Visvesvaraya Technological University, Belgaum-590 018

A Project Report

On

"VEHICLE ANTI-THEFT FACE RECOGNITION SYSTEM"

Submitted in partial fulfillment of the requirement for the award of the degree

Bachelor of Engineering

In

Electronics & Communication Engineering

By

Abdul Azeez Saqlain (4RA19EC400)
Pramod M N (4RA19EC405)
Yashwanth H R (4RA19EC411)
Yathish H K (4RA19EC412)

Under the Guidance of

Mrs. REKHA M G
Assistant Professor
Dept. of E&C Engineering,
R.I.T, Hassan

Department of Electronics & Communication Engineering

Rajeev Institute of Technology, Hassan-573201

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RAJEEV INSTITUTE OF TECHNOLOGY, HASSAN

Plot # 1 – D (P-1), Growth Center, Industrial Area,
Bangalore-Mangalore Bypass Road, Hassan – 573201

Department of Electronics & Communication Engineering

CERTIFICATE

Certified that the project work entitled "Vehicle Anti-Theft Face Recognition System" carried out by Mr. Abdul Azeez Saqlain (4RA19EC400), Mr. Pramod M N (4RA19EC405), Mr. Yashwanth H R (4RA19EC411), Mr. Yathish H K (4RA19EC412) are bonafide students of ***Rajeev Institute of Technology*** *in partial fulfillment for the award of* ***Bachelor of Engineering*** *in* ***Electronics & Communication Engineering*** *of the* ***Visveswaraya Technological University, Belgaum*** *during the year 2021-22. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.*

Guide	Project Coordinator	HOD
Mrs. Rekha M G	**Mrs. Rekha M G**	**Dr. Aravind B N**
Assistant Professor	Assistant Professor	Professor & HOD
E&C Department	E&C Department	E&C Department
RIT, Hassan	RIT, Hassan	RIT, Hassan

Principal
Dr. A N Ramakrishna
RIT, Hassan

Name of the Examiners	Signature with date
1 _____	----------
2 _____	----------

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Date:

Place: Hassan

NAME: Abdul Azeez Saqlain (4RA19EC400)

Pramod M N (4RA19EC405)

Yashwanth H R (4RA19EC411)

Yathish H K (4RA19EC412)

DECLARATION

We, **Mr. Abdul Azeez Saqlain (4RA19EC400), Mr. Pramod M N (4RA19EC405), Mr. Yashwanth H R (4RA19EC411), Mr. Yathish H K (4RA19EC412)** students of Eighth Semester B.E, Electronics and Communication Engineering, Rajeev Institute of Technology, Hassan hereby declare that the project report entitled **"Vechicle Anti-Theft Face Recognition System"** has been carried out under the supervision of guide, **Mrs. Rekha M G**, Assistant Professor, Dept. of E&C Engineering, RIT, Hassan, which has been submitted in partial fulfillment of the requirements for the award of the degree of Bachelor of Engineering in ECE of the Visvesvaraya Technological University, Belgaum is an authentic record of my own independent work carried out by me during the academic year 2021-2022.

I further undertake that the matter embodied in this dissertation has not been submitted to any other Organization/University for the award of any degree or certificate.

Date:

Place: Hassan

NAME: Abdul Azeez Saqlain (4RA19EC400)
Pramod M N (4RA19EC405)
Yashwanth H R (4RA19EC411)
Yathish H K (4RA19EC412)

ABSTRACT

This is an advanced system that can be utilized in many cars. Today, it is not difficult to make duplicates of vehicle keys and using such keys increases the risk of robbery. For such problems, we hereby propose an efficient and reliable solution. Our system uses a face recognition system to identify the authorized users of the vehicles and only authorized users are allowed to use the vehicle. This allows for a fast easy to use the authentication system. The system uses a Raspberry Pi circuit, it also consists of a camera. When we turn on the system authority provided by 3 options that are registration, start, and clear data, while registering, it first scans the owner's face. After successful registration, the owner can start the vehicle. If an unauthorized user tries to use the car, the system scans the person's face and checks whether face matches with the authorized face, if it does not match the system denies. In this way, the system helps to secure such intelligent vehicles.

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LIST OF ACRONYMS

- GSM - Global System for Mobiles.
- IOT - Internet of Things.
- SMS - Short Message Service.
- LCD - Liquid Crystal Display
- GPS - Global Position System.
- PC - Personal Computer.
- MMS - Multimedia Message Service.
- FDGA - Field Programmable Gate Array.
- GPIO - General Purpose Input Output.
- HDMI - High-Definition Multimedia Interface.
- DIP - Digital Image Processing.
- USB - Universal Serial Bus.
- CPU - Central Processing Unit.
- CSI - Camera Serial Interface.
- RAM - Random Access Memory.
- LAN - Local Area Network

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In the existing system of car securities, various sensors are used door sensors, engine sensors, light sensors, etc. Where the door sensors are used for locking and unlocking the car doors through suitable key, when any duplicate key is inserted it sends some signals to the controller, however when key is made suitable as the original one the sensor might not be able to differentiate the changes in the system hence resulting in the car theft. The other method to limit this theft is a surveillance pad that is used to monitor the car which consists of RF receiver, processing unit alarm, and display, but the drawback here is this surveillance pad should be carried by the us everywhere.

The engine and door sensors here are not that reliable. In the existing system, the car uses an alarm system where the car makes a sound as soon as a person enters it but once it's lost there is no assurance that we can get it. back, the alarm sometimes gets unnoticed which is the major drawback of the alarm system. The high-end vehicles have a very good level of security however; it is not the case with common vehicles as they have a very low level of security. We as electronics and communication engineers feel that we can add high security to these vehicles at a very low cost thus preventing the thefts. Just by use of face recognition technology this can be achieved in almost every vehicle. We can also use a wide variety of different sensors to increase the security of these vehicles. Today, it is not difficult to make duplicates of vehicle keys and using such keys increases the risk of robbery.

The system uses a face recognition system to identify the authorized users of the vehicles. The authorized users are allowed to use the vehicle. When we turn on the system authority provided by 3 options that are registration, start, and clear data. While registering, it first scans the owner's face. After successful registration, the owner can start the vehicle. Face recognition technology emulates the capabilities of human eyes to detect faces. This is done by smart computing that creates "face bunch" that consists of 70 nodal points. Features are extracted from the face and saved as templates. These templates are compared to the face detected. For this research, we interfaced an LCD, Camera and a Motor to the Raspberry Pi board. We have made a real time application, which compares the scans to records stored in the Raspberry Pi which in turn is used as a gate pass, wherein the name of the detected

person is This project will help us to reduce the complexity and improve security, also much cheaper and smarter than traditional ones.

Experiment results shows that it takes about 6 seconds to detect one 320*240 colour jpeg image by software which is running on Raspberry Pi. It seems to be too long to be used in real-time detection. This paper gives much more solutions with accurate results in user interactive manner rather than existing car security system.

1.2 PROBLEM STATEMENT

In the existing system of car securities, various sensors are used door sensors, engine sensors, light sensors, etc. Where the door sensors are used for locking and unlocking the car doors through suitable key, when any duplicate key is inserted it sends some signals to the controller, however when key is made suitable as the original one the sensor might not be able to differentiate the changes in the system hence resulting in the car theft.

The other method to limit this theft is a surveillance pad that is used to monitor the car which consists of RF receiver, processing unit alarm, and display, but the drawback here is this surveillance pad should be carried by the user everywhere. The engine and door sensors here are not that reliable. In the existing system, the car uses an alarm system where the car makes a sound as soon as a person enters it but once it's lost there is no assurance that we can get it back, the alarm sometimes gets unnoticed which is the major drawback of the alarm system.

1.3 OBJECTIVES

- To create an advanced system that will identify the authorized user of the vehicle using facial recognition.
- To get a basic knowledge on how digital image processing works.
- We hereby propose an efficient and reliable solution, raspberry pi-based face recognition system.
- Our system uses a face recognition system to identify the authorized users of the vehicles and only authorized users are allowed to use the vehicle.
- This allows for a fast easy to use the authentication system. The system uses a Raspberry Pi circuit, it also consists of a camera.

1.4 MOTIVATION

The high-end vehicles have a very good level of security however; it is not the case with common vehicles as they have a very low level of security. We as electronics and communication engineers feel that we can add high security to these vehicles at a very low cost thus preventing the thefts. Just by use of face recognition technology this can be achieved in almost every vehicle. We can also use a wide variety of different sensors to increase the security of these vehicles.

