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Automatic Door Lock System Using Face Recognition

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Abstract: ***In this paper we've proposed face recognition door cinch system using jeer pi for security purpose. Perpetration of the system is for covering whether any unknown person is entering in to the door. In order to get accurate and clear picture of an meddler we've proposed Haar Cascade system for face discovery. As soon as the person enters near the door, pi camera captures the image and face discovery process is done also if it matches with database images also the door is uncorked else a communication with the picture of a person will be transferred to the registered mobile through LAN network. The main aphorism of this design is to application of detector with the combination of bedded outfit for the door opening systems. The main purpose of this system is to give better security by using face recognition fashion.***

I. INTRODUCTION

Currently, as the technology is adding, installations for mortal beings are adding. In day to day conditioning, life of people has come veritably easier with the objectification of numerous technologies.. This type of approach is nothing but where conduct can be taken incontinently as soon as a security trouble occurs. Hence a smart IOT grounded face recognition system is the idea to develop, which recognizes the face of the person near by the door and compares with the uploaded faces stored in the database. On the additional hand, it also creates security issues. In overall, in order to protected home, people kind use of CCTV. Images will store trendy the database, so that the act can be taken when any guarded incident happens. This type of approach is a unresistant. But there's a need for an active approach. If person is detected also the door would open and welcomes them. However, the proprietor would be advised by communication and correspondence with an meddler image, If an unknown person enters. To develop this system, we've used servo motor, servo motor controls the function of opening and ending of the door. Further revision in the system moved to biometric security system to insure better security. Biometric security system includes point grounded system was the first biometric locking system. Using the fingerprints of a person for unleashing the door is main parameter for this system. Still, like any other systems, they also have downsides. Fingerprints of a person can be duplicated. This can main to opening of the door for unofficial person. Eventually exploration moved to image processing system. This system provides high security.

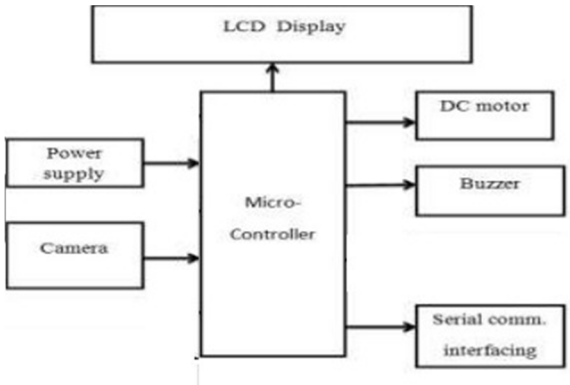


Figure1. Overall block diagram of automatic door access system using face recognition

This module is used in order to shoot dispatches to the registered mobile number. When a person wants to pierce his locker, originally at the main door of locker and detector will be placed. This detector will smell the body temperature of a person, standing near the door. And also, his/ her image will be captured by the camera installed at the main gate. This image will be given to the PC where the MATLAB software will compare this image with the authentic images stored in the PC If authentic, also only he door will open else it'll remain unrestricted and the alarm will buzz for farther action near the door for recognition of face.

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II. LITERATURE REVIEW

In this design we using one camera which is identify a proprietor of home and open the door in many second. However, we not suitable to go home that we need someone how take watch our love bone's but then is problem how go inside the home because face recognition system that time we use alternate option the system well shoot announcement to proprietor told some stand out of door or the person call proprietor how to get inside the home by enter OTP, If in home kiddies or aged age's in home need further attention and care that time. From decades, for wisdom society using of smart home isn't a new term. As there's an advance in technology there's a fast increase in the field of home security robotization. The control of smart systems for automatic door cinch system is done through Bluetooth, internet etc. Utmost of the laptops, tablets, mobiles have erected-in appendages which in turn reduce the cost of the system, but it controls within the Bluetooth range. The system which is grounded on SMS technology have only one

A. CNN Algorithm

In neural networks, Convolutional neural network (ConvNets or CNNs) is one of the main orders to do images bracket. objects findings, recognition faces etc., are some of the areas where CNNs are extensively used. Technically, deep literacy CNN models to train and test, each input image will pass it through a series of complication layers with pollutants (Kernals), pooling, completely connected layers (FC) and smear soft max function to classify an thing with probabilistic values between 0 and 1. The below figure is a complete inflow of CNN to reuse an input and classifies the objects grounded on values.

