value and below for the y value. So if $A[x, y]$ is the original image and $AR[x, y]$ is the rotated integral image then the integral image is computed as shown in equation 2 and illustrated in Figure 4.

$$AR[x, y] = \sum_{x' \leq x, x' \leq x - |y - y'|} A(x', y') \quad (2)$$

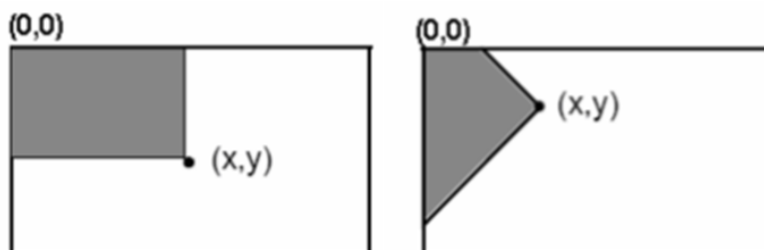


Fig 4: summed area of integral image Fig 5: summed area of rotated integral image

It only takes two passes to compute both integral image arrays, one for each array. Using the appropriate integral image and taking the difference between six to eight array elements forming two or three connected rectangles, a feature of any scale can be computed. Thus calculating a feature is extremely fast and efficient. It also means calculating features of various sizes requires the same effort as a feature of only two or three pixels. The detection of various sizes of the same object requires the same amount of effort and time as objects of similar sizes since scaling requires no additional effort.

Haar-Like Features

Haar-like highlights are a straightforward technique or apparatus to depict a specific item inside a picture. Each Haar-like component depicts the item by portraying the distinction in its powers at a specific area. Along these lines it can affirm whether a picture contains this item by checking if certain districts have contrasts in their powers like the article to be identified. A model that would explain this idea is the Haar like component portraying the district of eyes and cheeks inside a human face. This depends on the way that the eye and eyebrow district have darker powers than the cheek area. In this way if the picture at this area happens to have an enormous contrast in its powers, this suggests the picture may contain a face.

There are essentially three kinds of Haar-like highlights which are: 2-rectangular features(Edge highlights), 3rectangular features(Line highlights), and 4-rectangular highlights. 2-rectangular and 3-rectangular highlights may come in both level and vertical directions. The element is determined by subtracting the entirety of pixels in the white area from the total of pixels in obscurity locale. A figure demonstrating these highlights is demonstrated as follows.

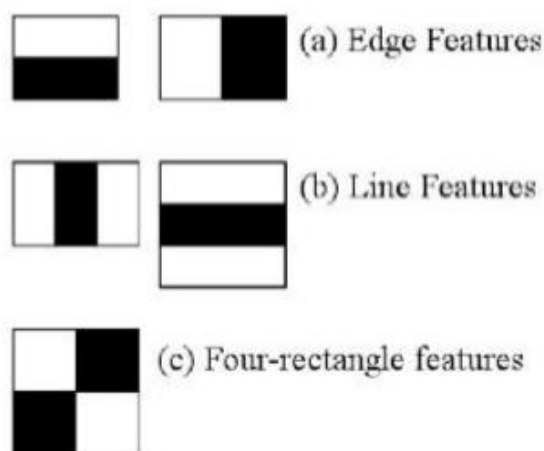


Fig 6: Haar like features

Cascade

The face recognition calculation disposes of face up-and-comers quickly utilizing a course of stages. The course kills up-and-comers by making stricter prerequisites in each phase with later stages being considerably more hard for a possibility to pass. Up-and-comers leave the course on the off chance that they pass all stages or flop any stage. A face is distinguished if an up-and-comer passes all stages.

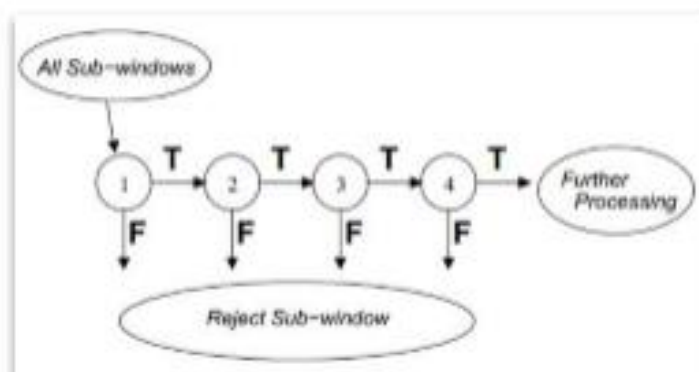


Fig 7: stages of the cascade classifier

LBP feature extraction

Each face picture can be considered as a sythesis of miniaturized scale designs which can be adequately distinguished by the LBP administrator. To consider the shape data of faces, they separated face pictures into M little non-covering districts R0, R1... RM. The LBP histograms extricated from each sub-locale are then connected into a solitary, spatially improved component histogram characterized as:

$$H_{i,j} = \sum_{x,y} I(f_l(x,y) = i)I((x,y) \in R_j)$$

where $i = 0, \dots, L-1$, $j = 0, \dots, M-1$. The extracted feature histogram describes the local texture and global shape of face images.