CHAPTER 2

LITERATURE SURVEY

A literature review is an overview of the previously published works on a specific topic. The term can refer to a full scholarly paper or a section of a scholarly work such as a book, or an article. Either way, a literature review is supposed to provide the researcher/author and the audiences with a general image of the existing knowledge on the topic under question. A good literature review can ensure that a proper research question has been asked and a proper theoretical framework and/or research methodology have been chosen.

2.1 LITERATURE REVIEW

1. Real Time IOT based Face Recognition

Syed fasiuddin described "Real Time Application of Vehicle Anti-Theft Detection and Protection with Shock Using Facial Recognition and IoT Notification". This system design and implementation of real time protection and detection of vehicles with help of wireless communication i.e. IOT notification .By doing this project we will provides the implementation of Anti-theft detection and also provides the solution for the theft kind of activities in the vehicles with the help of IOT notification and give the best security system to the authorized person.

2. Facial Recognition Using Raspberry Pi and GPS

Kosalendra Eethamakula have designed "Intelligent Car Anti-Theft System Through Face Recognition Using Raspberry Pi and Global Positioning System" From this, they have implemented theft control techniques that can provide the important functions required for advanced intelligent Car Security, to avoid vehicle theft and protect from the usage of unauthenticated users. A secured and safety environment system for automobile users and also the key points for the investigators can be easily found out with the hijacker's image. Person can predict the theft by using this system in our day-to-day life. This work will help to reduce the complexity and improve security, also much cheaper and smarter than traditional ones. Experiment results show that it takes about 6 seconds to detect one 320*240 color jpeg image by software which is running on Raspberry Pi. It seems to be too long to be used in real-time detection.

3. Anti-Theft Detection Using Fingerprint

Vishal Vitthal Dhamdhere described "Raspberry Pi Based Intelligent Car Anti- Theft System Through Using Fingerprint detection" incorporate fraud prevention strategies that can provide the essential functions provided by advanced smart car technology to deter fraud of vehicles and avoid the usage of unauthenticated users. face recognition, a GPS (Global PositioningSystem) module, IoT based android application and a control platform. In this method user first validates his fingerprint to unlock vehicle door lock. After approved access, user enters in car then camera captures image of user & immediately sends an image of that person with warning notification to the owner's Mobile application along with email and concurrently compares the face to the database to verify whether or not it is a valid driver with the picture of the hijackers, itis possible to figure out a stable and protected area network for car consumers and even the key points for the investigators. By using this method, person can foresee the crime in our everyday lives. This project will help us reduce uncertainty and enhance health.

4. Face Detection and Face Recognition system

Shrutika V. Deshmukh described "Face Detection and Face Recognition" this article focuses on the design and development of an Raspberry Pi, The system can be used in several places like banks, hospitals, labs and other sophisticated automated systems, which dramatically reduce the hazard of unauthorized entry. Evidence can be given to the security department if any robbery issue occurs. The design of the face recognition system using Raspberry pi can make the smaller, lighter and with lower power consumption, so it is more convenient thanthe PC-based face recognition system. Because of the open-source code, it is freer to do software development on Linux. The system was programmed using Python programming language. BothReal time face detection and face detection from specific images, i.e. object recognition, was carried out. The efficiency of the system was analyzed in terms of face detection rate. The analysis revealed that the present system shows excellent performance efficiency and can be used for facedetection even from poor quality images.

5. Vehicle Starter Based on Face Detection

Anap Sachin Dattatray described "Raspberry Pi Based Vehicle Starter on Face Detection" The technology may be employed in a variety of locations, including banks, hospitals, labs, and other sophisticated automated systems, reducing the risk of illegal entrance significantly.If there is a robbery, evidence can be presented to the security department. The Raspberry Pi-

basedfacial recognition system is smaller, lighter, and consumes less power, making it handier than a PC-based system. It is easier to build applications on Linux due to the open-source code. Python was used to create the system.Face detection in real time and face detection from specified photos,i.e., object identification, were both done. In terms of image processing rate, the system'seffectiveness was assessed. The results of the investigation demonstrated that the current method has a high-performance productivity and can be utilized to recognize faces even in low-quality photos.

6. Vehicle Security Using GSM and GPS

Ajish T described "Android board Based Intelligent Car Anti-Theft System Through Face Recognition Using GSM and GPS" implementation of theft control techniques that can provide the important functions required by advanced intelligent Car Security, to avoid vehicletheft and protect the usage of unauthenticated users. A secured and safety environment system forautomobile users and also the key points for the investigators can be easily found out with the hijacker's image. User can predict the theft by using this system in our day-to-day life. This projectwill help us to reduce the complexity and improve security, also much cheaper and smarter than traditional ones. Experiment results show that it takes about 6 seconds to detect one 320*480 colorjpeg image by software which is running on Android board. It seems to be too long to be used in real-time detection, By introducing the mobile app with good GUI will helps to the operation of the proposed system more Convenient.

7. Real Time Facial Recognition

Mr. Raj Rai developed "Survey paper on Vehicle Theft Detection through Face Recognition System" In this paper, a real time security system based on Global System for Mobile(GSM), Global Positioning system (GPS) and FPGA is introduced. This security system is suitablefor a real time monitoring in vehicles and controlling and avoiding the theft with face recognition and detection. In this proposed system, GSM/GPS has been used for sending MMS/SMS and knowing current location of the vehicle. This system makes easy to provide security to vehicle andalso to track the vehicle location. With the adoption of standards and community awareness, this technology will become more and more acceptable to avoid and control vehicle theft.

8. Vehicle Security and Accident Detection using AVR Microcontroller

Priti K. Powale implemented "Car Antitheft System with Accident Detection using AVR Microcontroller" When compared with the existing system the advantage of this proposed system is that we can prevent the vehicle theft by using face recognition. The proposed security system for smart cars used to prevent them from theft using AVR microcontroller. When any authorized person enters into car then access of will be granted and if not then block the car access and the car owner will informed about the unauthorized access with the help Multimedia Message Services (MMS) by using of GSM modem. Also, it can provide password authentication in such case if car owner wants to give emergency access to some user whose image is not recognizable, but still, it gets the access of car. In addition, it can also perform accident detection in order to provide the security to the users. In that case message will be sent to owner of car and nearest police station or hospital.

9. Face Recognition With the Study of Neural Network and Cascade Classifier

Ali Sharifara described "A General Review of Human Face Detection Including a Study of Neural Networks and Haar Feature-based Cascade Classifier in Face Detection" Face detection is an active research area and this technology passed a long way since couple of decades until now. Furthermore, over the last few years have exposed large advances in algorithms which can deal with complex environments. The complex environments are including Gray-scale images with low quality or cluttered background. Some of the greatest algorithms are still too complicated with high execution time and they cannot be applicable for real-time processing, but this is likely to revolutionize with future improvements in computer hardware. In the current study we have presented an extensive review of face detection techniques as well as the combination of two famous haar-like features and Neural Network in a complete system which can decrease the disadvantages of a classifier.

10. Vehicle Security and Notification (Using IOT)

Viraj Parmar developed "Vehicle Anti-Theft Face Recognition System" this particular system we can increase and maintain the safety of the vehicle by providing special programmed functions to it. System uses a face recognition system to identify the authorized usersof the vehicles and only authorized users are allowed to use the vehicle. This allows for a fast easy to use the authentication system. The system uses a Raspberry Pi circuit, it also consists of a camera. When we turn on the system authority provided by 3 options that are registration, start, and clear data, while registering, it first scans the owner's face.

If any unauthorized user tries to use or steel the car the central controller will stop its working immediately and appropriate SMS will be sent to the authorized user through a GSM module. system and much more. If a thief will try to steal our vehicle, we will be immediately informed ofit, through a text message, that someone is messing with our vehicle. Then we can lock our vehicle with a simple click on our smartphone, that means no one can move your vehicle after that. Infact, the accelerator, gear and brake pedals will be locked, so that the vehicle does not move from it's position. Thus with this system, theft of the vehicles can be prevented to a greater extent, which isa very important asset to us and thus leading to a safe society.

11. Anti-theft Security System for Vehicles

Here the system mainly uses two resources, firstly, an android app and secondly, a device, which will be installed in our vehicles. We would be able to control our vehicle using theapp. The functions made in the app will communicate with the device in the vehicle, to control it. But, in order for this system to work, our android phone and the device, should have an internet connection. Thus, as we are using an internet connection for communication, this system has an unlimited range, means we can control our vehicle from any part of the world, as compared to present days, where we use a key to connect to our vehicle from a distance, but that has a limited range. With the help of this system, we can connect to our vehicle from anywhere, anytime, with a simple click on a button in the android app. Moreover, we can discover our vehicle's location, start it, stop it, lock/unlock the doors, disable the use of our vehicle, monitor the alarm security. system and much more. If a thief will try to steal our vehicle, we will be immediately informed of it, through a text message, that someone is messing with our vehicle. Then we can lock our vehiclewith a simple click on our smartphone, that means no one can move your vehicle after that. Infact, the accelerator, gear and brake pedals will be locked, so that the vehicle does not move from it's position. Thus with this system, theft of the vehicles can be prevented to a greater extent, which isa very important asset to us and thus leading to a safe society.

