ANTI-THEFT VEHICLE USING FACE RECOGNITION

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ABSTRACT

The increasing incidents of vehicle theft have highlighted the need for advanced security measures. This project presents a sophisticated anti-theft vehicle system that utilizes facial recognition technology to authenticate and grant access to authorized individuals. Leveraging Python, OpenCV, and the face recognition library, the system captures real-time video from a camera mounted in the vehicle. Authorized personnel's facial features are pre-encoded and stored in a secure database. Upon detecting a face, the system compares it against the stored encodings to verify identity. If a match is found, the system grants access, otherwise, it triggers an alert, denying entry to unauthorized individuals. This face detection and recognition approach provides a robust, contactless security solution, enhancing the vehicle's safety by preventing unauthorized access. The system's effectiveness is augmented by its integration with the vehicle's locking mechanism, ensuring that only verified users can operate the vehicle. This project not only offers a practical application of computer vision and machine learning techniques but also addresses the pressing need for improved vehicle security systems in today's society.

Keywords: Anti-theft, Vehicle Security, Face Detection, Python, OpenCV

I. INTRODUCTION

In response to the increasing threat of vehicle theft, this project introduces an advanced anti-theft system that employs facial recognition technology to enhance vehicle security. Traditional security measures like key-based locks are often compromised, necessitating more robust solutions. Our system utilizes Python, OpenCV, and the face recognition library to capture real-time video from a vehicle-mounted camera, analyzing facial features to verify identity. Authorized users' facial data are securely stored, and upon detection, the system compares the real-time image to the database, granting access only to recognized individuals while triggering alerts for unauthorized attempts. This project exemplifies the application of modern computer vision and machine learning techniques to provide a reliable, non-invasive method of securing vehicles against theft.

II. EXISTING SCENARIO

With current techniques of lock and alarm in the vehicle does not ensure maximum security. That is why there are many cases of vehicle being stolen from places.

According to some stats, four vehicles were stolen from Delhi every hour in 2017, with the total number of such thefts rising to over 39,000 from 36,702 in 2016. Out of the 39,080 vehicles stolen last year, just over 10% (4053) were recovered by police stated in a report by Hindustan times.

With such less chance of recovery, it is very essential to develop a security system inside the vehicle itself so that it can be secured by the system to a good extent.

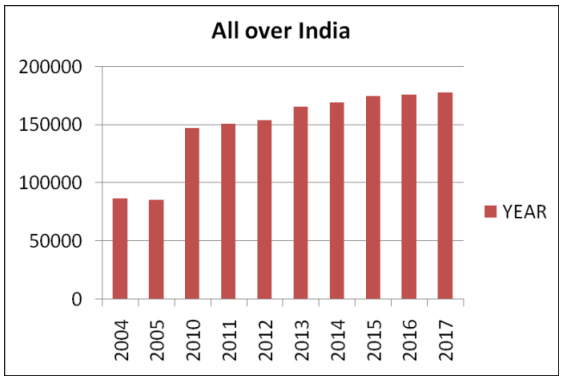


Fig.1. Statistics on Car stealing

Objectives

- Reduce the incidence of vehicle theft by addressing the limitations of traditional lock and alarm systems.
- Increase the chances of vehicle recovery through real-time alerts and deterrence of unauthorized access.
- Leverage advanced computer vision and machine learning techniques, specifically Python, OpenCV, and face recognition.
- Provide a non-invasive and user-friendly method for verifying identity[1].

III. LITERATURE SURVEY

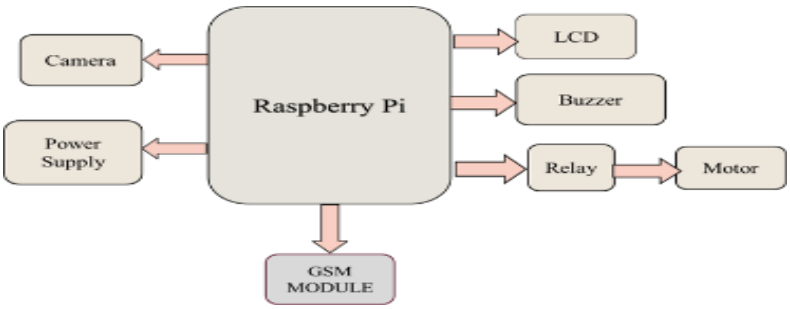
[1] Vehicle Security Systems: Studies and reports highlight the shortcomings of traditional vehicle security systems, such as mechanical locks and alarms, in preventing theft. These systems are often vulnerable to bypassing and manipulation by thieves. Statistics on Vehicle Theft: Statistical data, such as that from Hindustan Times, reveals the alarming rate of vehicle theft, with four vehicles stolen every hour in Delhi in 2017[3].