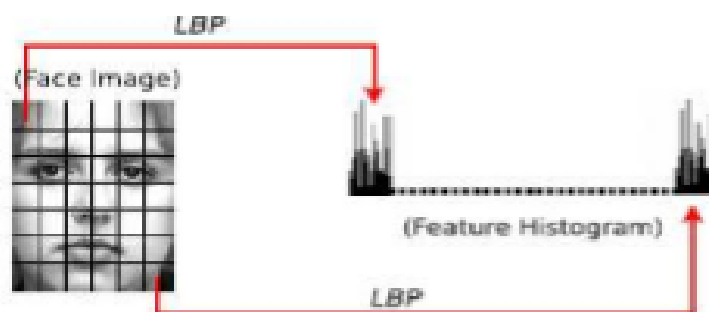


Fig 8: LBP based facial representation

Face recognition training phase

Identifying human facial highlights, for example, the mouth, eyes, and nose require that Haar classifier falls initially be prepared. So as to prepare the classifiers, the help vector machine is utilized. Luckily, Intel built up an open source library committed to facilitating the usage of PC vision related projects called Open Computer Vision Library (Open CV). The Open CV library is intended to be utilized related to applications that relate to the field of HCI, mechanical technology, biometrics, image processing, and different territories where perception is significant and incorporates an execution of Haar classifier discovery and preparing. To prepare the classifiers, set of pictures are required. The arrangement of pictures contains the positive pictures and negative picture of the article. The area of the items inside the positive pictures is determined by: picture name, the upper left pixel and the tallness, and width of the article. For preparing facial highlights the arrangement of pictures with in any event a super pixel goals were utilized for preparing. These pictures comprised of regular articles, similar to paperclips, and of common landscape, similar to photos of timberlands and mountains. So as to deliver the most powerful facial element identification conceivable, the first constructive arrangement of pictures should be illustrative of the change between various individuals, including, face, sexual orientation, and age. A decent hotspot for these pictures is National Institute of Standards and Technology's (NIST) Facial Recognition Technology (FERET) database. In preparing the few arrangement of pictures were utilized. In this proposed framework SVM is prepared by contrasting facial highlights of a few arrangements of pictures.

Fingerprint matching

Biometrics is the strategy for recognizing human by their very own one of a kind attributes. The Fingerprint biometrics is the skilled biometric design for individual discovery as far as security and unwavering quality. It is hard to fashion or take. It is acknowledged around the world. Live unique finger impression perusers dependent on optical, warm and ultrasonic methodology are utilized. The two generally utilized unique finger impression coordinating systems are details based coordinating and example coordinating. In example coordinating procedure just the closeness between two pictures are analyzed. Particulars coordinating depends on details focuses for example area and course of each point. The unique finger impression acknowledgment framework contains principally a picture catching module, include extraction module and example coordinating module. In unique mark coordinating procedure client need to enlisted finger first. When selecting client need to enter finger multiple times. The framework will process the double cross finger pictures, create a format of the finger dependent on handling results and store the layout. When coordinating client enters finger through optical sensor and framework will produce a format of the finger and contrast it and layouts of the unique mark library. For 1:1 coordinating, framework will contrast the live finger and explicit layout assigned in the module; for 1: N coordinating or looking through framework will scan the entire unique mark library for the coordinating finger. In the two conditions, framework will restore the coordinating outcome, achievement or disappointment. Here N is the most extreme no of formats streak library can stores. Mine has 1000. In this framework for unique mark coordinating and selecting we utilized the py. Unique mark library. The method used to coordinate the unique mark depends on the finger impression design. In example based unique mark coordinating the print of the live finger contrast and put away unique finger impression from the library. In the two conditions, framework will restore the coordinating outcome, achievement or disappointment. The flow chart of the fingerprint verification system as shown in figure 9.