12. Vehicle Anti-theft and Alarm System Using Facing Recognition

In this paper, a vehicle anti-theft system has been developed. When the car is start,this system begins to work, it captures the driver's video images using an active IR illuminator, then locates the driver's eyes and recognizes the driver's face using PCA algorithm. If the current driver is found to be unauthorized by compared his face image with the face images prestored,

This system will alarm and send the unauthorized driver's image to car owner or police through CDMA or GPRS networks. This system was tested in a simulating environment with subjects of different ages, with/without glasses, and under different mumination conditions, and it was found very robust, reliable.

13. Anti-theft control system design using embedded system

Here the system makes use of an embedded chip that has an inductive proximity sensor, which senses the key during insertion and sends a text message to the owner's mobile stating that the car is being accessed. This is followed by the system present in the car asking the user to enter a unique password. The password consists of few characters and the car key number. If the user fails to enter the correct password in three trials, a text message is sent to the police withthe vehicle number and the location tracked using a GPS module. The message is also sent to the owner about the unauthorized usage. Further the fuel injector of the car is deactivated so that the user cannot start the car by any means. At the same time a secret lock system gets activated and the unauthorized user gets trapped inside the car and only the owner who is equipped with the key to the secret lock system can deactivate the mechanism. This technique helps in taking fast steps towards an attempt to steal the. The design is robust and simple.

14. Vehicle Theft Detection using GSM on Raspberry pi

In this project, a compact, cheap and efficient system is studied, designed and explored using Raspberry Pi 3 as the core processing unit of the whole system. We are using the MEMS accelerometer sensor which is placed on the vehicle. First the key is inserting in key slot and it will be detected and if engine of car is started then owner will receive a message indicating that the engine is started using Global System for Mobile communication (GSM). We are also looking to rash driving situation. When driver is driving on high speed and taking dangerous driftit is detected by MEMS sensor placed on car then alert message is sent to the owner. This device functions in two modes which are user mode and theft mode. This paper explores the possibility of a compact, viable, cheap and efficient vehicle theft detection system.

15. Multi-Camera Vehicle Tracking System Based on Spatial-Temporal Filtering

Multi-Camera multi-target tracking is essential in the research field of urban intelligence traffic. It shows that the task becomes challenging due to differences of illumination, angle, and occlusion under different cameras. In this paper, we propose an efficient multi-camera vehicle tracking system, which contains a model trained with multi-loss to extract appearance features, and a filter with spatial-temporal information between cameras. The proposed system includes three parts. Firstly, we generate tracklets in a single-camera with different views by vehicle detection and multi-target tracking. Secondly, we extract the appearance feature of each tracklet through the trained vehicle ReID model. Thirdly, we innovatively propose a matching strategy that calculates several factors, the similarity of appearance features, the time information, and the space information of target ID between adjacent cameras.

16. An automatic anti-theft and keyless solution for vehicles

The automobile industry is a sector that brings together art, innovation, science, technology and ideas that empower the economy, people and the nation as a whole. A great deal of advancement has been done in automobiles, but there is always room for improvement. Security of the vehicle is an essential requirement. The conventional key-turning ignition process has become a hassle as access to the vehicle requires the user to possess the key at all times. In a scenario where the key is unavailable, it becomes very difficult to make use of the vehicle. So, In today's fast-paced technological world, it becomes imperative that a keyless system be built, that would provide the user with ease to operate the vehicle. Considering this, we have developed "FaceIgnition", which is an automatic vehicle ignition system that makes use of face recognition to check authenticity along with providing security against theft and unauthenticated use. It enablesthe user to make use of the vehicle without having the need to keep the key.

CHAPTER 3

METHODOLOGY

3.1 METHODOLOGY

The system consists of Power supply, Camera, Relay, and most importantly Raspberry Pi. The power supply provides necessary power supply to our system, basically to the Raspberry pi. The camera module is attached with the camera module.

It captures photos of the user who comes in contact with it in the car. The captured photos are then sent to raspberry pi, where the photos are analyses with the stored database of users.

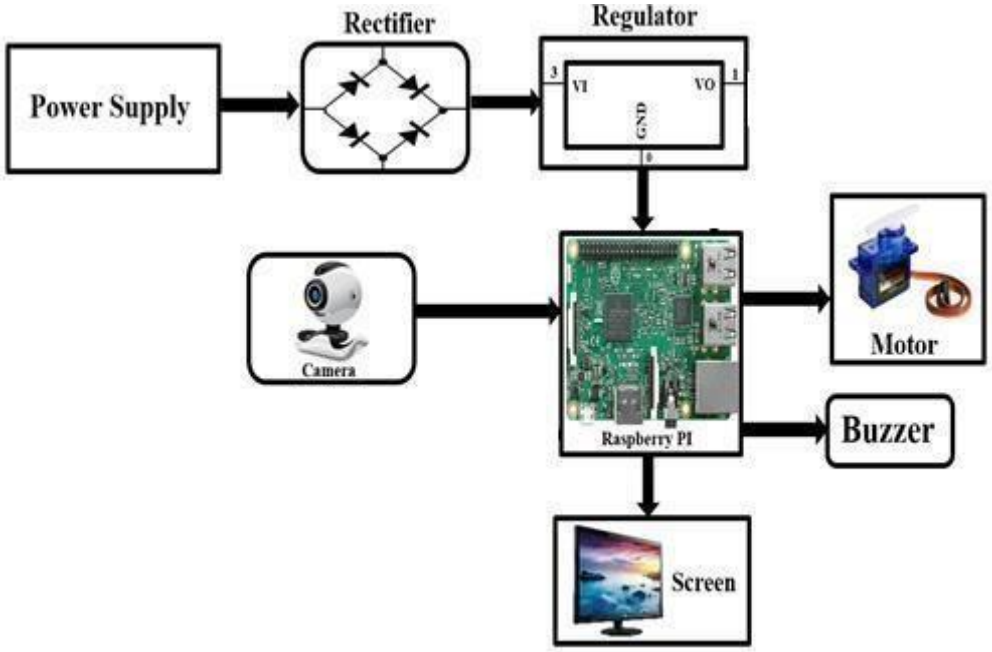

Fig 3.1: Block diagram of methodology

The photo captured is compared with the saved user data, if the image match is found then the user is permitted to turn on the system. If not, then car doesn't start. Today, it is not difficult to make duplicates of vehicle keys and using such keys increases the risk of robbery. System consists of Raspberry pi as the central processing unit that receives the data using a camera.

This hidden camera captures the facial data and sends it to the processing unit for comparison. We maintain a database that contains the facial data as given by the user and cannot be manipulated by any other unauthorized user. CPU generates command that switches off the motor. This restricts unauthorized users to take access to the vehicle The algorithm is programmed in Raspberry pi which helps us to compare camera captured images with database information, it also generates commands to operate other devices/components or other add-ons as defined by the programmer.