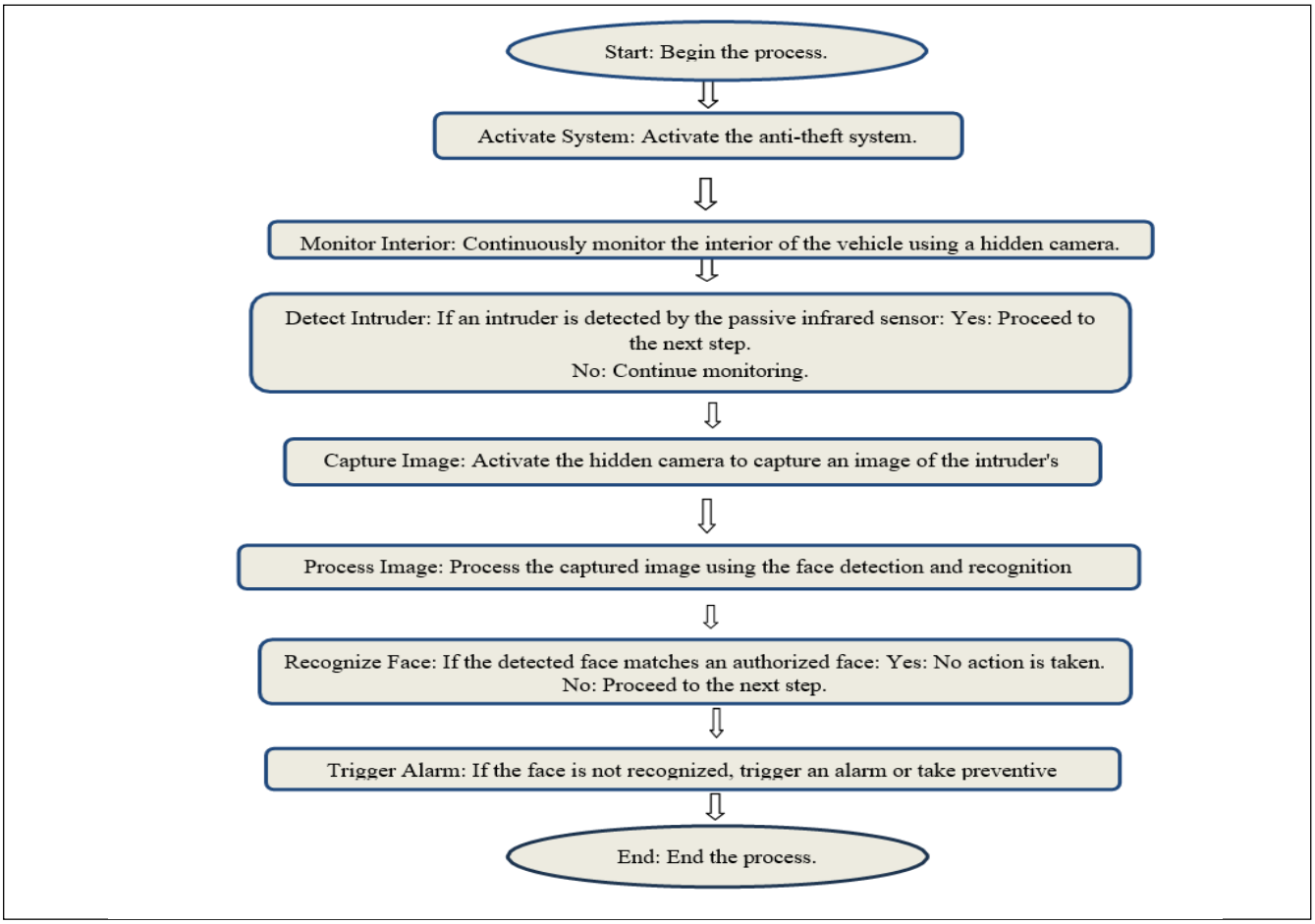
[2] Facial Recognition Technology: Research demonstrates the reliability and effectiveness of facial recognition technology in identity verification and access control. Advanced algorithms enhance the accuracy and efficiency of facial recognition systems. Computer Vision in Security: Computer vision technologies, including OpenCV and machine learning algorithms, play a crucial role in security applications. These technologies enable real-time image processing and recognition, enhancing security systems' capabilities[2].

[3] The proposed system integrates facial recognition technology into a vehicle security system to prevent theft. It uses a combination of image processing control units and microprocessors, with a focus on real-time face detection and recognition.

IV. PROPOSED SYSTEM[4]

In vehicle security system, major concern is to prevent the theft of vehicle and ensure safety of vehicle by avoiding the means of theft. One level of ensuring authentication of driving is through face recognition system that authenticates a user being an authorized person to have access to the ignition system. Face is detected and the recognized image is compared with the authorized image of users in the database.





V. WORKING

The anti-theft vehicle system using face recognition operates as follows: First, it continuously monitors the interior of the vehicle using a hidden camera. When an intruder is detected by the passive infrared sensor, the system activates the camera to capture an image of the intruder's face. This image is then processed using an enhanced face detection and recognition algorithm. If the detected face matches an authorized face stored in the system's database, no action is taken. However, if the face is not recognized or is unrecognized, the system triggers an alarm or activates preventive measures. These measures can include locking the vehicle's doors, sounding an alarm, or notifying the owner or authorities. The system provides a high level of security, using facial recognition technology to prevent theft and unauthorized access to the vehicle.

