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VEHICLE VISION: A DRIVER AUTHENTICATION SYSTEM USING IoT

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Abstract: Most of the times, vehicles used in crime would be a stolen one and can gimmick us in the name of various services like Ola, Uber. To avoid such thefts and the crimes accompanied by it, we need to increase the vehicle accessing systems. There are a lot of authentication systems available in the market such as drawing patterns, voice commands, biometric sensors, RF car keys, etc. Face recognition is one of the important and efficient authentication system among those. Thus the purpose of this project is to authenticate drivers at engine start using dual verification system and to connect the vehicle with the internet for enabling the framework "Internet Of Things" so that every time the registered dataset is retrieved from the server and is correlated with the real time data of the driver. Thus we are proposing this model for public vehicles authentication systems.

Keywords: Raspberry Pi, Pi Camera, Firebase, HTML, CSS, JavaScript, HOG Algorithm.

I.INTRODUCTION

The rising cases of vehicle theft, vehicle hijack, kidnapping, diversion of crude oil and petrol, change of route by drivers of transport companies and theft of valuable containers and items in sea ports have necessitated the use of a more reliable security and authentication system in vehicles and storage facilities for valuable items. Generally this system is meant to be installed for the four wheelers but for country like India where majority of the people using two wheelers, here is the cheapest source of an anti-theft system. Several technologies have been developed to provide reliable security for vehicles and valuable goods. Some of the technologies are locking systems such as the steering wheel lock, central locking systems, theft detection systems, fuel and ignition disabling system, etc. all these can reduce the possibility of vehicle been stolen but can easily be manipulated by the thief and does not give a trace or location of the vehicle or goods if the vehicle is eventually stolen. Several researchers and companies have designed and constructed vehicle monitoring and tracking device [1][2][3][4]. The safety of private and public vehicles is a major concern nowadays so having driver authentication system ensure their safety while travelling. This system can be found in consumers vehicles as a theft prevention and retrieval device

Biometric authentication is one of the popular and reliable methods used in most of the systems [3, 4]. Smart card based biometric authentication [5, 6] is used to ensure the correct driver person to ignite the vehicle else identifies authentication failure. This increases the security of vehicles and ensures safe driving by preventing accidents. The prototype of the ignition system is used by the Cortex M3 based Micro controller. Traditional vehicle authentication system requires multiple sensors for biometric validation and hence cost increases hand in hand. Most of the prototype models use PIC micro controllers through which all the process will be controlled [1,2]. However, lack of constant monitoring of driver authentication in such systems may lead to vehicle thefts, fraudulent switching of designated drivers, and driving beyond a designated amount of time for a single driver etc.

Another approach for authentication is using image processing in real time applications used to safeguard the vehicle from theft. The system that uses camera to capture the image and compares it with database image using viola Jones algorithm [7]. Linear Discriminate Analysis (LDA) algorithm is used for face recognition step to perform. The extracted image will be enhanced further to discriminate much of the features, rather than looking for exact pattern based on Euclidean distance and reliable to be used with large samples of data. In later method, authorization step involves with the setting of threshold value to be compared with known Euclidean distance. If it is beyond the threshold level then authentication fails and results as an unknown person. The same will be notified to the monitoring side system-using message SMS through GSM operating modem.

There are few limitations appear in existing systems such as usage of multiple vehicle controllers i.e. microcontrollers for authentication which may lead to overlapping during authentication purposes and the lack of a central admin in the

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system which is a key factor in data privacy. Thus the proposed system overcomes the above said limitations also includes some edge cutting technologies like Internet Of Things, cloud database for faster communication and data porting.

II.EXISTING SYSTEM

Existing system uses Raspberry pi 3b+ module along with pi-cam to furnish facial recognition module. Biometric authentication is provided by using r305 module. Both the modules use the common database through which the person's identification will be checked in the authentication phase. This system with GPS enabled ensures the safety of passengers throughout their journey.