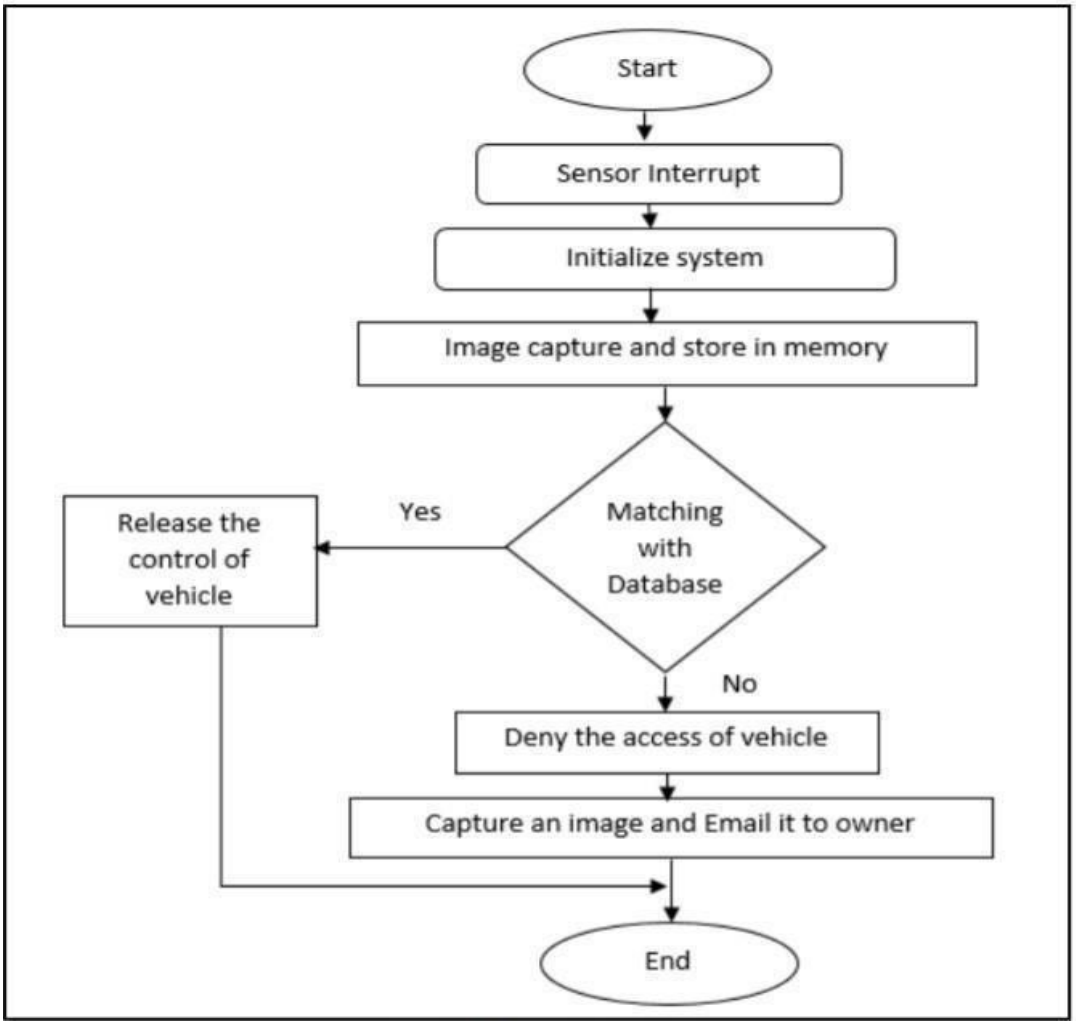

Fig 3.2: Flowchart

3.2 Face Recognition

Face detection works only on grayscale images. So, it is important to convert the colour image to grayscale detect Multiscale function is used to detect the faces. It takes 3 arguments the input image, *scale Factor* and *min Neighbours*. *Scale Factor* specifies how much the image size is reduced with each scale. *Min Neighbours* specifies how many neighbours each candidate rectangle should have to retain it. User may have to tweak these values to get the best results. *Faces* contains a list of coordinates for the rectangular regions where faces were found. We use these coordinates to draw the rectangles in our image.

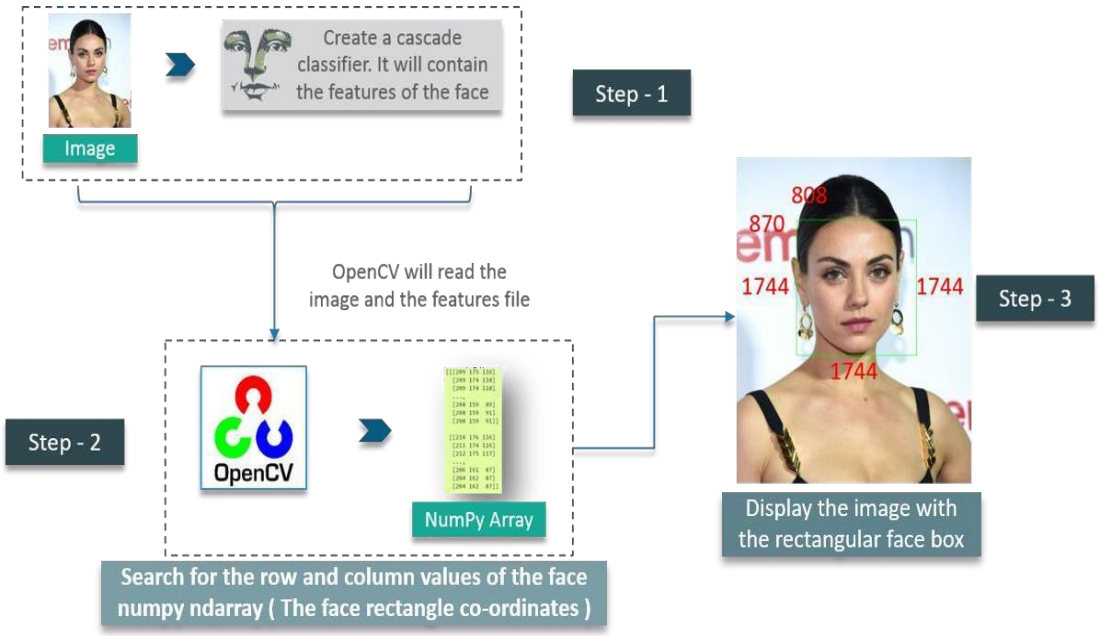

Fig 3.3: Face recognition using Python

Machine Learning Algorithms require inputs to be quantitative in nature, i.e., numerical. OpenCV allows us to apply Machine Learning techniques to images, however, oftentimes we are required to pre-process and prepare the raw images for them to be transformed into features (columns of data) that are useful and usable by our Machine Learning Algorithms.

Adding the rectangular face box

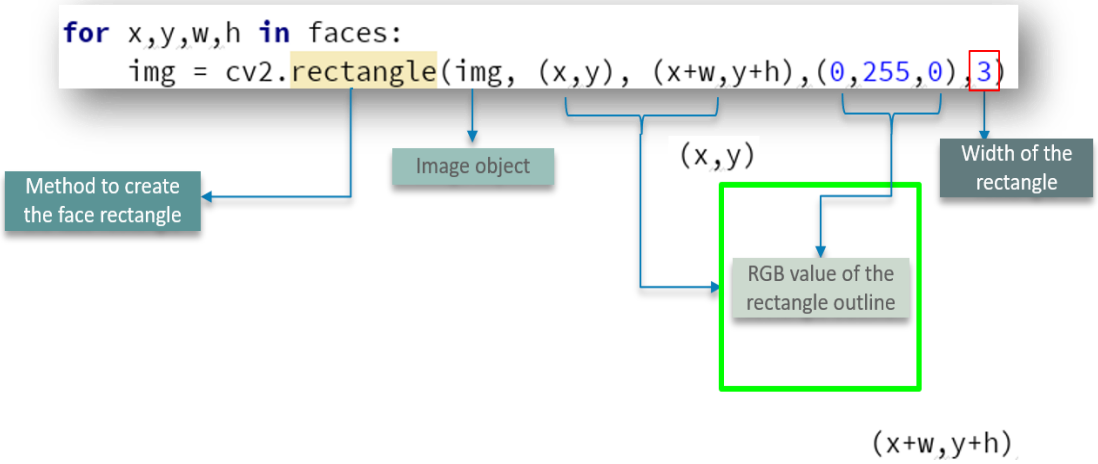

Fig 3.4: Simple code for face recognition

This logic is very simple – As simple as making use of a for loop statement. We define the method to create a rectangle using cv2.rectangle by passing parameters such as the image object, RGB values of the box outline and the width of the rectangle.

3.3 Digital Image Processing

The term "digital image processing" refers to the use of computing techniques to process images. Image processing is a subtype of digital processing, it is thought to have a number of advantages over analog processing. When photos are processed, it usually has a wide range of methods that can be used to reduce concerns like noise build-up or distortion. Images are recognized for having several dimensions, and image processing models have multiple properties as well.

Fig 3.5: Digital Image Processing

Image processing, in general, refers to the process of enhancing an image using various approaches. When software is able to detect and recognize a person based on facial features, it is referred to as a facial recognition system. Facial Recognition modules come in a variety of shapes and sizes, but the comparison of facial traits that are selected individually is the same for all of them. It's an artificial intelligence application that recognizes persons based on their distinguishing characteristics such as shape, colour, or any other distinguishing characteristic. This can be done on a variety of platforms. The technology is frequently employed in cell phones by tech giants these days since it is incredibly efficient and requires little work from the user. This system's security has to be improved because it has problems of its own. It claims to be the most efficient method of security access, with better modules being produced every day. Open CV is used in our project for all image DIP-related processes.