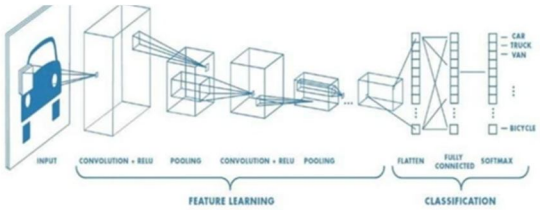


Figure 2. CNN Algorithm

Equations

Machine learning cnn , in short, the answer is as follows:

Output height= (input height + padding height top + padding height bottom – kernel height) / (stride height) +1.

B. Har-Cascade Classifier

Object detection using Haar feature based cascade classifiers is an efficient object detection method proposed by Paul Viola and Michael Jones!". it's a machine education founded style where a cascade meaning is trained from tons of positive and negative images. It is then used to notice objects in other pictures. Here, we are working with face detection. Initially, the algorithm needs tons of positive images (images of faces) and negative images (images without faces) to coach the classifier. Then we'd like to extract features from it. Features are nothing but numerical information extracted from the pictures which will be wont to distinguish one image from another.

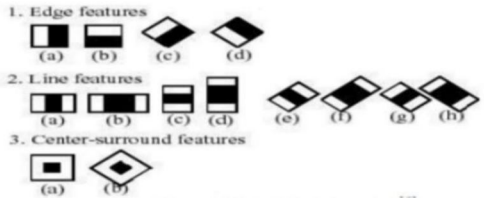


Figure 3. Different types of features

Figure 3 shows different Haar features. A simple blockish Haar like point can be defined as he differences of the sum of pixels of areas inside the cube, which can be at any position and Scale within the original image. A Haar-suchlike point considers bordering blockish regions at a specific position in a discovery window, totalities up the pixel intensities in each region and calculates the difference between these totalities. First, the pixel values inside the black area are added together also the values in the white areas are added. This result is used to classify image sub regions. An illustration of this would be the discovery of mortal face. Commonly the areas round the eyes are murkier than the areas on the cheeks!). One illustration of a Haar like point for face discovery is thus a set of two bordering blockish areas above the eye and impertinence region.

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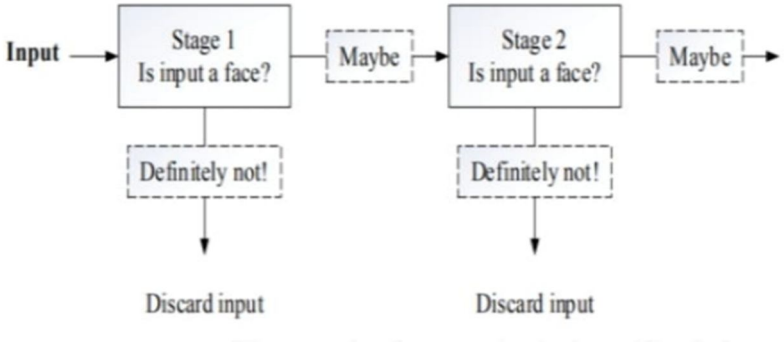


Figure 4. Har-Cascade Classifier

C. Proposed System

After preprocessing like resizing and cropped images, Haar waterfall classifier is used to descry whether there's a single face detected or not. Figure 4 demonstrates the flowchart for the proposed system. Edge, line, and center compass are the features of Haar which are acting as inputs. By these waterfall features the test of the image is done. The features of Haar are divided into colorful different stages. Stage thru stage the window will be tested. Generally original stages will have lower Haar-such like features. However, also it's to be discarded and the coming stages won't be tested, If the first stage window fails. However, 12, 13, If all the stages successfully passes also it's considered to be face is detected and checks with the images formerly stored in database of jeer Pi (9. The advantage of Haar waterfall classifiers is fast discovery speed compared to other classifiers.

