International Journal of Latest Engineering Research and Applications (IJLERA) ISSN: 2455-7137

Volume –06, Issue – 11, November 2021, PP – 10-16

# Embedded Based Automatic Vehicle Starter on Face Recognition Using Raspberry Pi

Malathi. L[1], Sreemathi. R[2], Subhashini. E[3], Sneha. M[4]

[1,2,3,4] *Electronics and Communication Engineering, Sri Ramakrishna Institute of Technology, India*

**Abstract:** The goal of this project is to use the Raspberry Pi to create a facial recognition system for car access control. For future generation automobiles, this initiative adds sophisticated security measures. For the envisioned advanced system, the Raspberry Pi will serve as a command module. Only authorized and registered people are allowed to operate the car due to the robust security system. Generally a key is used to unlock and start a vehicle. But in this project demonstrates the unlocking and starting a vehicle using facial recognition. Which not only is efficient but also will help reduce car thefts. Here, the face detection system takes multiple photos of the person and stores this data into its database. While scanning, when the face is detected by the camera the system compares the given face with the images in the database and authorizes the person, if the person is already registered then it starts the vehicle or else identifies the person as invalid user and the buzzer goes on and access is denied and the motor doesn't start. To clear data the user need to use the clear option to clear entire data.

**Keywords:** Raspberry Pi 3 B+, IoT, PCB, VNC Viewer etc.

## I. Introduction

The vehicle security program study and analyses are consistently improving. Many trendy techniques, a well-known as biometric passport campaign, perception processing technique, communication technique thus, have been entire into vehicle security systems with the knowledge and applications of large amount embedded techniques. At the same anticipate, the approach to the vehicles remains valuable. So, one efficient vehicle security program should be sensible, competent and reliable. So, to prohibit vehicles stealing from thieves, owners of the automobiles are facing towards technology as an anti-robbery system. Detecting faces in images is a fundamental task for realizing surveillance systems or intelligent vision-based human computer interaction. To build flexible systems that work in a variety of lighting conditions and run-on mobile phones or handheld PCs, robust and efficient face detection algorithms are required. Appearance-based methods are mainly employed to achieve high detection accuracy.

## II. Existing Work

Hanna Pasula, Stuart Russell, Michael Ostland, and Ya'acov Ritov [5], "Tracking many objects with many sensors". As the number of older Americans increases and many decide to stay in their homes, the need for assistive technologies grows. One such technology is an intelligent system of surveillance cameras. While these systems can provide many services, we attempted to limit ourselves to the evaluation of systems that use cameras to track the locations of objects that may be lost or misplaced within a home. We provide a comparison of the systems that are currently in operation or are being developed and suggest areas where enhancements may produce systems that are more effective. Because few systems exist for the sole purpose of tracking objects in a home, we also evaluate systems that are designed to use multiple cameras to perform general surveillance. We go on to show where some principles of these system can be adapted to improve the performance in the task of tracking objects within a home.

Shrutika V Deshmukh , Prof Dr. U. A. Kshirsagar; [11] "Face Detection and Face Recognition Using Raspberry Pi". Wireless Sensor Networks (WSNs) are used in variety of applications. The amount of power consumed to perform the processing and communications by each node of WSNs will be related to the amount of communications between nodes, the type of applications, the type of processing core used in each node, and the type of components and technology used in the design of each node. One of the challenges associate with using such nodes in remote area is the power supplied to nodes of the WSNs. Although, using batteries could help to support the power of the sensor nodes used for some basic applications and for short period of time. However, using WSN nodes used in some applications such as border monitoring, cannot use batteries and continuous power supply to support such nodes with their working environment. In this research, we investigate this challenge for boarder monitoring application when the WSN nodes used in remote areas where it is not possible to use continuous power supply and batteries for powering such nodes.

