

# Vehicle Anti-Theft Face Recognition Based Car Ignition System Using Arduino

Ms.Sk. Shabeena.,  
Assistant Professor.M.Tech.,(Ph.D)

B.Akhila, M. Vijaya And K.Manoj Babu  
Dadi Institute Of Engineering & Technology  
Jntugv Univeristy  
Visakhapatnam, India

---

## Abstract:

A fresh and creative approach to car convenience and security is shown by the "Face Detection-Based Car Ignition System" project. Utilizing OpenCV and Haar Cascades, computer vision technology is used in this research to create a reliable and easy-to-use system that improves ignition control and car security. To create an intelligent ignition system that turns on when it detects the face of an authorized driver is the main goal of this project. By employing Haar Cascade classifiers, the system can consistently identify the driver's face, ensuring that the ignition. Not only does this system provide security, but it also makes ignition simple and smooth by doing away with the need for conventional keys or key fobs. Presenting the "Face Detection-Based Car Ignition System" development process, outcomes, and possible use cases, with an emphasis on the innovations in hardware integration and computer vision that have improved security and the automobile industries.

**Keywords:** Face detection system, Haar cascade algorithm, Microcontroller (Arduino)

---

Date of Submission: 28-03-2024

Date of Acceptance: 08-04-2024

---

## I. Introduction

Using a car becomes crucial everywhere in the world, and keeping it safe from theft is equally necessary. Automakers are implementing sophisticated automated technology to enhance these security aspects of their vehicles, with the goal of preventing thefts, especially with regard to automobiles. In actuality, the facial recognition-based car start system replaces the vehicle start by using an explicit client face in place of the key. The auto hardware can be used to achieve both the security concern and the fulfillment of luxurious highlights user's face to the key. The suggested method uses a face recognition-based car ignition system that precisely restarts the car by matching the user's face to the key. Here, we suggest a facial identification system that combines a face tracking algorithm with a Haar cascade classifier and a face detection system. For the simple reason that they are widely used in interactive user interfaces and are essential to machine vision, facial recognition and detection alternatives were taken into consideration. With the help of our technology, persons can be identified without their knowledge thanks to more advanced, user-friendly facial recognition and detection algorithms. Everybody and every industry in this world likes to be up to date with technological advancements. In this regard, the auto sector is like wise not user's face to the key. Here, we suggest a facial identification system that combines a face tracking algorithm with a Haar cascade classifier and a face detection system. For the simple reason that they are widely used in interactive user interfaces are essential to machine vision, facial recognition and detection alternatives were taken into consideration. With the help of our technology, persons can be identified without their knowledge thanks to more advanced, user-friendly facial recognition and detection algorithms. Everybody and every industry in this world likes to be up to date with technological advancement. These days, nearly everyone owns a car. People are quite worried about the cutting-edge technologies used in the automotive sector because buying a car is a significant financial commitment. In order to provide their consumers with cutting-edge features that are easy to use, automakers have seen a significant increase in their technological capabilities as a result of installing automation in their cars. On the other hand, the problems with locking and unlocking the car and turning on and off the engine when the key is lost remain unaffected. It is not unusual for someone to lose the car's key less remote and

have a lot of trouble locking and unlocking the vehicle.

## II. Literature Review

This section provides a summary of both the old and new systems. Even though a lot of technologies for those with visual impairments have been developed in the previous few years, many of these innovations have various constraints and limitations.

Nicolas Morizet [1] In this research, by using the camera in that circuit, this technology allows us to identify the face of the thief. This system provides higher level car security features with theft information by introducing and describing the design of a mobile controller car security system.

Viola P [2] A major computer vision issue that has applications in consumer goods, multimedia processing, and surveillance is face identification. In an effort to detect faces more quickly and with a greater detection rate, numerous novel techniques have been created. The majority of recent work on face detection has concentrated on using Haar-like features to enhance cascades of fundamental classifiers. These systems are thought to be among the quickest since they can detect real-time face detection with very low false positive rates and high detection rates.

Joseph A. O'Sullivan [3] Developments in Security Technologies: Car accidents continue to occur often, especially involving fatalities. Thus, a practical vehicle security system should be effective, durable, and dependable. Conventional vehicle security systems are expensive and rely on a lot of sensors.

The measuring point is used to objectively measure some significant object properties, which are then merged to form a point vector during point birth. The third stage is bracket. In this stage, the decision is simply to determine which order each object belongs to. Thus, photos are the input for pattern recovering a truly missing car. We suggest utilizing facial recognition software for car security.

Mahendra S M, [4] The program for real-time detection of auto theft. The Ada boost method is used to create the architecture utilizing skin color information. The face of the person attempting to unlock the automobile will be detected in the proposed automotive security system video frame, which will be recorded.