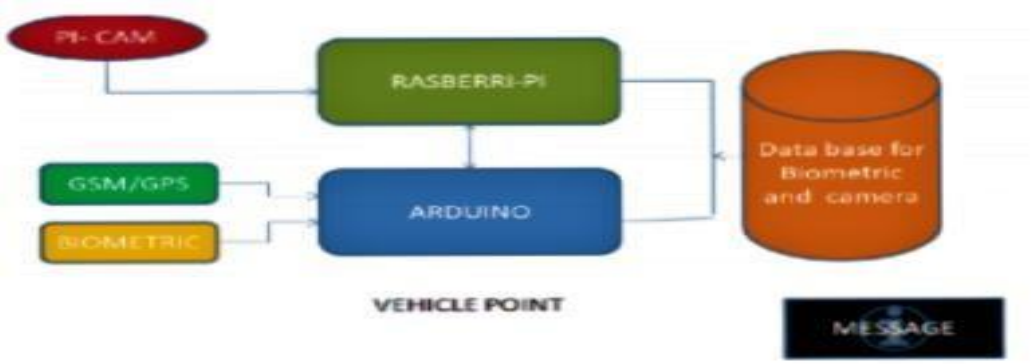

Fig 2.1: Block diagram of existing system

III.PROPOSED SYSTEM

In proposed system, Raspberry pi only act as vehicle controller. Java server is responsible for Driver registration and database handling. Driver need to request the server every time he starts the vehicle and his travel history will be maintained in log After request, Driver needs to pass dual authentication i.e. OTP and face recognition. This process will ensure the safety of the travel for public

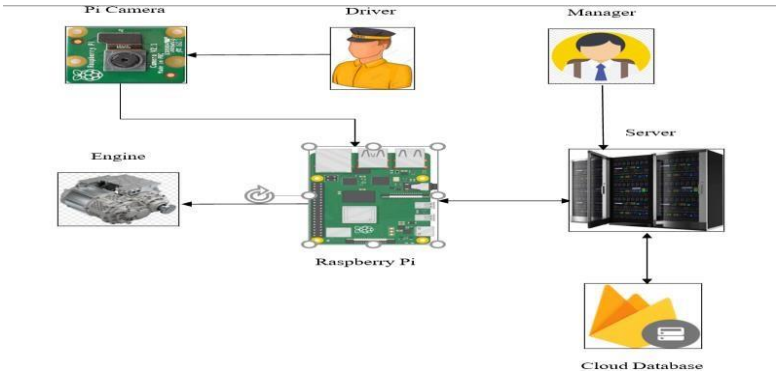

Fig 3.1: Block diagram of proposed system

The process flow is divided into two segments i.e. data aggregation and the real time validation part.

a. Data aggregation

In the data aggregation section, the manager logins into the driver's registration page using his credentials. After successful login of the manager he will be able to register the details of the driver like vehicle ID, driver name, email ID, phone number and the facial capture of the driver. This information is stored in the cloud database for future retrieval.

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b. Real time validation

After the data aggregation part, the real time validation part gets executed. First the driver tries to start the engine and simultaneously the vehicle contacts the vehicle controller for access. Then the dual verification system gets executed and if both the verification gets succeeded the driver gets permission to drive the engine.

The various system design requirements for the proporsed system are:

I. RASPBERRY PI

The **Raspberry Pi** is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards and mice) or cases. The organization behind the Raspberry Pi consists of two arms. After the Pi Model B was released, the Foundation set up Raspberry Pi Trading, with Eben Upton as CEO, to develop the third model, the B+. Raspberry Pi Trading is responsible for developing the technology while the Foundation is an educational charity to promote the teaching of basic computer science in schools and in developing countries.

II. PI CAMERA

The Raspberry Pi camera module can be used to take high-definition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're looking to expand your knowledge. There are lots of examples online of people using it for time-lapse, slow-motion and other video cleverness. You can also use the libraries we bundle with the camera to create effects. If you're interested in the nitty-gritty, you'll want to know that the module has a five megapixel fixed-focus camera that supports 1080p30, 720p60 and VGA90 video modes, as well as stills capture. It attaches via a 15cm ribbon cable to the CSI port on the Raspberry Pi. It can be accessed through the MMAL and V4L APIs, and there are numerous third-party libraries built for it, including the Pi camera Python library. The camera module is very popular in-home security applications, and in wildlife camera traps. You can also use it to take snapshots.

III. FIREBASE

Google Firebase is a Google-backed application development software that enables developers to develop iOS, Android and Web apps. Firebase provides tools for tracking analytics, reporting and fixing app crashes, creating marketing and product experiment.