CHAPTER 4

HARDWARE AND SOFTWARE REQUIREMENT

4.1 HARDWARE REQUIREMENT

4.1.1 Raspberry Pi

The Raspberry Pi 4 Model B is the latest product in the popular Raspberry Pi range of single board computers. It offers ground-breaking increases in processor speed, multimedia performance, memory, and connectivity compared to the prior generation Raspberry Pi 3 Model B+ while retaining backward compatibility and similar power consumption. For the end user, Raspberry Pi 4 Model B provides desktop performance comparable to entry-level x86 PC systems. Key features include a high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, hardware video decode at up to 4Kp60, up to 8 GB of RAM, dual-band 2.4 / 5.0 GHz wireless LAN, Bluetooth® 5.0, Gigabit Ethernet, USB 3.0, and PoE capability (via a separate PoE HAT add-on). The dual-band wireless LAN and Bluetooth have modular compliance certification, allowing the board to be designed into end products with significantly reduced compliance testing, improving both cost and time to market.

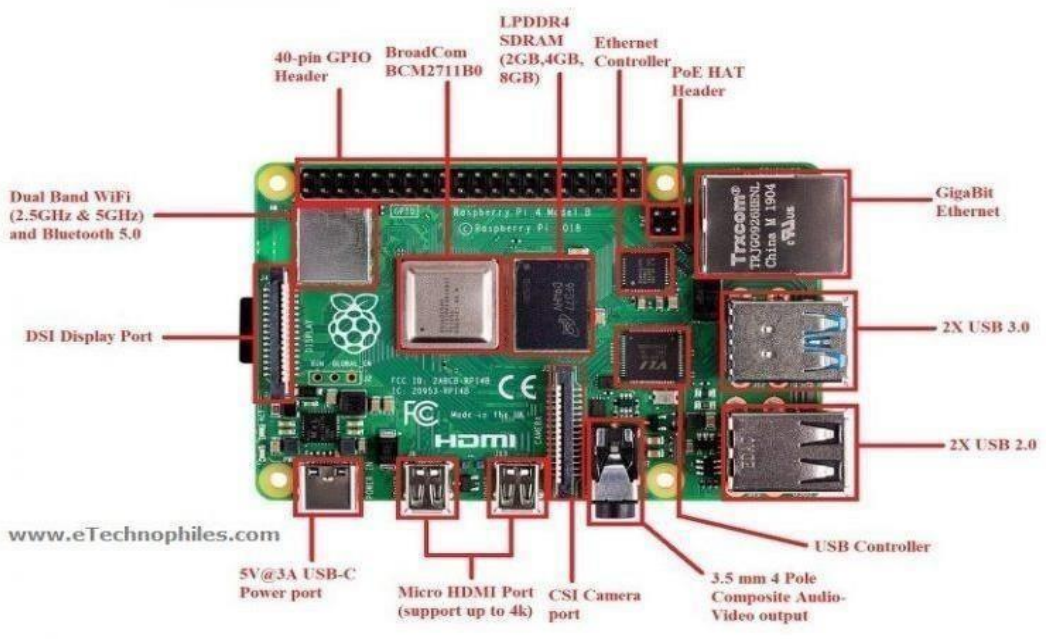

Fig 4.1.1.A: Raspberry Pi

Raspberry Pi is the name of a series of single-board computers made by the Raspberry Pi Foundation, a UK charity that aims to educate people in computing and create easier access to computing education. The Raspberry Pi launched in 2012, and there have been several iterations and variations released since then. The original Pi had a single-core 700MHz CPU and just 256MB RAM, and the latest model has a quad-core CPU clocking in at over 1.5GHz, and 4GB RAM. All over the world, people use the Raspberry Pi to learn programming skills, build hardware projects, do home automation, implement Kubernetes clusters and Edge computing, and even use them in industrial applications. The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a set of GPIO (general purpose input/output) pins, allowing you to control electronic components for physical computing and explore the Internet of Things (IoT).

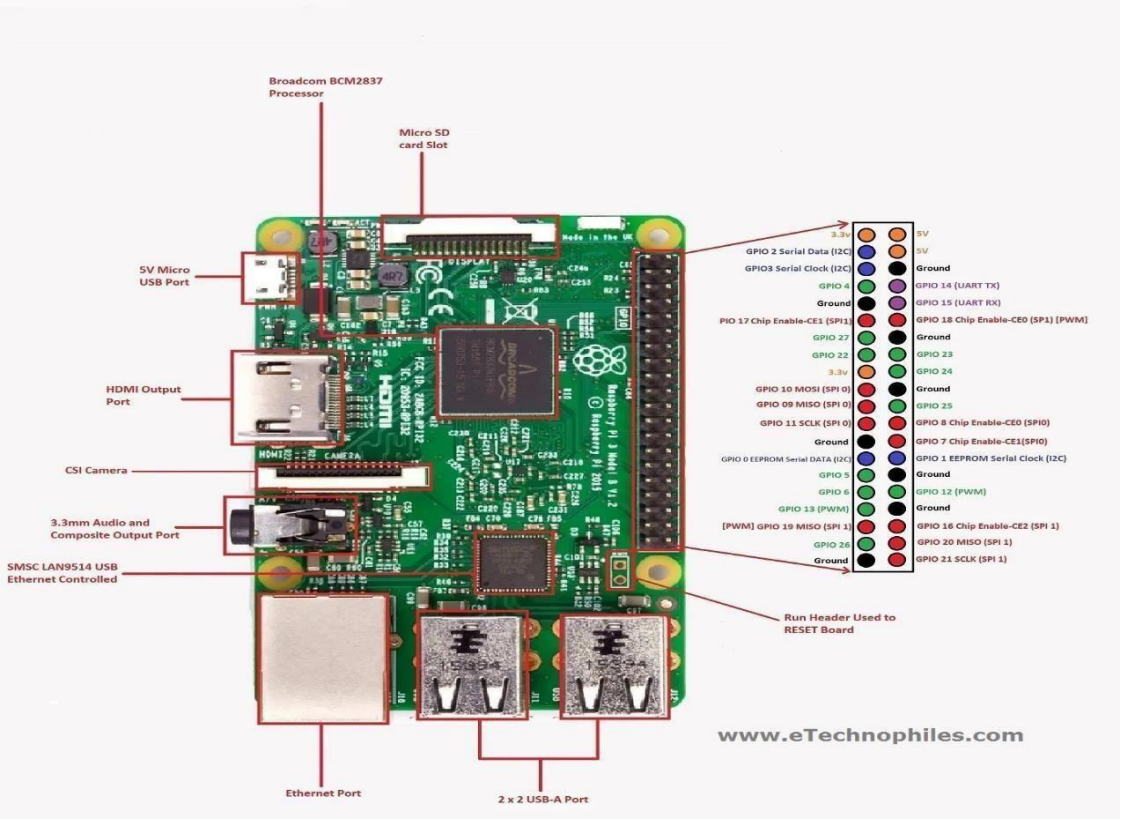

Fig 4.1.1.B: Raspberry Pi Pin Description

The Raspberry Pi 4 **Model B** is a single-board computer developed by the Raspberry Pi Foundation. This board consists of a 1.2Ghz 64-bit quad-core ARM processor and an 802.11n Wireless LAN, Bluetooth 4.1, and Bluetooth Low Energy. Like the previous version (the Pi2) it consists of 1 GB of RAM, 4 USB ports, and full HDMI support.

Specifications of Raspberry PI 4 board:

- Quad-Core 1.2GHz Broadcom BCM2837 64bit CPU
- 1GB RAM
- BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board
- 100 Base Ethernet
- 40-pin extended GPIO
- 4 USB 2 ports
- 4 Pole 3.3mm stereo output and composite video port
- Full-size HDMI CSI (Camera Serial Interface) camera port for connecting a camera
- DSI (Display Serial Interface) display port for connecting a touchscreen display
- Micro SD port
- Micro USB power port (up to 2.5A)
- Size – 85 x 56 x 17 mm

Broadcom BCM2837 is a 1.2GHz 64bit ARM quad-core Cortex A53 processor, with 512 KiB shared L2 cache, dual-core Video Core IV GPU @ 400 MHz supporting OpenGL ES 2.0, hardware-accelerated OpenVG, and 1080p30 H.264 high-profile decode. A powerful feature of the Raspberry Pi is the row of **GPIO** (general-purpose input/output) pins along the extreme right edge of the board. Like every Raspberry Pi chipset, it 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. GPIO pins do not have a specific function and can be customized using software.

4.1.2 POWER SUPPLY

The Raspberry Pi can function on lower current power supplies e.g., 5V @ 1A. However, any excessive use of the USB ports or even heavy CPU/GPU loading can cause the voltage to drop, and instability during use. The latest versions of the Raspberry Pi B+/A+/2 have a “low voltage indicator icon” to notify the user if there is a problem with the power. Although the Raspberry Pi 4 is a versatile and powerful mini-computer capable of a vast array of applications, it’s quite particular when it comes to power requirements. Supply the wrong voltage, and the small but mighty Pi 4 may peter out and struggle to reach its full potential.

