ANTI-THEFT VEHICLE SECURITY SYSTEM USING FACE RECOGNITION

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Abstract – *In this 21st century, there's a rapid increase in the number of vehicles so that the number of car theft attempts also increases, locally and internationally. With the invention of strong stealing techniques, owners are in fear of having their vehicles being stolen from the common parking lot or from outside their home. In this proposed vehicle security system face detection system (FDS) is used to detect the face of the driver and compare it with the predefined face. Real-time vehicle security system supported computer vision provides an answer to the present problem. The proposed vehicle security system performs image processing based on real-time user authentication using face detection and recognition techniques. As the person enters the parked car to the driver's seat of the vehicle activates the hidden camera fixed in an appropriate position inside the vehicle. As soon as the image is acquired from the activated camera, the face of the person is detected. The extracted face is recognized using the LBPH. If the face of the person is detected as unknown then this integrated system will be sent the image of the person to the device of the owner via mail and the ignition system remains lock. When there will be authenticated person will seat on the driver sit then this ignition will unlock.*

***Key Words*:** Open CV, Anaconda, Raspberry pi, Image Processing, Car Protection system, Ignition Lock.

1. INTRODUCTION

The use of cars becomes important everywhere in the world and also protecting it from theft is required. Automobile manufacturers are attaining the security features of their Vehicles by introducing advanced embedded and automated technologies to avoid thefts particularly in the case of cars. Usually, Biometric and non-biometric methods provide this type of security features. But, sometimes these system fails due to password hacks and encryption of decrypted data, thus we are approaching these smart hidden vehicle safety device it will be more effective in real time[1].

The main aim of this paper is to offer an advanced security system in automotive, which consists of a face detection system, a wifi module, and an IoT control platform. The face recognition system bases an optimized algorithm and recognizes faces in vehicles especially four-wheelers during which nobody should be in the car, and make an alarm loudly.

Security in today's world has also become the most advanced because of technology. In preventing thefts, for instance, various types of security systems have been developed. There are CCTVs (Closed-circuit Television) which can be found in every commercial establishment because of their high effectivity and low expensive in protecting and solving crimes, burglar alarms used by commercial establishments which help protect burglary thefts unauthorized access by setting off a loud alarm, button alarms which automatically alert the nearest police station that crime was attempted or is currently taking place, and many More. There are also different kinds of authentication that are used to increase security

Features in different kinds of devices such as biometrics, non-biometrics, fingerprint, retinal, iris, and face recognition. Among the types of security features mentioned, face recognition is the most sophisticated and secured[1].

There are many anti-theft systems ready to be drawn in the complete market. However, the price camp on the doorstep of such an anti-theft system is low expensive. In this business, we confirm a prototype of a real anticipates antitheft system which can be doubtless implemented by vehicle owners everywhere. This system uses a Microcontroller and GSM services.

2. Methodology

The extendable real-time car security system comprises the protection of vehicles parked in parking with the help of an integrated unit of computer vision with a high-end Microprocessor. Face detection and recognition system use enhanced algorithms for authentication.

Here we are using the latest raspberry pi3 Model B+ with a 64-bit 1.4GHz Quad-core Processor, with 1GB RAM. We have deployed a Pi camera with the proper interfacing of RPI Camera Raspberry pi. When any person will enter in a car the system will passively active by the action of the opening door. And the camera will be activated. The camera deployed in the car in front of the appropriate driver seat will acquire the image of a person's face seating on the driver seat. Once the image of the person is acquired, the system now tries to detect the face.

