

Face Recognition based Anti -Theft System Using Raspberry Pi

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Abstract - The main problem of car owners is that they have constant fear of losing their vehicles from a common parking lot or from outside their home. Image processing is based detection system provides a solution for this problem. There are some system which helps to recover, but the crime is already happened. In this paper, a cheap automotive security system is proposed, which consists of a Face Detection System (FDS) and a control platform. The hidden camera takes photos of driver and compares the photos or faces with stored database to check whether he or she is an authenticated driver or not. The face detection subsystem bases on optimized Haar Cascade algorithm and can detect faces in cars. The other modules transfer necessary information or details to users and help to keep eyes on cars all the time. This system standard is built on Raspberry pi. The system also has inbuilt memory which can be used to store database of list of drivers faces who has driven the vehicle with the date and time data also.

Key Words: Face Recognition, Face Detection, Haar Cascade, Vehicle security, Authorization, Internet of Things, Image Processing

1. INTRODUCTION

In recent days, the popularity of the automobile sector is rapidly increasing all over the world. But regrettably there exist an aggressive increase in vehicles crime. At the current situation, most of the vehicles are controlled by using mechanical keys, security cards, and password/pattern. Many well-known biometrics-based identification and verification techniques existed Face recognition is to know a most suitable option biometric technique for vehicle safety and alarm systems because it supported face information and may work under different conditions. Therefore, most of the face recognition techniques have been improved to achieve a higher rate of differentiation.

2. LITERATURE REVIEW

Guodong Guo atl - "Face Recognition by using Support Vector Machines" [1] paper author says a face recognition system should be able to work with various changes in face images. There are a lot of variations in images due to illustration and direction of our view. This presents a difficulty to face recognition. Two issues are central, the first one is which features to use to represent a face. A face image subjects to changes in view, illumination, and expressions of person. A suitable representation should be able to deal with all changes. The second is how to classify a new face image using the selected representation.

Timo Ahonen atl "Face Description with local Binary Patterns- Application to Face Recognition" [2] Face image representation, local binary pattern, texture features, face misalignment are used. The algorithm used are less efficient.

Mira Kartiwi atl "Development of Face Recognition on Raspberry Pi for Security Enhancement of Smart Home System" [3] face recognition algorithm & face detection algorithms will detect the face from the image. The discussion of various hardware components is done here. Linux operating system is used to implement system using Raspberry Pi.

"K. K. Dube atl -Face recognition system for unlocking automobile using gsm and embedded technology" [6] has the security system, the main part is to prevent the theft of vehicle and ensure safety of car by avoiding the means of theft. The authentication of driver is through face recognition system that authenticates a user as authorized user to have access to the system. The system captures image from the camera on detection of person within the parked vehicle. The recognized face is compared with the authorized image of users in the database.

Ashwini Kolhe atl -"Security and Safety with face recognition Feature for next generation Automobiles "[5] paper has proposed the system which uses the efficient algorithm for the face recognition and detection. The main things are face detection, face recognition and then beginning the engine. In which the picture of authenticate person is taken and stored in database, the features from the input images are extracted by the method and match with the authenticate user of car. The technology is progressing, we also have to trouble the security of the car. The stolen of car, as it is autonomous car, so it is more dispose for cyber-attacks, some local threats etc.

Mohammed Kayed and Ahmed A Elngar -"Vehicle Security Systems using Face Recognition based on Internet of Things"[6] paper proposed a system called VSS-IoT i.e Vehicle Security System using IoT. An Author used the hybrid mechanism of haar cascade and PCA algorithms for the face recognition and detection. As mentioned in this paper, their system has a combination of an embedded devices, Iot Technologies and a biometric techniques. Also author said that the system is simple.

Mahesh R. Pawar and Imdad Rizvi -IoT based embedded system for Vehicle Security Driver Surveillance system [7] is designed by biometric authentication. This

system will use biometric authentication to recognize a driver and give access to a vehicle.

Narayan T. Deshpande and Dr. S. Ravishankar - Face Detection and Recognition using Viola Jones algorithm and fusion of LDA and ANN system[8] uses three different algorithms viz viola jones algorithm, Linear Discriminative Analysis Algorithm, Artificial Neural Network algorithm. For face detection viola jones algorithm used. LDA is used to contain a linear classifier. ANN algorithm is used for face recognition. The total success rate was 92% for this method.

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3. METHODOLOGY

1. We will detect the faces using USB camera
2. The detected faces will be enrolled in the database.
3. We will check the authorized drivers from database to give access of car.
4. Unauthorized driver will be not allowed to access the car.