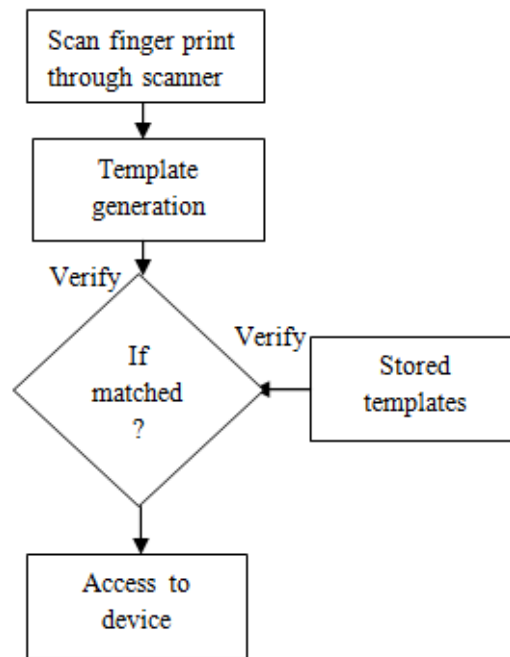


Fig 9: flow chart of fingerprint matching

Vehicle tracking

The vehicle following framework comprises of a GPS collector which gives the continuous area of the car. Vehicle data can be seen on electronic maps by means of the web. The framework utilizes geographic position and time data from the Global Positioning Satellites. The GPS beneficiary gets facilitate (scope, longitude and elevation) time and a few other data. The data refreshed at consistently. Worldwide situating framework can be utilized to give security all through the off state of the vehicle. Indeed, even there is a probability to head out vehicle in turn off condition. There are situations where one vehicle can be totted in another higher vehicle. Hence GPS anticipates robbery location. While motor is in off condition yet in the event that GPS area changes fundamentally, ready SMS will be sent to the approved individual. Thus it gives security notwithstanding when there is no battery supply to the motor unit. Presently multi day's vehicle following framework mainstream in purchaser vehicles as a burglary aversion, checking and recovery gadget.

IV. Result & Experimental Setup

Hardware design

The figure 10 shows the experimental setup of the proposed system. In this framework the raspberry pi 3 control every one of the gadgets. The framework comprises of raspberry pi 3, web camera, fingerprint module R305, GPS module, relay, 16x2 LCD and supply. The supply required for the proposed framework is 5v. The 16x2 LCD is utilized to show the status of the framework. In this framework the USB to sequential convertor is utilized to associate the GPS recipient to the framework.

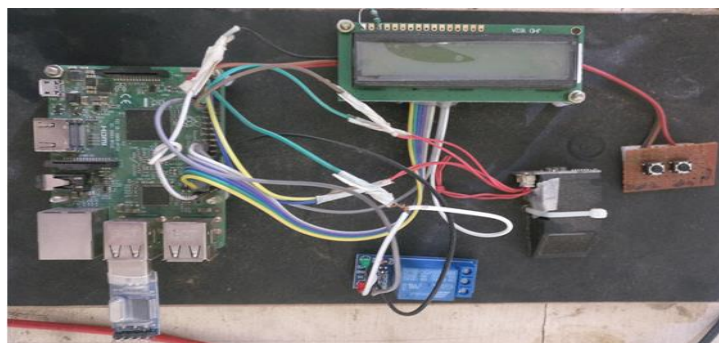


Figure 10: Experimental setup of the proposed system

The results of vehicle door locking system

1. When the fingerprint of user matched with the stored fingerprint from library then the relay will be ON and doors of vehicle opens automatically. The message displayed on LCD as.



Fig 11: result displayed on LCD

2. When the fingerprint of the user not matched with the stored fingerprint from library then the relay remains off and doors of vehicle remains closed. Hence the SMS is send to the owner as URL link of location.

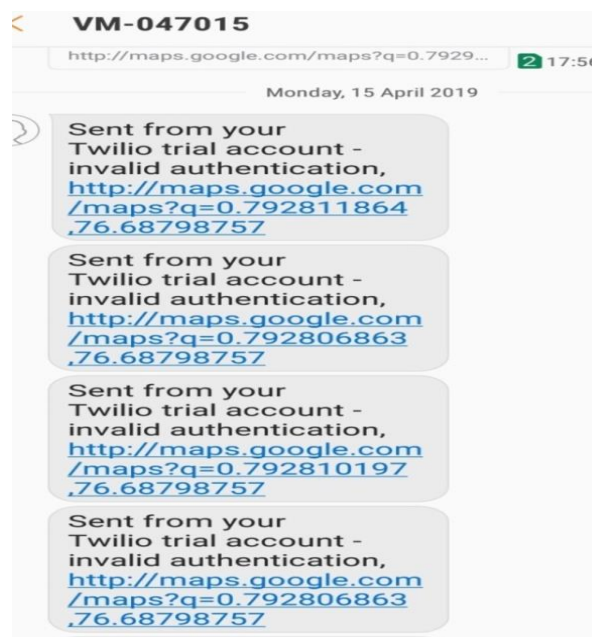


Fig 12: SMS with GPS coordinate of vehicle

The result displayed on LCD as



Fig 13: message displayed on LCD

The results for ignition control system

1. When the image of the user matched with the stored image from database then the relay will be ON and the ignition of vehicle will be activated.