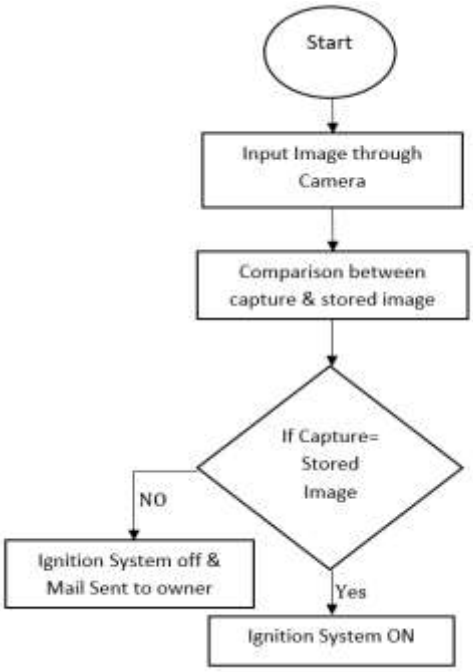

Fig.1 Flow Chart

2.1 Image Processing

The microcomputer which contains the image processing unit embedded within it performs face detection and authorizes the person. The processing of images involves two parts, face detection, and face recognition.

2.1.1 Face Detection

The acquired image is processed to detect the face using the algorithm which effectively uses cascade object detection. Cascade detector detects acquire an image and extracts the face region from the acquired image. The face recognition system has stored the images of the face of an authorized person in a different environment. The face images are enhanced by normalizing them to remove the unwanted detailing due to illumination constraints while acquiring the image and are stored in the database. Now the face recognition task must be performed with the detected face and image stored in the database.

```
# Detect faces in the image
faces = faceCascade.detectMultiScale(
    gray,
    scaleFactor=1.1,
    minNeighbors=5,
    minSize=(30, 30),
    flags = cv2.cv.CV_HAAR_SCALE_IMAGE
)
```

Fig.2 Cascade face detection Program

2.1.2 Face Recognition

Face recognition can be performed by different algorithms in OpenCV such as feature-based face recognition algorithm or model-based algorithm. Mostly feature-based algorithm used in real-time security systems. Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) algorithms are efficient in terms of extracting the features to perform recognition. Both algorithms compared are the same in decrement to feature base algorithm, but Linear Discriminant Analysis (LDA) outperforms Principal Component Analysis (PCA) algorithm when large training sets are involved in recognition. LDA Also discriminates most of the present information in images efficiently by computing intraclass and inter-class scattered matrix. Using the databased stored images it performs the LDA and recognizes the difference between normalized images stored in the database and detected images[5]. LDA performs the authorization of the image and gives further signals to the system. Since we have successfully detected the person using open CV and anaconda software-based image processing algorithm.

2.2 Vehicle and Ignition Control Unit

After the image processing unit classifies the face or person as unknown, Then the vehicle ignition system remains deactivated and sends the unauthorized person image to the owner's mobile device through a wifi base control unit. The owner based on received information gives the command to control unit of the system. If the owner wants a person to be authorized they can give a command to be active the ignition. This provides high-level security to the vehicle in modern improve theft techniques.

3. SYSTEM ARCHITECTURE

To detect the face and processing the security action the entire security system comprising each component is shown in Fig. 2.

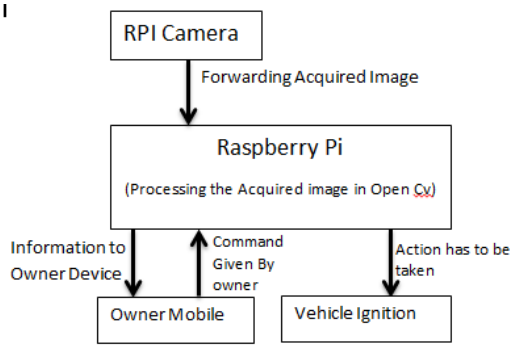

Fig.2 Block Diagram of security system

3.1 Hardware

- RPI Camera
- Raspberry pi 3 model B+
- Ignition Lock

RPI Camera

Fig.3. RPI Camera

- The Pi camera module is a portable lightweight camera that supports Raspberry Pi. It is normally used in image processing, machine learning, or surveillance projects[3].
- 8MP color camera module without a microphone for Raspberry Pi
- Supports both Raspberry Pi Model A and Model B
- Omni vision 5647 Camera Module
- Resolution: 2592 * 1944
- Supports: 1080p, 720p and 480p
- Lightweight and portable (3g only)