IV. HYPER TEXT MARKUP LANGUAGE(HTML)

The Hyper Text Markup Language, or HTML(Hyper Text Markup Language) is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript.Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

V. CASCADING STYLE SHEET(CSS)

Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language such as HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript. CSS is designed to enable the separation of presentation and content, including layout, colours, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file which reduces complexity and repetition in the structural content as well as enabling the .css file to be cached to improve the page load speed between the pages that share the file and its formatting.

VI. JAVASCRIPT

JavaScript often abbreviated as JS, is a programming language that conforms to the ECMAScript specification. JavaScript is high-level, often just-in-time compiled, and multiparadigm. It has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first class function. Alongside HTML and CSS, JavaScript is one of the core technologies of the World Wide Web. JavaScript enables interactive web pages and is an essential part of web applications. The vast majority of websites use it for client-side page behaviour, and all major web browsers have a dedicated JavaScript engine to execute it. The ECMAScript standard does not include any input/output (I/O), such as networking, storage, or graphics facilities. In practice, the web browser or other runtime system provides JavaScript APIs for I/O.

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VII. HOG ALGORITHM

Histograms of oriented gradients (HOG) finds applications in object and pattern recognition domain as it is capable of extracting crucial information even from the images that are obtained under garbled environments. It is therefore well suited for tackling the facial recognition problem. The feature extraction process of HOG is based on extracting information about the edges in local regions of a target image. Simply put, HOG feature extraction is primarily the characterization of the orientation and magnitude values of the pixels in an image. That is, it defines an image in terms of groups of local histograms that point to local regions of an image. The features of HOG can be seen on a grid of target image spaced uniformly. The grid dimensions depend upon the size of the cell and image. Thus, every target image depicts the gradient orientations distributed in a HOG cell. In a cell histogram, the length of the A B C D. Depiction of rectangle features shown relative to the detection window. For the gradient directions, the plot indicates the directions of the edges that are normal.

IV RESULTS AND DISCUSSION

The proposed system overcomes the faulty authentication and provides prime protection against theft, kidnapping and overall promoting public safety. The results are shown below with the step by step process of the system.

1. Data Aggregation

I. Manager's Login Page

The login page for the manager is created using HTML CSS and JavaScript, using this the manager logins into the registration page of the driver.

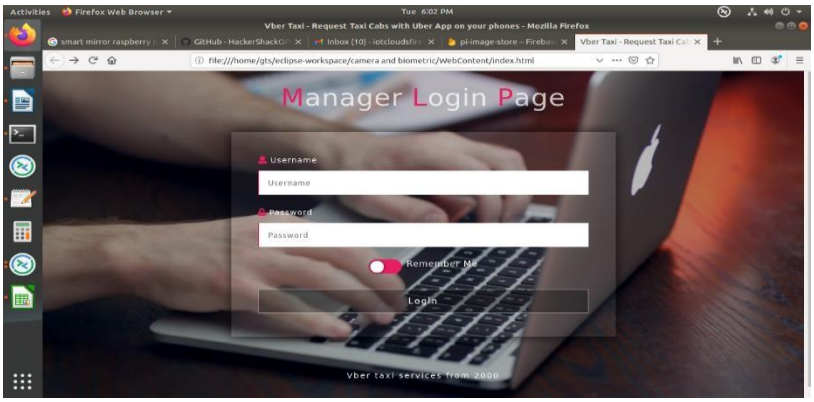

Fig 4.1. Manager login page

II. Driver's Registration Page

The registration page has the details of the driver such has vehicle ID, driver name, contact number, email ID and the image of the driver which will be further used for facial recognition.