  

Zhixiong L. and Guiming H. [12], "A Vehicle Anti-theft and Alarm System Based on Computer Vision & quot; Car and light van thefts are increasing alarmingly around the world and new guidelines driven by the insurance companies, are being set for vehicle manufacturers to make their products more secure. POLLUX has been developed as a vehicle guard against theft and alarm system, this security system based upon machine vision technology acids a new level of theft protection to vehicle security systems in a manner that does not intrusive the drivers. It is based on hardware system, for real time acquisition of driver's images using an active IR illuminator. This system can locate and recognize the driver's face, identify the unauthorized driver. When the unauthorized driver is driving, POLLUX will alarm and send the unauthorized driver's image to car owner or police through CDMA or GPRS networks. The system was tested in a simulating environment with subjects of different ages, with/without glasses, and under different illumination conditions, and it was found very robust, reliable.

## III. Proposed Work

In this proposed system, we develop a system with hardware and software components that would optimize the security of the vehicles. In line with this, the paper aims to achieve the following specific objectives: To install a face recognition system in the vehicle for authentication of engine ignition.

**Advantages**

- The system provides faster face detection.
- Anti-robbery system.
- It improves the security of the vehicle.

**Selection Algorithm**

Start the program
There are three sections they are selection, training, face recognition
Import Open CV2 for image processing import cv2
Start capturing video
Detect object in video stream using Haarcascade Frontal Face
For each person, one face id faceid = 5
Initialize sample face image count = 0
Start looping
Capture video frame
Convert frame to grayscale
Crop the image frame into rectangle.
Increment sample face image
Save the captured image into the datasets folder
If image taken reach 100, stop taking video
Stop video
Close all started windows

  

**Block Diagram**

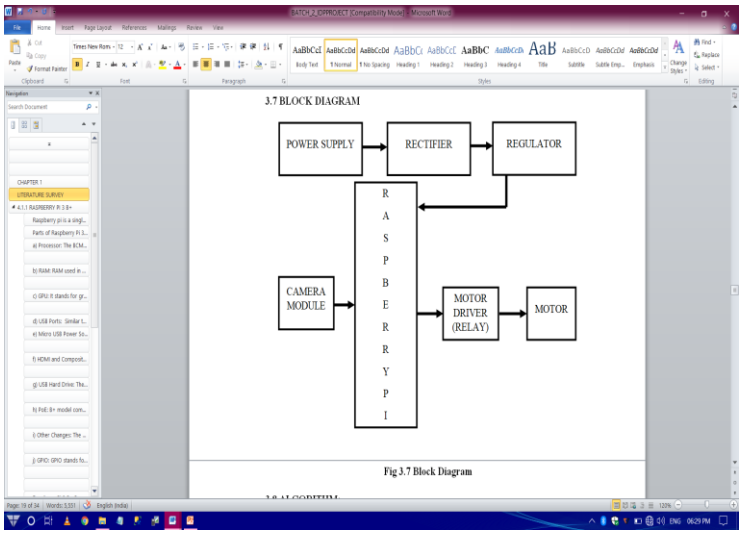


**Fig. 1. Block Diagram**

**Training Algorithm**

Import Open CV2 for image processing
Import os for file path
Import Python Image Library (PAL)
Create Local Binary Patterns Histograms for face recognition
Using prebuilt frontal face training model, for face detection
Create Local Binary Patterns Histograms for face recognition
Using prebuilt frontal face training model, for face detection
Create method to get the images and label data
Get all file path and initialize empty face sample
Loop all the file path
Add the image to face samples
Save the model into the trainer.

**Face Recognition**

Import numpy for matrices calculations
Create local binary patterns
Load the trainer mode
Set the font style
Initalize and start the video frame capture
Looping
Converting captured frame into grey scale
Put text who is in the picture
Check matched or unknown
Stop the camera
End of the program

## IV. HARDWARE AND SOFTWARE DESCRIPTION

**Hardware Description**

Raspberry pi is a single-board computer that contains a System on chip usually called SOC (has a multicore processor, graphical user interface, read-only memory, and input/output peripherals inside it). It is a small device capable of doing most of the things that a desktop computer can do. Raspberry pi 3 B+ has a fast and power-efficient 1.4 GHz processor (1.2GHz in model B) and a faster gigabit Ethernet (it's limited to 300 Mbit/s by the internal USB 2.0 connection) or dual-channel 2.4 / 5 GHz 802.11ac Wi-Fi (100 Mbit/s).