Pranali Langde [5] This study describes a real-time car system that uses an integrated computer vision unit and a high-end microprocessor to secure vehicles while they are parked. Improved algorithms are used by face detection and recognition systems for authorized users. The technology will become passively active when someone opens a car door and gets inside. Moreover, the camera will turn on.

## III. Problem Statement

The current system is biometric in nature. The ignition system can be switched on if the fingerprint matches pre-load data, which is detected when a finger is placed over the fingerprint sensor. If the fingerprints do not match, the ignition system cannot be turned on. One drawback is that the systems aren't entirely accurate. It is impossible to change our fingerprints, even if someone manages to figure it out. With a variety of tools, we may also obtain the fingerprints of other people. Therefore, biometric security for cars is not very reliable. Vehicle keys are used to unlock cars, however we can also unlock our cars with our fingerprints. However, car keys could be taken, and fingerprints are not safe since they can be compromised.

## IV. Proposed System

We are developing an Arduino-based car anti-theft system for this suggested system. For facial identification in this, the Haar Cascade Classifier Algorithm is being used. Comparing this method to other kinds, we will get findings that are more accurate. Using the camera, the input photos are captured from the live video, and the video frames can then be transformed into single-frame images. The algorithm known as the Haar Cascade Classifier will examine a set of photos to determine which ones include faces at the moment of recognition. Because this type of technique is quick and efficient, we must first use data sets to save photographs, and then we will train those faces to an algorithm system. It is kept in the database. Following that, the face of the subject will be classified as allowed or unauthorized by the Haar cascade classifier algorithm by comparison with the trained data set. If only those with permission can access the ignition of the car. When an unauthorized person is identified, the engine will not start.

## V. Prototype of Proposed System

The automobile ignition module is managed by an Esp8266 microcontroller. Code is loaded onto the board via the Arduino IDE and requires libraries to function properly for recognition, while object kinds and image

structure analysis are the outputs. The structural analysis is a description of images that allows us to correctly grasp and interpret the key information included in them.

The facial recognition module sends a signal to the microcontroller to regulate the car ignition when the code has been dumped. In order to train the facial recognition module, training images are stored in a different folder. The "Face Detection-Based Car Ignition System" project represents an novel and innovative approach to automotive security and convenience. The facial recognition module's signal is handled by an ESP8266 microprocessor. Its primary function is to employ signals to control the car's ignition. The voltage can be maximized by using a relay module to start the car's ignition. In this case, the camera is used to provide input. A face recognition unit uses a Haar cascade classifier to identify the face after detecting it as a dynamic image. When a face is identified as a particular face, signals are sent to the ESP8266 microprocessor, which controls the ignition of the vehicle. When a face is detected, a microcontroller connected to a USB port receives a command to activate the engine.

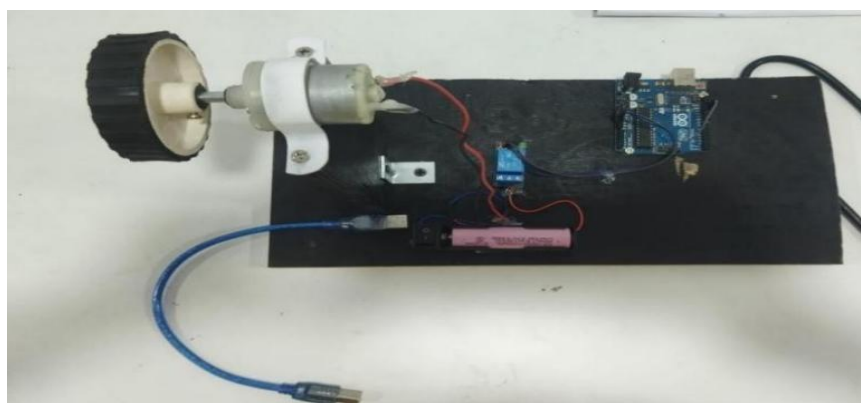


Fig.1 Prototype Design of the Proposed System

### VI. Haar Cascade Classifier

To detect things in photos, an object identification method called Haar Cascade is applied, which is based on characteristics. Several positive and negative photos are used to train a cascade function for detection. The method may operate in real-time and doesn't require a lot of processing power. It makes use of OpenCV and Haar Cascades in computer vision technology to create a dependable and easy-to-use solution that improves ignition control and vehicle security. This project's main goal is to create an intelligent ignition system that turns on when it detects the face of an authorized driver.