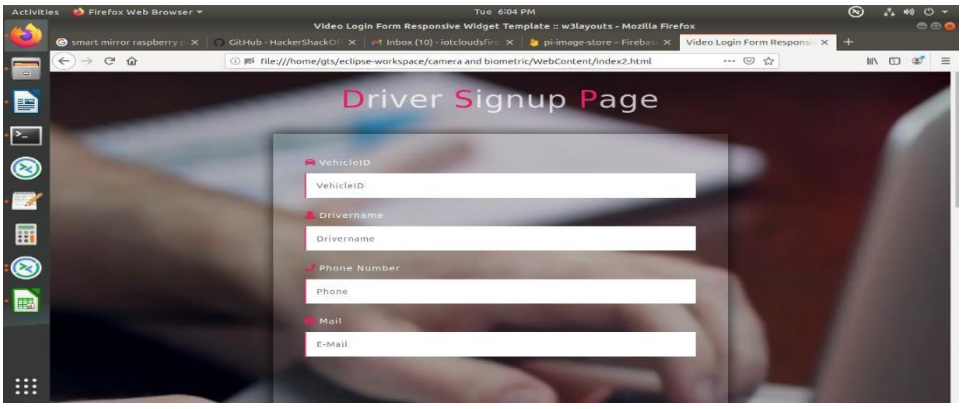

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Fig 4.2. Driver registration page

III. Information stored in database

The registered details are further stored in the database which is the firebase.

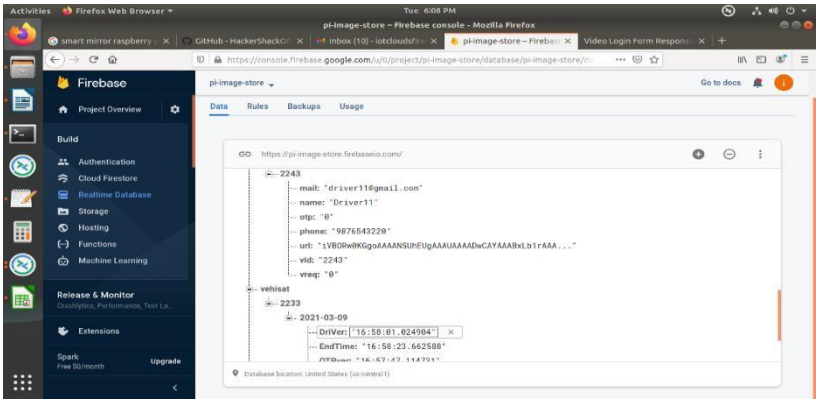

Fig 4.3.1 Real-time database

Fig 4.3.2 Real-time database

2. Real time validation

I.Enabling vehicle controller using remote desk with a Mac ID 192.168.43.100.

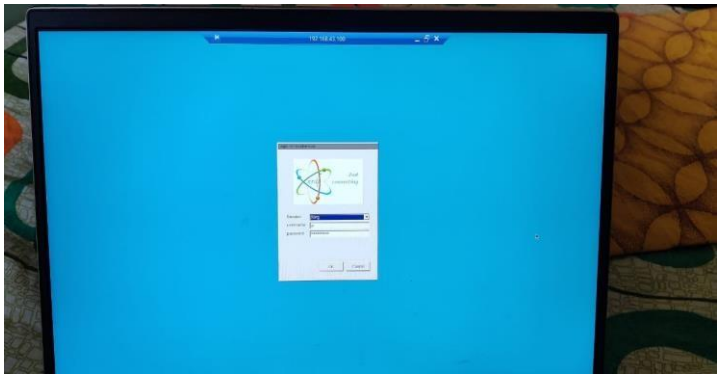

Fig 4.4 Validation of data

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II.Training the data set obtained from the cloud database.