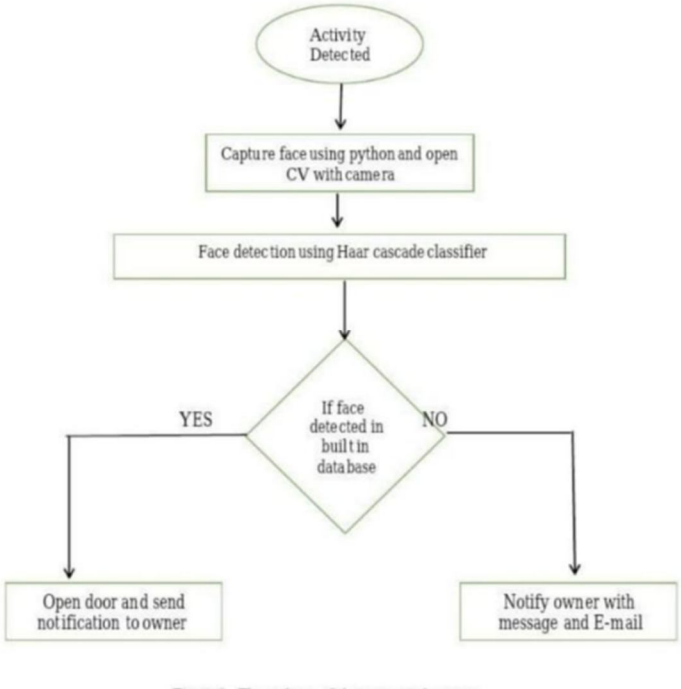


Figure 5. Flowchart of proposed system

D. Methodology

The first task is to gather the data for which we're going to train our classifier. We'll write a python law that will take 30 faces of each person using OpenCVpre-trained classifier. When the person press the button, the enforced law now called using the camera, system prisoner the image sequence and compare this image with database. However, also in operation module get the signal to the door, If the image is match. In this design, for face discovery and identification we're using machine literacy, deep literacy and python. For honor face we using camera and for controlling the locking system we are using nodemcu and all modules integrated through garçon.

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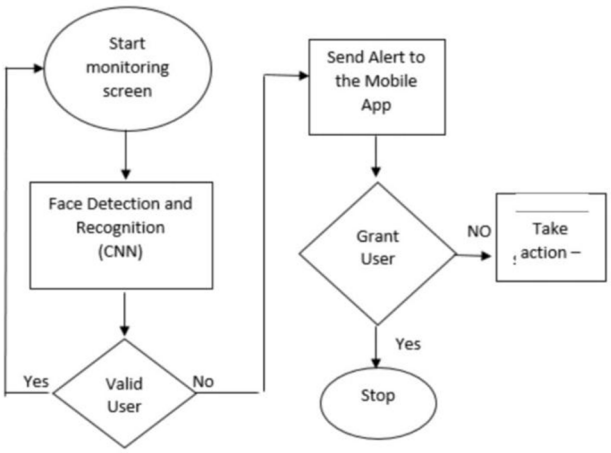
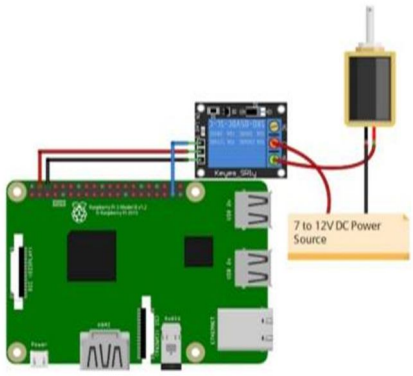


Figure 6. System Block diagram

According to below block illustration shown above, first stir is detected by detector also the image is captured by camera which is input to the microcontroller, Microcontroller checks whether given input is saved within thedatabase.However, which is mechanical function done by DC motor, If so the door will open. If input image doesn't match with the database also door will remain unrestricted and Buzzer will start telephoning. The result will be demonstrated on the TV. This design uses system to shoot announcement of an unauthorized person and also to connect tackle with PC it uses periodical communication interfacing.

E. Circuit Diagram



The facial recognition circuit diagram.

Figure 7. The facial recognition circuit diagram.

The circuit shows the design of automatic door cinch system. The factors used are nodemcu, solenoid, appendage. detector works as a main function. a live body generally emits infrared energy which is tasted by the detector from considerable distance. This seeing signal is fed to a microcontroller to operating range of the detector, it sends a logical command to open the door. The door automatically closes with fixed time detention. If there's no farther movement within the operating range. Intrude signals are used through limit switches to avoid locked rotor condition of the motor. The GPIO legs of the Jeer Pi can give an affair of3.3 V but the solenoid cinch requires 7-12V to operate. Because of this, we will need to use an external power source and relay to operate the cinch. Connect the VCC and GND of the relay unit to 5V and GND of Raspberry Pi. Also connect the indication leg of the relay element to the GPIO 26 of RaspberryPi. On the other side of the relay module, connect the negative form DC power source to the negative of the solenoid door cinch. Connect the positive from the DC power source to the common of the relay module and also connect typically open from the relay module to positive of the solenoid doorlock. machine literacy algorithm is used to avoid the complexity of computations, which is inbuilt in Open CV library. Jeer Pi processes the captured image coordinates with the being equals in the database. If it matches also it sends the signals to bear switch through GPIO legs.