The Haar Cascade classifier divides image pixels into squares according to their functions using the Haar Wavelet approach. This computes the "features" observed using "integral image" principles. In order to provide an effective result for classifiers, using a large number of features, the Ada-boost learning method selects a subset of important features for Haar Cascades. Cascading techniques are then used to recognize faces in images. Here are a few oddities:

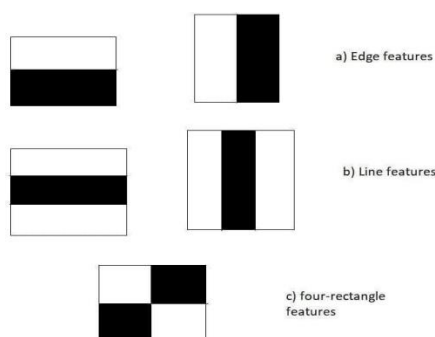


Fig 2: Features used in Haar cascade



**Fig3:Faceidentificationusing Haarcascade**

The system can detect the driver's face with high accuracy by using Haar Cascade classifiers. If the recognized face does not match the authorized driver, the ignition will stay locked. Preventing unauthorized vehicle access and ignition is the goal of this security feature, which tackles a crucial issue in car security. Using the L298 module, the system communicates with a microcontroller to drive a motor. When face detection is effective, the motor turns on and the ignition can be returned on.

This method not only provides security but also convenience by doing away with the need for conventional keys or keyfobs, making ignition smooth and simple. It is an algorithm for object detection that finds faces in images or in real-time videos.

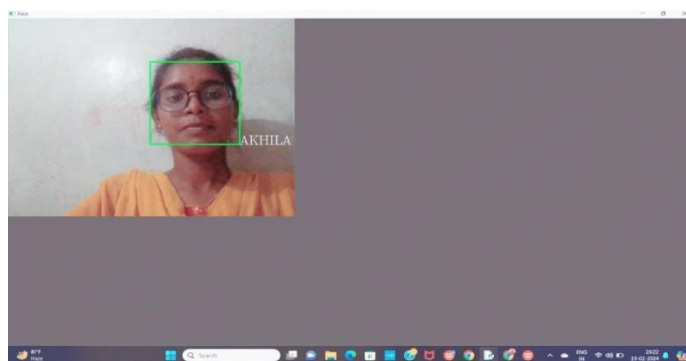
## VII. System Architecture

In this project, an engine locking system for cars is developed using OpenCV (Open Source Computer Vision Library) and Arduino microcontrollers. The principal aim is to augment vehicular safety via facial recognition technology, which will be employed in three essential phases: generation of datasets, training, and identification.

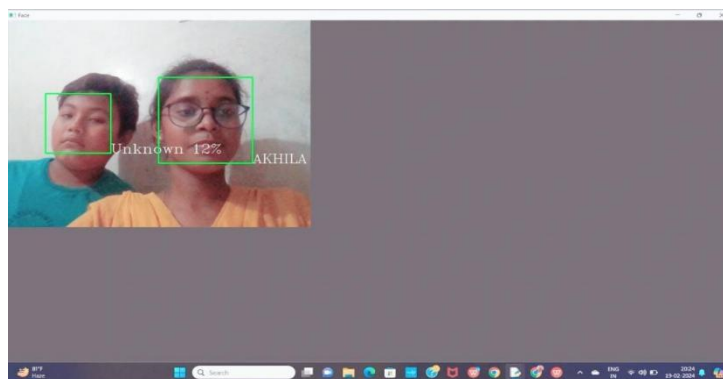
The system recognizes authorized users by facial recognition using OpenCV's Haarcascades. After a successful recognition, the system uses serial communication to connect to an Arduino board and activate a relay, which ignites the DC motor that is powered by a LiPo battery. To prevent unwanted access, the system stays locked in the case that a face is not recognized.

## VIII. Results

When a face is identified, a signal is sent to the microcontroller Esp8266 board as a parameter, which controls the ignition of the car's fixed engine. When face recognition is successful, the car ignition starts the engine; otherwise, the engine is not started. A camera module for facial identification, an Arduino board for processing, and a relay to regulate the car ignition are all integrated into the implementation of an Arduino-based anti-theft face recognition system. The end result is an improved level of vehicle security with a safe car ignition system that only turns on when a recognized face is identified. The outcome yielded satisfactory findings with an accuracy rate of over 89%.



Authorized



Unauthorized

## IX. Conclusion

The photos in this suggested door access system are saved in a database via face recognition technology. Door lock access is used by this system for both commercial and residential usage. Here, we've used Miniature OS to develop an extremely secured door locking system. It will be successfully communicated to those who are worried about the individual detection and the attached details. Face recognition is one of various techniques for recognizing people. That can be achieved with a variety of approaches. Using Eigen faces or PCA are two of the most popular ones. Even so, there are other novel approaches that work just as well and are easier to use and apply. Among those algorithms is the Haar Cascades algorithm. As we demonstrate, Haar Cascades has excellent performance and has a high degree of accuracy. OpenCV has the full door unlocking system in place. Facial recognition technology is used in this CARENGINE access system to enhance security.