  

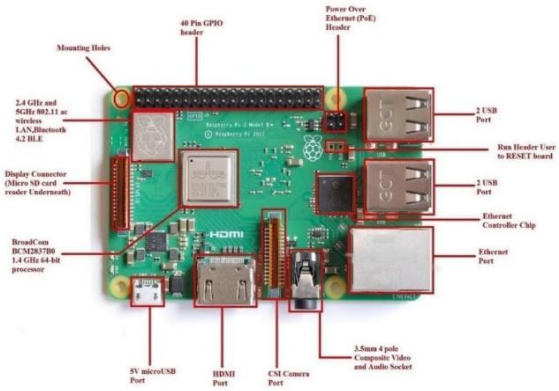


**Fig. 2.** Raspberry Pi 3 B+ Module

GPIO stands for General Purpose Input Output pins these pins are used to connect the Raspberry pi board to external input/output devices. Like the previous model, model B+ also consists of a 40-pin GPIO. A standard interface for connecting a single-board computer or microprocessor to other devices is through General-Purpose Input/Output (GPIO) pins. As these pins don't have a specific function, they can be customized using the software.

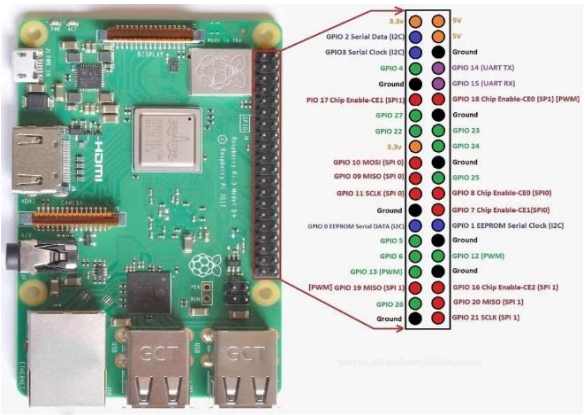


**Fig. 3.** GPIO Pin Diagram

A GPIO pin set as Input reads the signal received by the Raspberry Pi, sent by the device connected to this pin. Any voltage between 1.8V and 3.3V is read as HIGH and voltage lower than 1.8V as LOW by the Raspberry Pi. A GPIO pin set as an output pin sends the voltage signal as high (3.3V) or low (0V). When this pin is set to HIGH, the voltage at the output is 3.3V and when set to LOW, the output voltage is 0V.

## Camera Module

Camera is an input device used to capture either still pictures or motion video of the user. Camera module is an important aspect of our system. The camera captures pictures of the user who comes in contact with the camera and then sends it to Raspberry pi module for analyzing the data.

The 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.

The camera works with all models of Raspberry Pi 1, 2, and 3. It can be accessed through the MMAL and V4L APIs, and there are numerous third-party libraries built for it, including the Picamera Python library. The camera module is very popular in home security applications, and in wildlife camera traps.

**Software Description**

**VNC Viewer**

VNC stands for Virtual Network Computing. It is a cross-platform screen sharing system that was created to remotely control another computer. This means that a computer's screen, keyboard, and mouse can be used from a distance by a remote user from a secondary device as though they were sitting right in front of it.

  

VNC works on a client/server model. A server component is installed on the remote computer (the one you want to control), and a VNC viewer, or client, is installed on the device you want to control from. This can include another computer, a tablet, or a mobile phone. When the server and viewer are connected, the server transmits a copy of the remote computer's screen to the viewer. Not only can the remote user see everything on the remote computer's screen, but the program also allows for keyboard and mouse commands to work on the remote computer from afar, so the connected user has full control (after being granted permission from the remote computer).