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III. HARDWARE DESIGN

A. I3 Processor

Established and artificial by " Intel" and first introduced and released in 2010, The core i3 is a binary- core computer processor, Available for use in both desktop and laptop computers. It's one of three types of processors in the " I" series (also called the Intel core family of processors)



Figure 8. I3 Processor

B. Webcam

A webcam is a videotape camera that feeds or streams an image or videotape in real time to or through a computer network, similar as the Internet. Webcam software enables druggies to record a videotape or stream the videotape on the Internet.



Figure9. Webcam

C. WIFI ESP8266

The ESP8266 WiFi Module is a tone contained SOC with integrated TCP/ IP protocol mound that can give any microcontroller access to your WiFi network.



Figure 10. wifi ESP8266

D. IC 7085

The 7805 voltage checker is a three-terminal voltage regulator IC. In colorful operations, a 7805 voltage controller with fixed affair voltage is used

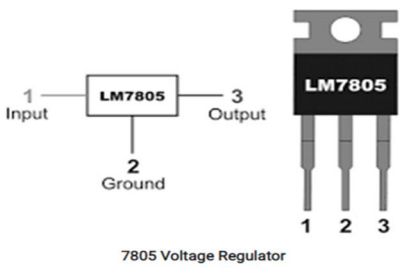


Figure 11. IC 7805

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E. Servo Motor

A servo motor is rotary actutator or direct actutator that allows for precise control of angular or direct position, haste and acceleration. It consists of a suitable motor coupled to a detector for position feedback.



Figure 12. Servo Motor

IV. IOT COMPONENTS

A. NodeMCU



Figure 13. NodeMCU

NodeMcu is a low cost open source IOT platform. It originally included firmware which runs on the ESP826 wifi SoC from Espress if systems, and tackle which was grounded on the ESP-12. Latterly, support for the ESP32 32- bit MCU was added. .

B. Adapter



Figure 14. Adapter

An adapter or adaptor is a device that converts attributes of one electrical device or system to those of an else inharmonious device or system. Some modify power or signal attributes, while others simply acclimatize the physical form of one connector to another.

V. IMPLEMENTAION

There are single corridor in this perpetration step. The perpetration of face discovery and face recognition system by using MATLAB.

A. Implementation of Face Detection And Recognition

Matlab2014a is used for rendering. In the database brochure, 50 different facial part of images for ten persons are used as the training images. While making the database brochure, the captured images are applied and cropped by face discovery module in order to gain the only facial corridor of all images with different directions For case, five images of a person with different face directions are shown in figure 12.



Figure 15. Five different images for a single face image.

All training images are reshaped and converted into 125x125 argentine scale images by using resize and rgb2graymatlab erected-infunction. Mean centered (or abated) images are estimated by abating average image from the original training image. The eigenvectors corresponding to the covariance matrix define the Eigen faces which look like ghostly faces. Since 50 training images are used, 50 eigen faces are obtained. Some eigen faces of the training images are shown in figure 16



Figure 16. Some eigen faces of training images

The trained and test images are projected onto the face space where the eigen faces are the coordinates or confines to find their separate euclidian distance. By comparing the euclidian distance of all projected trained images with the projected test image, minimum distance between them which shows similarity to test image is attained. By this mode, the facial image gratitude was done. .