Face Detection and Recognition

In your anti-theft vehicle system project, face detection and recognition are accomplished using Python and OpenCV The system starts by capturing images or video frames of individuals attempting to access the vehicle using a camera.

OpenCV processes these images by employing basic computer vision techniques to identify and locate facial features. This involves analyzing pixel patterns and distinguishing facial regions based on predefined characteristics, such as edges and contours. Once a face is detected, the system proceeds to the recognition phase, where it compares the detected face against a stored database of authorized individuals. This comparison is done by analyzing unique facial landmarks and features to determine if there is a match. If the system recognizes an authorized individual, it grants access to the vehicle; otherwise, it triggers an alert for unauthorized access. This approach ensures robust security while utilizing fundamental computer vision techniques.

VI. SYSTEM TESTING

Train Database of User

Fig.4. Database of the user having photos of his face

As per the database shown in Fig.4, a user has photos of his face that must be included in the train database set so that his face gets recognized once the system detects it. Here four photos have been uploaded but one can make a database of as many photos as per his/her requirements. The database is not limited to just one person. The user can share his photos with that of his family and friends also.

User would just have to add their face as photos in the same set. The system will automatically detect whose face is getting recognized.

VII. RESULTS

User Recognized

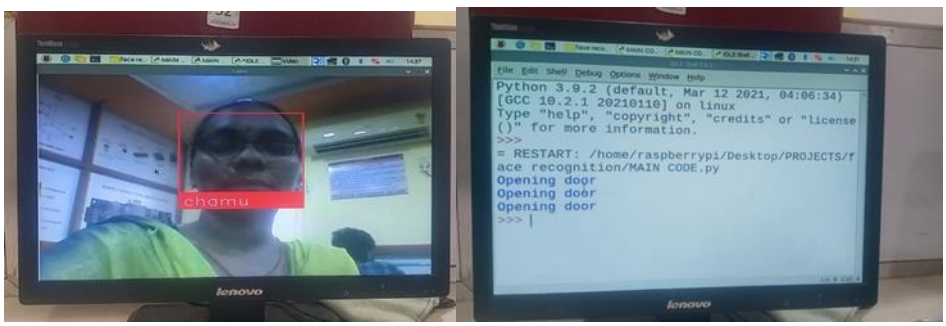


Fig.5. Face recognized according to the database

In Fig 5. the user's face can be seen recognized as per the database and once it is recognized the system shows “verified user” as shown in figure. After the face is successfully recognized then the engine of the vehicle will turn on. This would also happen with other users as well, the only requirement is that the photos of their face has to be included with the primary user in the set.

User Not Recognized

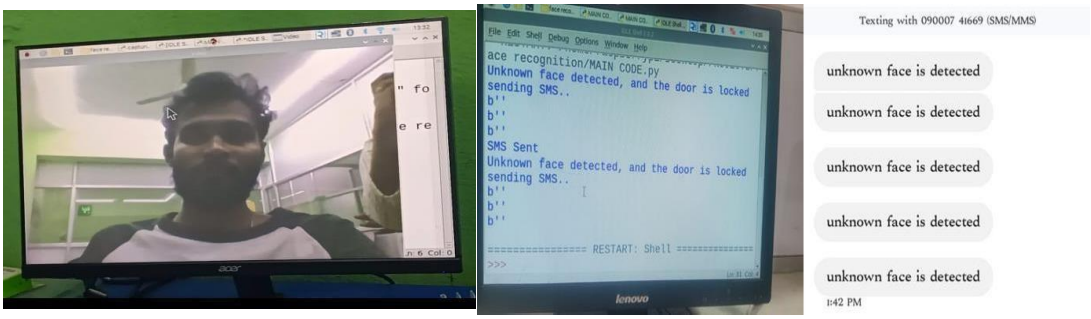


Fig.6. Face does not match with database

If the algorithm detects any theft then it doesn't verify the user and the system will not let the engine of the vehicle turn on. Users having their faces in the database can access the system. If an unrecognized person would try to access the system then it will show “unknown face is detected” as shown in Figure.

VII. CONCLUSION

In conclusion, the anti-theft vehicle system using face detection is a robust and intelligent solution for protecting vehicles from theft. By leveraging face detection algorithms, cellular connectivity, and a relay module, this system provides a secure and convenient way to unlock and lock vehicles. The system's ability to recognize authorized faces and alert owners of unknown faces makes it an effective deterrent against theft. Additionally, the system's modular design and use of off-the-shelf components make it a cost-effective and scalable solution. Overall, this system has the potential to revolutionize vehicle security and provide peace of mind for vehicle owners.

VIII. REFERENCE

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