Fig 4.1.2: Raspberry Pi Power Supply

4.1.3 CAMERA MODULE

The Raspberry Pi Camera Board plugs directly into the CSI connector on the Raspberry Pi. It's able to deliver a crystal clear 5MP resolution image, or 1080p HD video recording at 30fps! Latest Version 1.3! Custom designed and manufactured by the Raspberry Pi Foundation in the UK, the Raspberry Pi Camera Board features a 5MP (2592?1944 pixels) Omni vision 5647 sensor in a fixed focus module.

The module attaches to Raspberry Pi, by way of a 15 Pin Ribbon Cable, to the dedicated 15-pin MIPI Camera Serial Interface (CSI), which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to the BCM2835 processor.

The board itself is tiny, at around 25mm x 20mm x 9mm, and weighs just over 3g, making it perfect for mobile or other applications where size and weight are important. The sensor itself has a native resolution of 5 me gapixel, and has a fixed focus lens onboard. In terms of still images, the camera is capable of 2592 x 1944 pixel static images, and also supports 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 video recording. The camera is supported in the latest version of Raspbian, the Raspberry Pi's preferred operating system

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Fig 4.1.3: Raspberry Pi Camera Module

The Raspberry Pi Camera Board Features:

- Fully Compatible with Both the Model A and Model B Raspberry Pi
- 5MP Omni vision 5647 Camera Module
- Still Picture Resolution: 2592 x 1944
- Video: Supports 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 Recording
- 15-pin MIPI Camera Serial Interface - Plugs Directly into the Raspberry Pi Board
- Size: 20 x 25 x 9mm
- Weight 3g
- Fully Compatible with many Raspberry Pi cases

4.1.4 SERVO MOTOR

There are lots of servo motors available in the market and each one has its own speciality and applications. The following two paragraphs will help you identify the right type of servo motor for your project/system.

Most of the hobby Servo motors operates from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so make sure you project can live with the half circle if no, you can prefer for a 0° to 360° motor or modify the motor to make a full circle. The gears in the motors are easily subjected to wear and tear, so if your application requires stronger and long running motors you can go with metal gears or just stick with normal plastic gear.

Next comes the most important parameter, which is the torque at which the motor operates. Again, there are many choices here but the commonly available one is the 2.5kg/cm torque which comes with the Tower pro SG90 Motor. This 2.5kg/cm torque means that the motor can pull a weight of 2.5kg when it is suspended at a distance of 1cm. So,

if you suspend the load at 0.5cm then the motor can pull a load of 5kg similarly if you suspend the load at 2cm then can pull only 1.25. Based on the load which you use in the project you can select the motor with proper torque. The below picture will illustrate the same.

Fig 4.1.4.A: Raspberry Pi Servo Motor

To make this motor rotate, we have to power the motor with +5V using the Red and Brown wire and send PWM signals to the orange colour wire. Hence, we need something that could generate PWM signals to make this motor work, this something could be anything like a 555 Timer or other Microcontroller platforms like Arduino, PIC, ARM or even a microprocessor like Raspberry Pie.

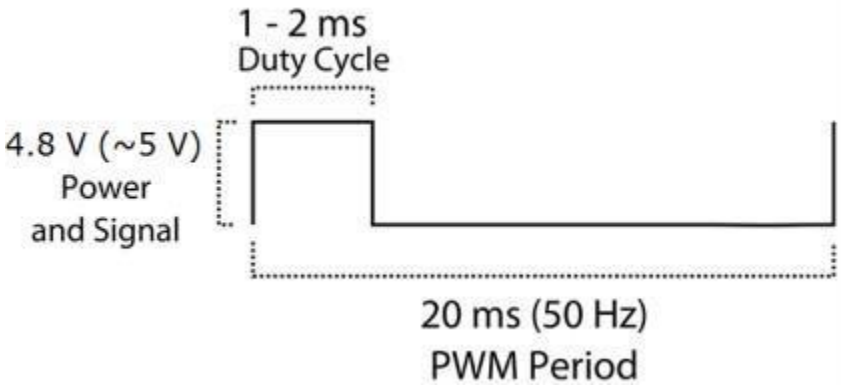

Fig 4.1.4.B: Servo Motor waveform

From the picture we can understand that the PWM signal produced should have a frequency of 50Hz that is the PWM period should be 20ms. Out of which the On-Time can vary from 1ms to 2ms. So when the on-time is 1ms the motor will be in 0° and when 1.5ms the motor will be 90°, similarly when it is 2ms it will be 180°. So, by varying the on-time from 1ms to 2ms the motor can be controlled from 0° to 180°.

Motor Specification:

- 3 pole ferrites, all nylon gear
- Top ball bearing Operating Voltage: 4.8V~6.0V
- Operating speed: 0.12sec/60 degree
- Output torque: 1.6kg/cm 4.8V
- Dimension: 21.5 x 11.8 x 22.7mm
- Weight: 9g

4.1.5 BUZZER

A buzzer is used in the system to alert the people nearby so that they can analyse the situation and take necessary action accordingly. The buzzer is connected to pin 3 of the Arduino Uno. It gets activated whenever alcohol is detected by the MQ3 sensor. Its frequency and tone can be changed and used according to the requirements. Hence, it is an easy and cheap way to alert people and grab attention to point out that something is wrong.

Fig 4.1..5: Buzzer

The motor and the buzzer are connected to BC547transistor which acts as a driver IC. It controls the working of these components based on the voltage that they receive. A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signaling device. A piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed. A conventional Piezo bell works between 3 – 12 volts DC

Buzzers are a simple and inexpensive means of providing communication between electronic products and the user. Piezo and magnetic buzzers are used in similar applications with the primary differences being that magnetic buzzers operate from lower voltages and higher currents than their piezo buzzer counterparts, while piezo buzzers offer users higher SPLs in generally larger footprints.

Buzzers configured as indicators require only a dc voltage to operate but are limited to a single audio frequency of operation, whereas transducers require external circuitry, but provide a wider range of audio frequencies.

Specifications:

4.1.6 Operating Voltage (VDC) 3.5V ~ 5.5V

4.1.7 Maximum Current 30mA / 5VDC

4.1.8 Resonance Frequency 2500Hz ± 300Hz

4.1.9 Driver transistor S8550

4.1.10 Minimum Sound Output 85dB @ 10cm

4.1.11 Working Temperature -20°C ~ 70°C [-4°F ~ 158°F]

4.1.12 Storage Temperature -30°C ~ 105°C [-22°F ~ 221°F]

4.1.13 Dimensions (L x W x H) 29 x 14 x 12 mm

4.1.14 Weight 6 g

4.2 SOFTWARE REQUIREMENTS

4.2.1 Python

Python is a well-known, high- level, and widely useful programming language. Python was created by Guido van Rossum and first released in 1991, enhances code meaningfulness through the prominent use of critical whitespace. Its language advancements and object-oriented methodology plan to help software engineers write clear, consistent code. Python is gradually assembled and garbage collected. It is the foundation of many programming standards, including procedural, object-oriented, and practical programming. Because of its extensive standard library, Python is frequently portrayed as a "batteries included" language.

Python is a programming language with multiple worldviews. article-oriented programming and organized writing applications are fully supported, and a significant number of its highlights support useful programming and object-oriented programming. Expansions uphold a variety of standards, including a plan by agreement and rational programming. Anaconda is open-source distribution of the Python and R programming languages. The distribution includes the Python translator as well as other AI and information science-related bundles. Essentially, the idea behind Anaconda is to make it simple for people interested in those fields to introduce all (or a large portion) of the required bundles with a single establishment.

4.2.2 NumPy

NumPy is the most popular Python package for logical operations. It has, among other things:

- A fantastic N-dimensional cluster object.
- Advanced capabilities.
- Tools for combining Fortran code and C/C++.
- Handy straight polynomial math, Fourier change, and arbitrary number capabilities.

4.2.3 Open CV-Python

Open CV 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.

Computer Vision can be defined as a discipline that explains how to reconstruct, interrupt, and understand a 3D scene from its 2D images, in terms of the properties of the structure present in the scene. It deals with modelling and replicating human vision using computer software and hardware.

Computer Vision overlaps significantly with the following fields

- **Image Processing** − It focuses on image manipulation.
- **Pattern Recognition** − It explains various techniques to classify patterns.
- **Photogrammetry** − It is concerned with obtaining accurate measurements from images.