Raspberry pi 3 model B+

Fig.4. raspberry Pi 3 Model B+

- The latest Raspberry Pi 3 Model B+ has a faster 64-bit 1.4GHz quad-core processor, 1GB of RAM, faster dual-band 802.11 b/g/n/ac wireless LAN, Bluetooth 4.2, and significantly faster 300Mbit/s Ethernet[2]
- Most powerful pi
- Supports Linux, python (making it easy to build applications)
- High processing power in compact boards
- Memory interfaces (HDMI, multiple USB, ethernet, onboard wifi and Bluetooth, 40 GPIO, USB powered, etc).
- On-board wireless LAN - dual-band 802.11 b/g/n/ac (CYW43455)
- On-board Bluetooth 4.1 HS low-energy (BLE) (CYW43455)
- 1GB RAM
- 40 GPIO pins
- Camera interface (CSI)
- Display interface (DSI)

Ignition Lock

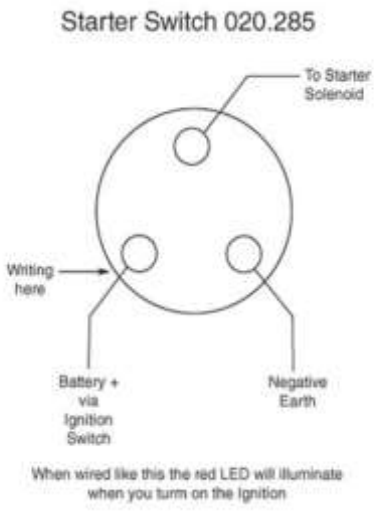

Fig.5. Ignition Lock Circuit

- Most drivers think of the ignition switch as the slot where they insert the key to start their car, but that's the ignition lock cylinder.
- The ignition switch is a more complex electrical component that has to "read" anti-theft coding in

the key before it will activate electrical systems in the vehicle so the vehicle can start or allow an automatic transmission to be shifted out of Park.

- Generally, the GND pin of the ignition lock is connected to the normally open pin of the relay. thus the circuit gets complete and the current starts following due to which engine gets started.
- But in our project we have connected the GND pin of the ignition lock which is normally connected to the relay .as we connect the normally connected pin to the relay The GND pin of the ignition lock is connected to the normally open pin of the relay.
- Thus the circuit gets complete and the current starts following due to which engine gets started

3.2 Software

- OpenCV
- Anaconda

OpenCV

- OpenCV is a cross-platform library using which we can develop real-time computer vision applications. It mainly focuses on image processing, video capture, and analysis including features like face detection and object detection.
- Features of OpenCV Library
- Using OpenCV library, you can −
- Read and write images
- Capture and save videos
- Process images (filter, transform)
- Perform feature detection
- Detect specific objects such as faces, eyes, cars, in the videos or images.
- Analyze the video, i.e., estimate the motion in it, subtract the background, and track objects in it.

Anaconda

- Anaconda is a free and open-source distribution of the python and R programming languages for scientific computing that aims to simplify package management and deployment. Package versions are managed by the package management system anaconda[3].
- Anaconda Navigator is a desktop graphical user interface (GUI) included in Anaconda distribution that allows users to launch applications and manage conda packages, environments, and channels without command-line commands.
- Operating system: Windows macOS, Linux

4. Results

Here we implemented an RPI camera and microcomputer base processing unit for detection and recognition of authorized and unauthorized persons using Open CV and Anaconda. The face is detected by a cascade face detector in the acquired images. The result proves that the computer vision-based algorithm is reliable for protecting the vehicle from the modern improve theft techniques.

5. CONCLUSION

From these we implement theft control techniques that will provide the important functions required by advanced intelligent car security, to avoid theft and protect the usage of unauthenticated users. Secured and safe environment system for automobile users and also key points for the investigators can easily determine the hijacked image.

References

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