VNC was created in Cambridge in the late 1990s by the founders of RealVNC, and was commercialized in 2002 when the company was established. VNC Viewer is used for local computer and mobile devices you want to control from. A device such as a computer, tablet, or smart phone with VNC Viewer software installed can access and take control of a computer in another location.

It is a graphical desktop sharing system that allows a user to remotely control the desktop of a remote computer (running VNC Server) from your device, and it transmits the keyboard and mouse or touch events to VNC Server, so that once you are connected, you have control over the computer you've accessed. If you're using your mobile phone, for example, you would be able to use the computer you've remotely accessed as though you were sitting right in front of it.

### Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

Python is commonly used for developing websites and software, task automation, data analysis, and data visualization. Since its relatively easy to learn, Python has been adopted by many non- programmers such as accountants and scientists, for a variety of everyday tasks, like organizing finances.

### Open CV

Open CV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as NumPy, python is capable of processing the Open CV array structure for analysis. To identify image pattern and its various features we use vector space and perform mathematical operations on these features.

The first Open CV version was 1.0. Open CV is released under a BSD license and hence it's free for both academic and commercial use. It has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android. When Open CV was designed the main focus was real- time applications for computational efficiency.

## V. Results and Conclusion

**Results**

This is the face recognition process which store the face and taken as input.

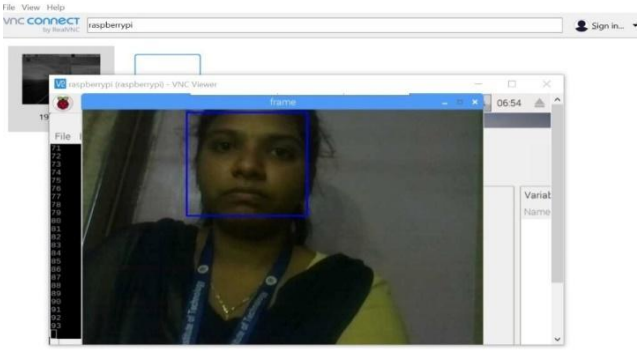


Fig. 4. Face Detection (selection)

  

If the detected face is matched and shows the output matched.

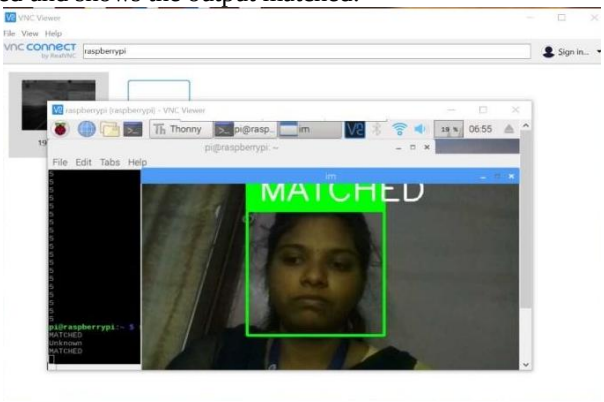


**Fig. 5. Output Matched**

This is the output which shows the unknown face detection.

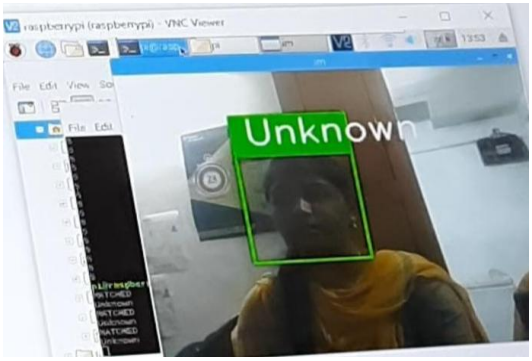


**Fig. 6. Output Unknown**

## Conclusion

From the results obtained in the demonstration it is clear the system provides faster face detection and recognition for owner authentication. Ignition is provided immediately, after owner authentication, for starting the vehicle engine. All the sensors of black box are excellent at performance and provide adequate data to the system for monitoring and accurate information about the status of vehicle is provided to the owner and family. This means that the system fulfil all the expected results and it is fruitful for the user.