Flowchart of system -

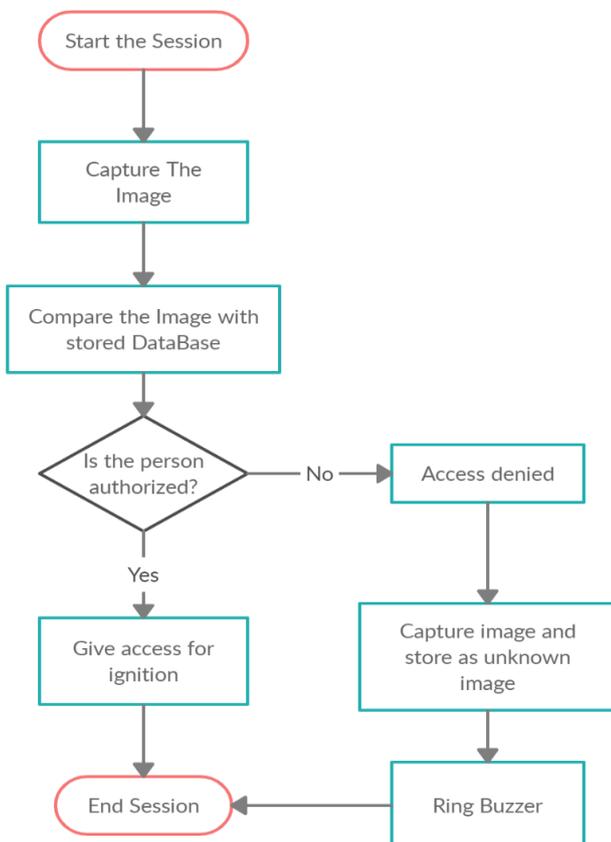


Fig -1: Flowchart

The input and the output modules of the system are connected to Raspberry Pi. The keyboard and mouse are used to give the inputs and run commands. The USB camera is also connected to the Raspberry Pi which will capture the images of a person and compare it with the images stored in database. The power supply will be given to raspberry Pi. And the VJA to HDMI cable is used to connect the monitor/LCD.

The steps to begin a system includes creating of database and using the images stored in it for comparing the live images. When the Raspberry Pi is started following points should be taken into consideration like connection of Monitor to check the image captured by USB webcam which will be used for detection of entity.

Linux commands are given as input to Raspberry Pi to store images in memory card. The authorized driver images will be stored in one directory and while giving access to the car live images will be compared to them.

3.1 Software Design

1. Linux:- We have installed latest version of Raspbian Operating system in Raspberry Pi. This operating system is open source and free to use.
2. Python:- We have done our implementation in python language.
3. Open cv:- Opencv is an open source library and is usually used for image processing.

3.2 Haar Cascade Algorithm

Haar cascade is a machine learning algorithm. The function is trained from a many of positive and negative images. It is then used to detect objects in some another images. The algorithm has four stages:

- i. Haar Feature Selection
- ii. Creating Integral Images
- iii. Adaboost Training
- iv. Cascading Classifiers

1. Haar Feature Selection

The algorithm needs a set of positive images and negative images as input to train the classifier. Then will extract features from it. First phase is gathering the Haar Features.

2. Creating Integral Images

Integral Images are used to make this superfast. But among all these features we calculated, most of them are not relevant. So, best features will be selected.

3. Adaboost Training

To select the best features out of 160000+ features we will use concept called Adaboost. It selects the best features and trains the classifiers that use them. During the detection, a window of the target size is moved over the input image, and for each section of the image and Haar features will be calculated. These differences are then compared to a learned threshold that will separate non-objects from objects.

4. Cascading Classifiers

It consists of a collection of stages, where each stage is an combination of weak learners. Every stage will be trained using technique which is boosting. Boosting will result into high accurate model to be used.

4. PROPOSED SYSTEM

Proposed system prototype is built on Raspberry pi. The system has inbuilt memory which can be used to store database of list of drivers who has driven the vehicle with the date and time data also. There are three phases viz Data Gathering, Train the Recognizer, Recognition.

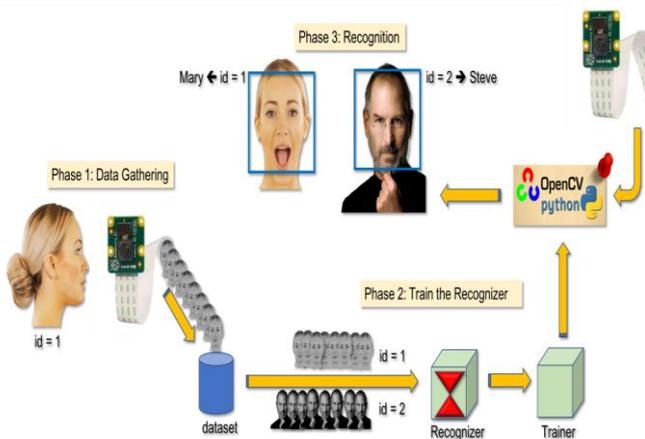


Fig -2: Proposed system

We are first gathering the images of authorized drivers. Then those images are given as training set into face recognition stage. USB camera is used to take the images of driver in car. The images are then store into a database in jpeg format. Images stored in database are called training images and the images taken during authentication are called as test images. When driver's face match with the images stored in database then he/she is authorized otherwise he/she will be considered as an unauthorized. When the face is authorized then only the permission will be given to start a vehicle. When the face is unauthorized, then image will be stored in the database as unknown with the time and date. Then alarm will ring and vehicle ignition will be off.

5. DATABASE

We have taken images of authorized drivers in different light conditions to increase the confidence level of a system. Images will be stored in database i.e. in memory card. If captured image is compared with the images stored in database and image is not found then that person will be unauthorized. And that person's image will be stored in database as unknown user with the date and time. If the person is unauthorized then unknown will be displayed otherwise it will display a name of driver.

6. CONCLUSION

Vehicle robbery is increasing day by day. Some systems are there which helps to get recovered. But victim remains unknown. This system will help to find the victim. By using this particular system, we can increase and maintain the safety of vehicle. If any unauthorized user tries to use or steal the car the central controller will stop its working immediately and the buzzer will ring. And the victim's image will be captured and will be stored in database as an unknown face with date and time.

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