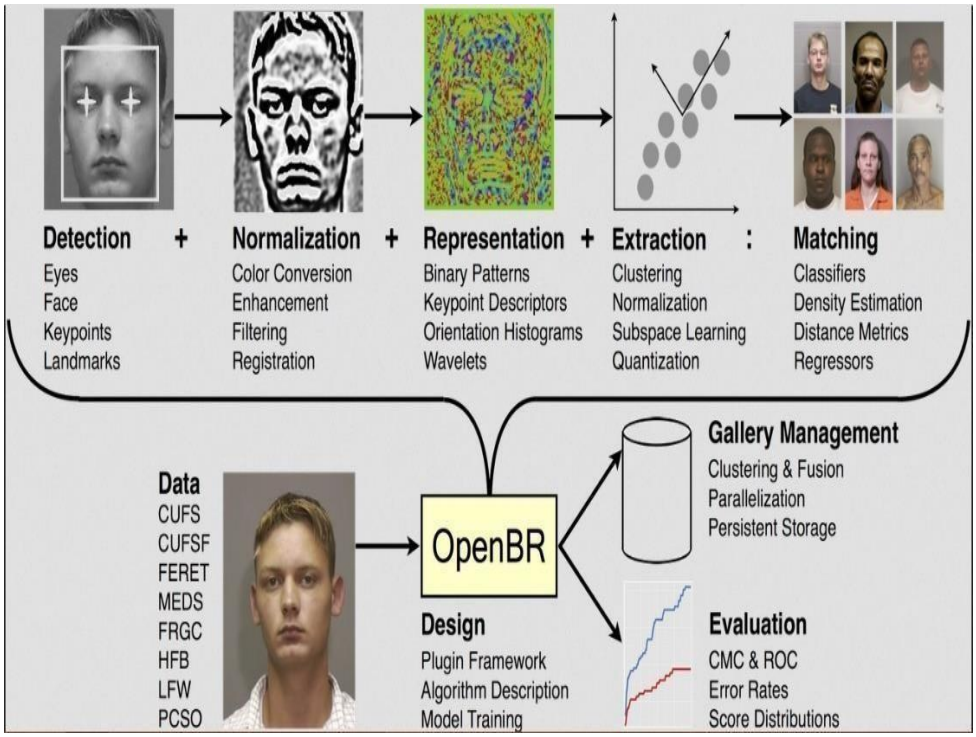

Fig 4.6: Open-Source Face Detection

Python is a general-purpose programming language started by Guido van Rossum that became very popular very quickly, mainly because of its simplicity and code readability. It enables the programmer to express ideas in fewer lines of code without reducing readability. Compared to languages like C/C++, Python is slower. That said, Python can be easily

extended with C/C++, which allows us to write computationally intensive code in C/C++ and create Python wrappers that can be used as Python modules.

This gives us two advantages: first, the code is as fast as the original C/C++ code (since it is the actual C++ code working in background) and second, it easier to code in Python than C/C++. Open CV-Python is a Python wrapper for the original Open CV C++ implementation. Open CV-Python makes use of **Numpy**, which is a highly optimized library for numerical operations with a MATLAB-style syntax. All the Open CV array structures are converted to and from Numpy arrays. This also makes it easier to integrate with other libraries that use Numpy such as SciPy and Matplotlib.

Recently various methods for a local feature extraction emerged. To avoid the high-dimensionality of the input data only local regions of an image are described, the extracted features are (hopefully) more robust against partial occlusion, illumination and small sample size. Algorithms used for a local feature extraction are Gabor Wavelets, Discrete Cosines Transform and Local Binary Patterns. It's still an open research question what's the best way to preserve spatial information when applying a local feature extraction, because spatial information is potentially useful information.

CHAPTER: - 5

ADVANTAGES AND LIMITATIONS

5.1 Advantages

- Compared to normal central locking security systems, our face recognition system, is more reliable and secure.
- If an unauthorized person tries to access the vehicle, the system will alert the vehicle owner.
- More convenient, sensed as soon as one is seated in position.

5.2 LIMITATIONS

- As the face recognition system is 2D(dimensional), it can be fooled by images of the authorized person.
- The face recognition system may not work as intended in the dark.

CHAPTER: - 6

RESULT AND DISCRIPTION

This chapter elaborates the details of the results which have been yields through the implementation of project. The outcomes of this project is to create an advanced system that will identify the authorized user of the vehicle using facial recognition

Step 1: Capturing the authorized person's image

Capturing the authorized person's image: The authorized person's face will be captured and stored in a folder along with his/her name.

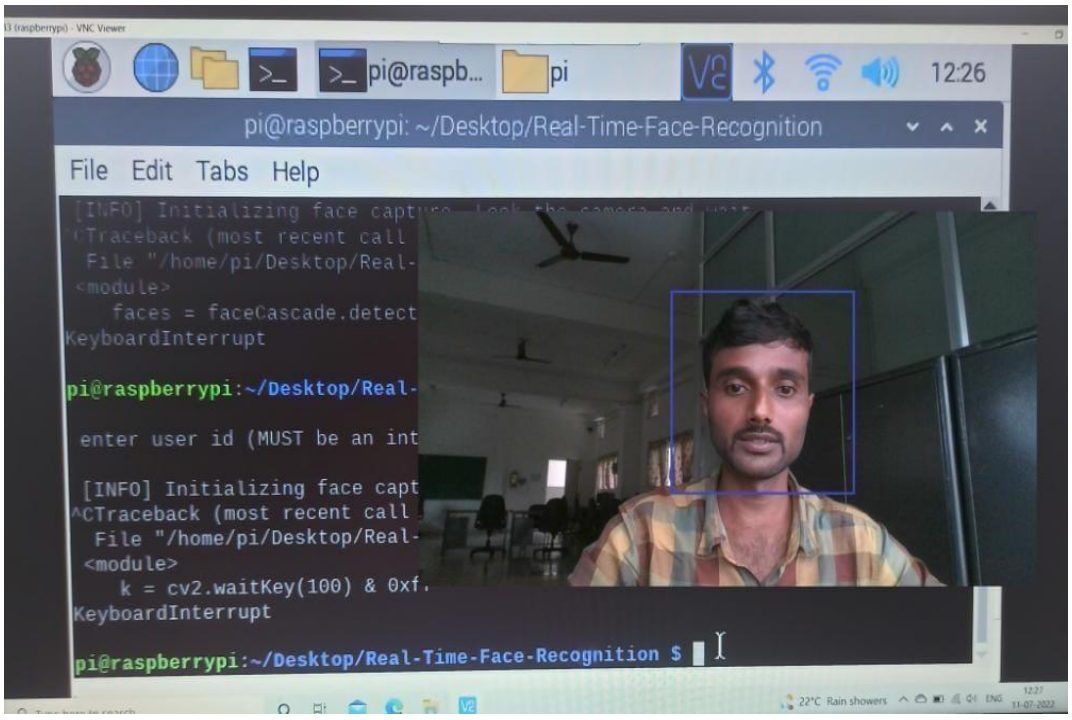

Fig.6.1: Capturing the authorized person's image

Step 2: Processing the captured images for facial recognition

Processing the captured images for facial recognition: The captured images will be trained based on KNN Algorithm to find the most accurate face using open CV library files.

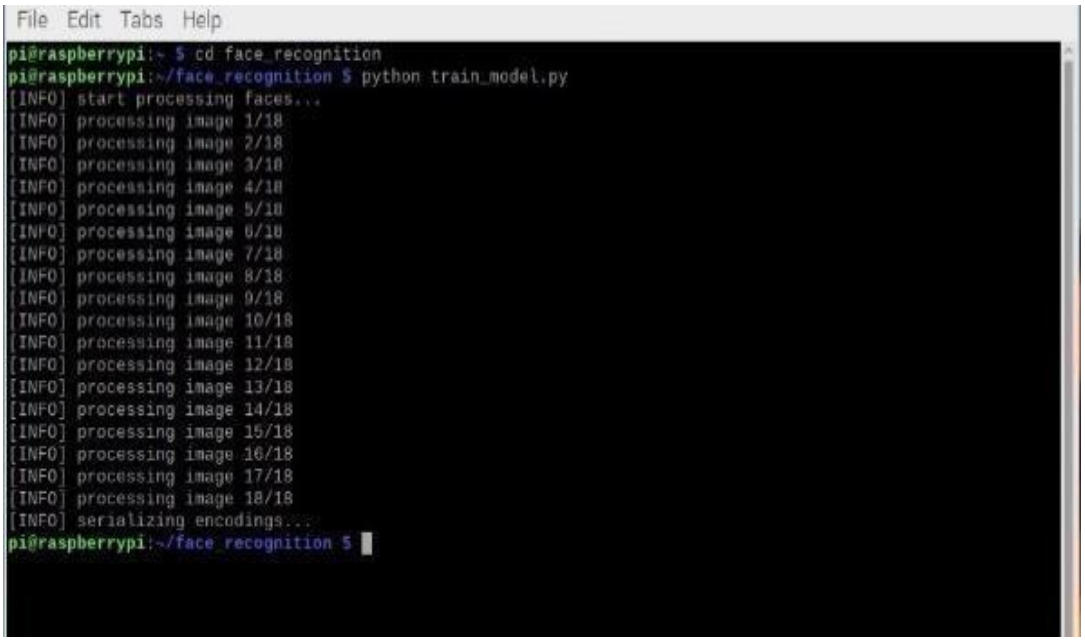

Fig.6.2: Processing the captured images

Step 3: Recognizing the face

After training the model the system will recognize the face and display it on the screen if it is an authorized persons face.