## Future Scope

As the actual implementation of the system for commercial purpose is taken in to the consideration the system can be upgraded with advance components. For improving system Performance, best and advance versions of the components used, can be included in the system Advance version refers to Orange-pi for faster processing, high resolution cameras, higher accuracy digital sensors etc.

## Acknowledgements

Thanks to our management and Sri Ramakrishna Institute of Technology, Coimbatore, India for providing necessary support to complete this project successfully.

## References

[1]. Ansari, Aamir Nizam, Mohamed Sedky, Neelam Sharma, and Anurag Tyagi, “An Internet of things approach for motion detection using Raspberry Pi,” IEEE Int. Con. Intelligent Computing and Internet of Things, 2014, pp. 131- 134.

[2]. Christina Ma., Fernandez D., Kristina J. E. G., Aubrey R. M. L., RonJ. J. R., Argel A. B. and Elmer P. D., & Simultaneous Face Detection and Recognition using Viola-Jones Algorithm and Artificial Neural Networks for Identity Verification, pp. 672-676, 2014 IEEE Region 10 Symposium, 2014.

[3]. Dalal N. and Triggs B. 2005. Histograms of Oriented Gradients for Human Detection. In Proceedings of IEEE International Conference on Computer Vision and Pattern Recognition.

  

[4]. Fatima Jabeen A. ,"Development and Implementation using Arduino and Raspberry Pi based Ignition control system" , Advances in Computational Sciences and Technology, Vol 10, 2017, pp.1989-3004.

[5]. Hanna Pasula, Stuart Russell, Michael Ostland, and Ya'acov Ritov, "Tracking many objects with many sensors", Proceedings of the Sixteenth International Joint Conference on Artificial Intelligence, IJCAI 99, Stockholm, Sweden, July 31 – August 6, 1999.

[6]. Ketan J. Bhojane , s.s. Thorat ; "Face Recognition Based Car Ignition and Security System" ;International Research Journal of Engineering and Technology (IRJET) ,Vol 05,may2018 , pp. 2395-0072.

[7]. Kuan-Wen Chen; Chih-Chuan Lai; Yi-Ping Hung; Chu-Song Chen, &; An adaptive learning method for target tracking across multiple cameras; Computer Vision and Pattern Recognition, 2008. CVPR 2008. IEEE Conference on, vol., no., pp.1-8, 23-28 June 2008.

[8]. Liu Z. , Zhang A. and Li S. , &; Vehicle anti-theft tracking system based on Internet of things;, Vehicular Electronics and Safety("ICVES"), "IEEE International Conference" on, Dongguan, 2013,pp. 48-52., doi: 10.1109/ICVES.2013.6619601.

[9]. Mahesh R. P., Imdad R. , &; IoT Based Embedded System for Vehicle Security And Driver Surveillance&;, Proceedings of the 2ndInternational Conference on Inventive Communication and Computational Technologies (ICICCT 2018), IEEE Explore Compliant -Part Number: CFP18BAC-ART; ISBN:978-1-5386-1974-2.

[10]. Pavan.s, Prajwal B A, Krishna G T , Parvez Nadevi, Ramyashree B R ;" Anti-Theft Detection System for Automobiles "; International Journal of Innovations in Engineering and Technology; Vol 10 ,4 july 2018 , pp.2319-1058.

[11]. R. Chellappa, C.L. Wilson, and S. Sirohey, "Human and machine recognition of faces: Asurvey," Proc. IEEE, vol. 83, pp. 705–740, 1995.

[12]. Shrutika V Deshmukh, Prof Dr. U.A. Kshirsagar; "Face Detection and Face Recognition Using Raspberry Pi" ;International journal of Advanced Research in Computer And communication Engineering : Vol 6, 4 April 2017 ,pp.2319-5940.

[13]. Zhixiong L. and Guiming H., "A Vehicle Anti-theft and Alarm System Based on Computer Vision&;, IEEE International Conference on Vehicular Electronics and Safety, 2005. DOI: 10.1109/ICVES.2005.1563666.

  