## X. Future Scope

The potential applications of an Arduino-based face recognition system for vehicle anti-theft appear bright. It is in line with the increased interest in integrating cutting-edge technologies into automotive systems and improving vehicle security. Improved face recognition algorithm accuracy, integration with additional biometric measures, and interaction with smart car ecosystems are possible future enhancements. Stay abreast on market trends and developing technology to learn about potential project enhancements.

## References

- [1] Jian Xiao And Haidongfeng "An Affordable Expandable Structure For Integrated Smart Vehicle Safety System" Proceedings Of The 2019 Institute Of Electrical And Electronics Engineer International Conference On Networking, Sensing And Control, Okayama, Japan, March 26-29, 2019.
- [2] W. Astuti And E. B. Wahyu Riyandwita, "Voice Recognition Technology Based Automated Engine Starting" 2016 Institute Of Electrical And Electronics Engineer Student Conference On Research & Development (Scored), 2016, Pg. 15, Doi: 10.1109/Sco Red.2016.7810061.
- [3] Xusheng Tang, Zongyingou, Tieming Su, Pengfei Zhao, "Cascade AdaBoost Classifiers For Cellular Phone Embedded Face Detection System With Stage Features Optimization" Advances In Natural Computation, Pg. 688, 2020.
- [4] Pooja And G. V. S. Jyothirmayee " For Vehicle Safety, A Fingerprint-Based Anti-Theft System." International Journal Of Innovative Research In Computer And Communication Engineering, Vol. No.-5, Issue-2, February 2017.
- [5] Mahesh R. P. Imadr. "Iot-Based Embedded System For Driver Surveillance And Vehicle Security", Proceedings Of The 2<sup>nd</sup> International Conference On Inventive Communication And Computational Technologies (Icicct 2018), Institute Of Electrical And Electronics Engineer Explore Compliant -Part Number: Cfp18bac-Art; Isbn: 978-1-5386-1974-2.
- [6] N. Kaushik, M. Veralkar, P. Parab, And K. Nadkarny, "Vehicle Security System That Deters Theft," International Journal For Scientific Research And Development, Vol. 1, No. 12, Pg. 2845-2848, March 2018.
- [7] S. P. Pingat, Shubham Rakhecha, Risha Bagarwal, Sarika Mhetre, Pranayroshan (2016) Using Biometrics, A Real-Time Smart Car Security System. International Journal Of Innovative Technology And Exploring Engineering 2, 2278-3075.
- [8] Joseph A. O'Sullivan, Robert Pless, "Security Technology Advances: Imaging, Anomaly Detection, And Target And Biometric Recognition" Microwave Symposium Institute Of Electrical And Electronics Engineer/Mtt-International Volume, 2017
- [9] Sneha, G. N. And Prasad, G. V., 2023. Face Recognition-Based Car Ignition System. International Journal Of Image Mining, 4(2), Pg. 115-123.
- [10] Nair, A., Patil, V., Nair, R., Shetty, A. And Cherian, M., 2024. A Review On Recent Driver Safety Systems And Its Emerging Solutions. International Journal Of Computers And Applications, Pg. 1-15.
- [11] Kumar, A. And Kumar, A., 2022, August. A Literature Survey Of Drunk Driving Detection Approaches. In Proceedings Of The 2022 Fourteenth International Conference On Contemporary Computing (Pg. 342-349).
- [12] Kaur, G., Sinha, R., Tiwari, P. K., Yadav, S. K., Pandey, P., Raj, R., Vashisth, A. And Rakhra, M., 2022. Face Mask Recognition System Using Cnn Model. Neuroscience Informatics, 2(3), Pg. 100035.
- [13] Hiremani, N., Hasan, M. K., Basavaraju, T. G., Islam, S., Alboaneen, D., Alkayal, E., Alharbi, N. M., Mansor, Z.

- And Amanlou, S., 2022. Artificial Intelligence-Powered Contactless Face Recognition Technique For Internet Of Things Access For Smart Mobility. *Wireless Communications & Mobile Computing (Online)*, 2022.
- [14] Yang, X., Shu, L., Liu, Y., Hancke, G.P., Ferrag, M.A. And Huang, K., 2022. Physical Security And Safety Of IoT Equipment: A Survey Of Recent Advances And Opportunities. *Ieee Transactions On Industrial Informatics*, 18(7), Pg.4319-4330.