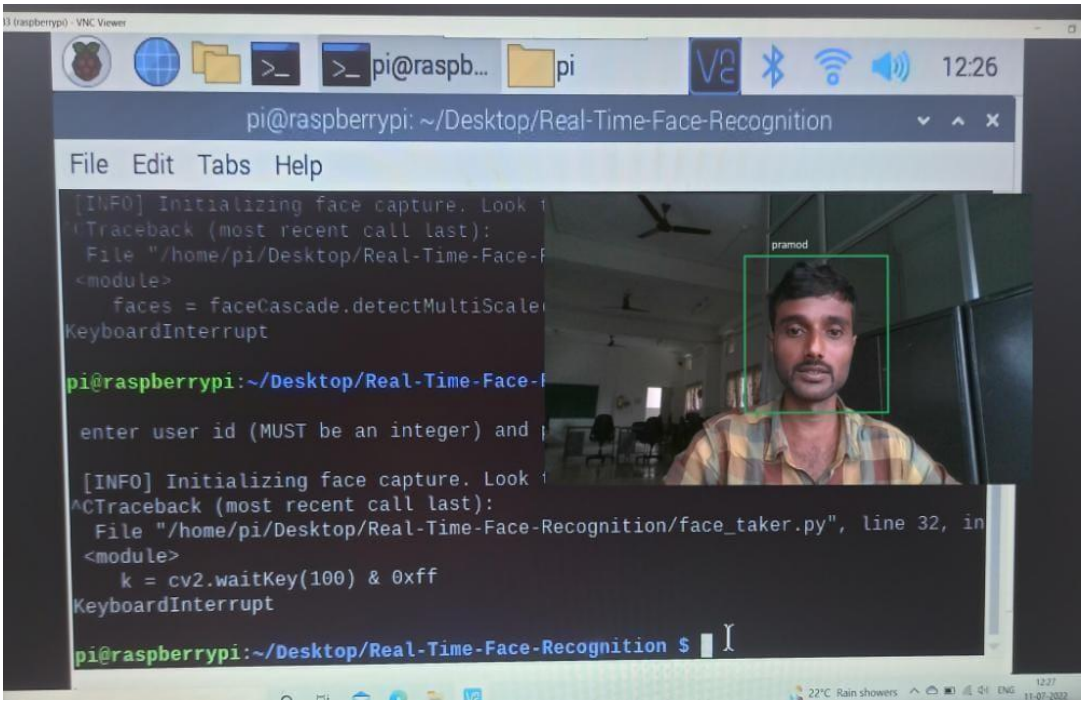

Fig.6.3: Recognizing the face

Step 4: Recognizing the Unknown person face

If it displays the unauthorized persons face it shows the unknown on the screen and Buzzer will be ON and Sends the message to authorized person.

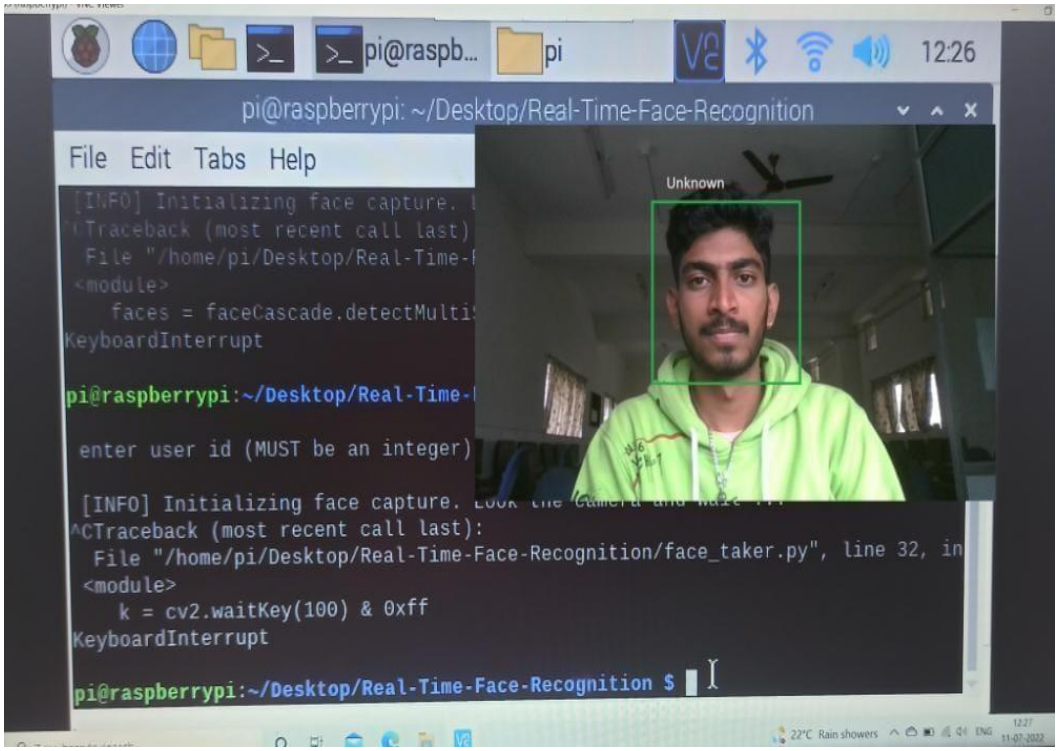

Fig.6.4: Identifying the unknown person face

CONCLUSION AND FUTURE SCOPE

CONCLUSION

The Proposed Face-Recognition system consists of a Raspberry Pi board, a camera, motor, and a buzzer, it automatically captures the face of the person as the car is beginning and checks to see if the person is authenticated by comparing their face to a database. So, if the person is authorized, he can start the car, if not the buzzer starts ringing, indicating he is an unauthorized person. If the face recognition system fails to recognize the face due to bad lighting or any other reason, can use a pin code to start the vehicle. This approach makes thief identification simply smarter, cheaper, and more difficult to defeat than conventional ones.

FUTURE SCOPE

As the technology is Evolving. so, many new methods for attacker are there, for that we need to utilize some different technology to implement counter methods to safe guard our vehicles privacy from the attackers.

Whenever the attackers try to misbehave with the system for that we are upcoming with the new method of protecting of vehicle from attacker

As we have saved the data of face in our database likewise the face recognition would also be saved in our database. This new feature will give our vehicle a new security system for the user.

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NAME: **Abdul Azeez Saqlain**

USN: **4RA19EC400**

Phone No.: **8747954313**

E-mail: **abdulazeezsaqlain@gmail.com**

ADDRESS: **Abdul Azeez Saqlain S/O Mohammed Hyder, 1st Cross Sunni Chowk , Arsikere(Taluk),Hassan(Dist.) Karnataka-573103**

NAME: **Pramod M N**

USN: **4RA19EC405**

Phone No.: **8971123503**

E-mail: **pramodmn18@gmail.com**

ADDRESS: **Pramod M N S/O Nataraj M G Shanakaranahalli (Village), Palya(Post),Alur(Taluk), Hassan (District), Karnataka (State) Pin No - 573218**

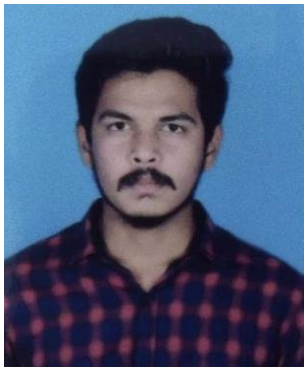
NAME: **Yashwanth H R**

USN: **4RA19EC411**

Phone No.: **7676140255**

E-mail: **yashugowda1527@gmail.com**

ADDRESS: **Yashwanth HR S/O Ravigowda, ward No. 35 #117 K Hossakopplu, HN pura road, Hassan, Karnataka- 573201**



NAME: **Yathish H K**

USN: **4RA19EC412**

Phone No.: **9663905244**

E-mail: yathishhk011@gmail.com

ADDRESS: **Yathish H K S/O Kantharaju, Halekote mavinakere (p), Holenarasipura(tq), Hassan (Dist),Karnataka-573211**