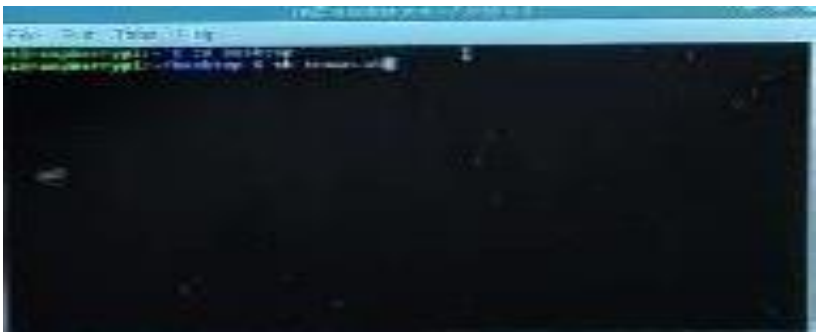

Fig 4.5 Training dataset

3. Dual authentication process

I.FACE RECOGNITION

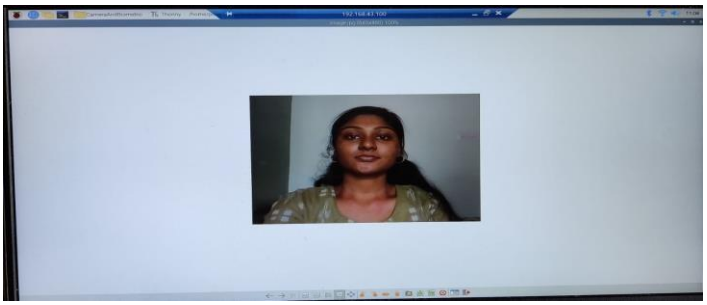

Fig 4.6 Face recognition

II.OTP VERIFICATION

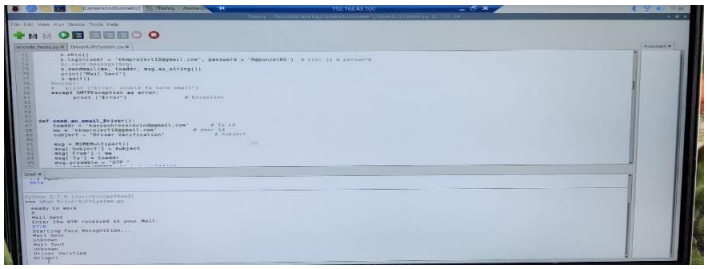

Fig 4.7 OTP verification

4. Access Denial

If an unauthorized driver tries to start the vehicle a mail is sent to the manager.

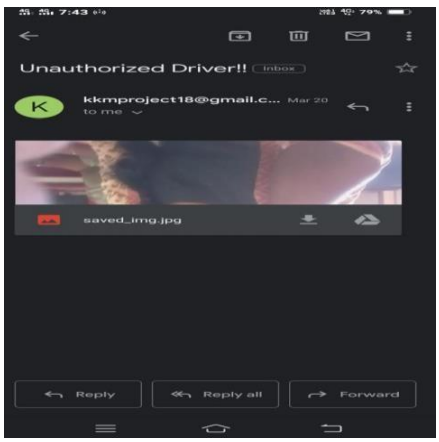

Fig 4.8 Access denial

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5. Final output

After the successful verification of the above mentioned dual verification process, the engine gets started which is depicted as the successful turn on of the DC motor attached in our kit.

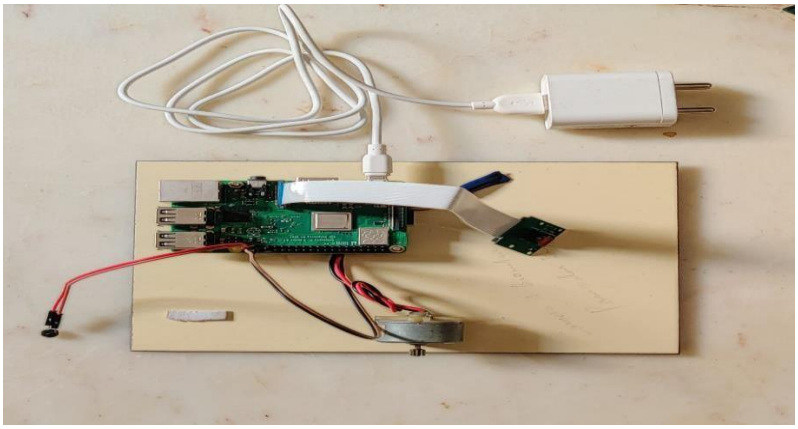

Fig 4.9 Working model

X. FUTURE SCOPE

We have envisioned the future scope of our proporsed work by implementing the lastest technology: Machine learning and artificial intelligence into the authenticating system so that the accuracy and efficiency of the system can be increased further more. These cutting edge technologies can enable us to provide additional features to our system making it to the next level of authentication.

XI. CONCLUSION

The amount of threat is exponentially reduced by dual verification provided by the system. The use of a single vehicle controller makes the process complete in a jiffy and makes it more real-time. The amount of crimes which usually requires a theft car will also decrease as the automobiles are kept much safer. Human interaction with server is reduced and thus human error can be avoided. Significant amount of cost can be reduced since the usage of hardware components are reduced. Performance of server can be improved. The facial recognition is made much faster by extracting the essential features using the HOG algorithm.

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