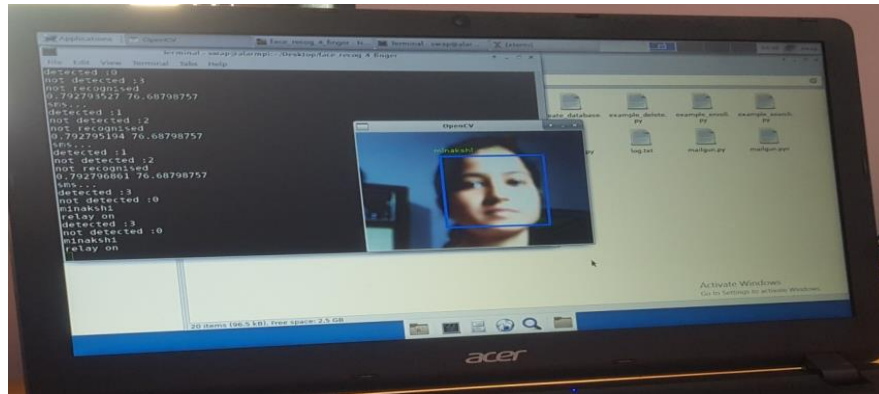


Fig 14: face detected



Fig 15: Result displayed on LCD

2. When the user's image not matched with the stored image from database then the relay remains off and the ignition will not be activated. Hence the location of vehicle and image of the user is send to the owner. The URL link of location is send using SMS and image will be send using mail.

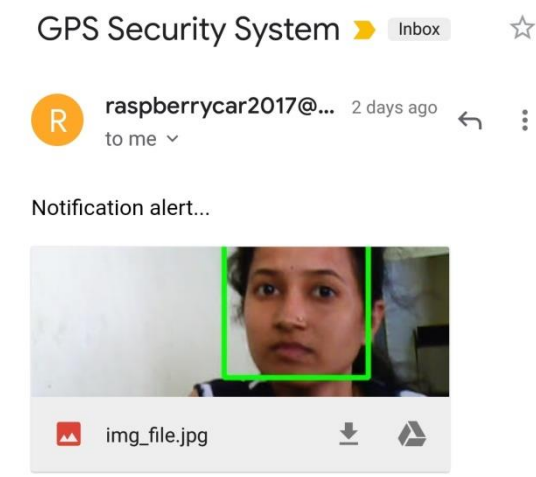


Fig 16: email received by the owner when unknown face detected.

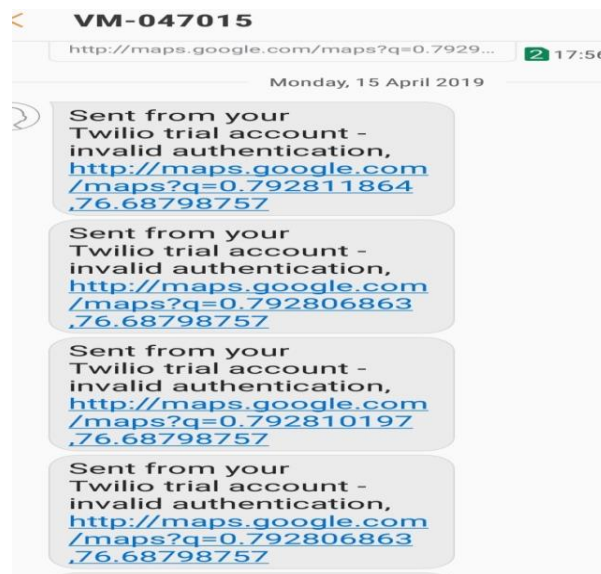


Fig 17: SMS with GPS coordinates of vehicle.



Fig 18: result displayed on LCD

V. CONCLUSION

This venture is gone for improving the degree of security for vehicles. The proposed plan gives security to the start and entryways of vehicle likewise gives the precise area of vehicle by utilizing the GPS technology. Thus burglary of the gadget can without much of a stretch be recognized. We have built up an inserted framework that utilizations unique mark biometric example and face recognition, a low-cost yet effective method, to provide high security to give high security to vehicle from getting robbery. Such altered vehicles with security framework will help in dropping burglary of a vehicle.

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