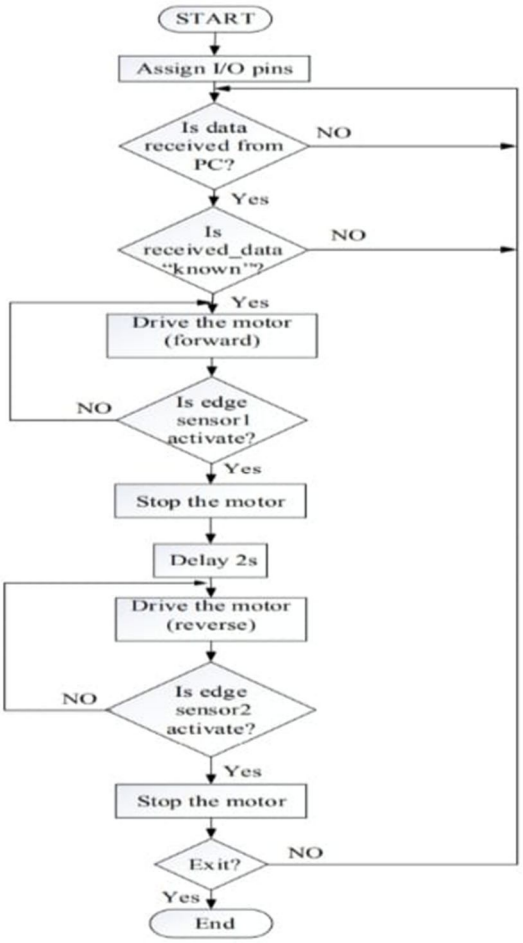


Figure 17. Flowchart for the automatic door and closing system

VI. SIMULATION TESTS AND RESULTS

The overall automatic door access system using face recognition is dissembled by using PROTEUS software and MATLAB. VSPE software is used to produce a virtual journal communication harborage. A MATLAB GUI is created in order to perform automatic face discovery and recognition. There are two cases in this system. The first is automatic door opening for the honored person and the second is ringing the alarm for the unauthenticated person. In this scheme, input images are taken finished a web camera continuously until the‘ stop camera’ button is pressed. Figure 15 shows the MATLAB GUI affect when captured face is detected and recognized as authenticated person



Figure 18. Matlab GUI result when captured face is detected and recognised as authenticated person.

When the seized image is documented as the genuine. person, door motor is alternated with the onward direction until the edge sensor 1 is actuated. When the sensor 1 is actuated, the door motor is stopped. After 2 seconds, door motor is rotated with hinder direction until edge sensor 2 is Actuated. Figure 19 and 20 show the simulation result for authenticated person.

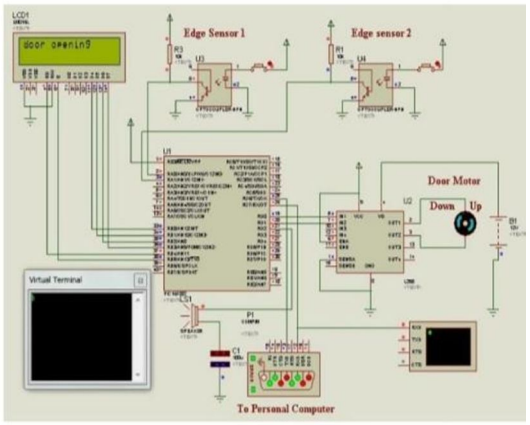


Figure 19. Simulation result when the door motor is rotated with forward direction for authenticated person

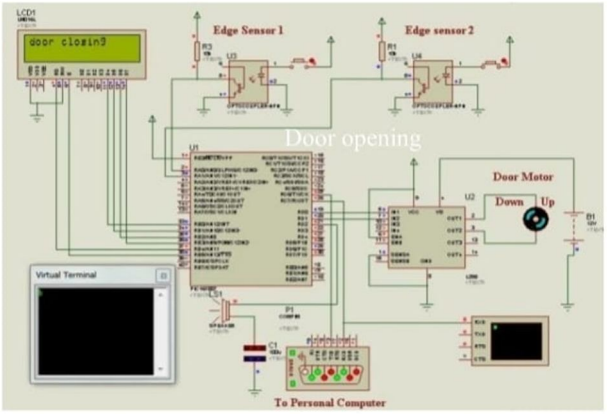


Figure 20. Simulation result when the door motor is rotated with reverse direction for authenticated person

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When the captured image is recognized as unauthenticated person, alarm is tolled and door is still unrestricted. This simulation result is shown in figure 20.

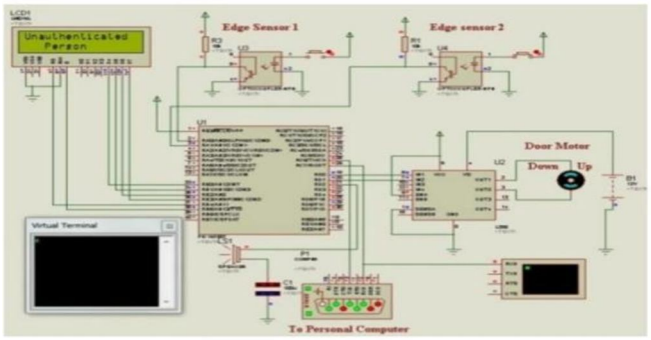


Figure 21. Simulation result for Unauthenticated person

VII. HARDWARE RESULTS

To perform involuntary door access system, specific computer (PC) is associated with the microcontroller via USB to RS232 motor. When no face is detected in front of the webcam, any signal is not transferred to the microcontroller. Since microcontroller is not entered any signal from PC, the door remains unrestricted. This circumstance is shown in figure 22.

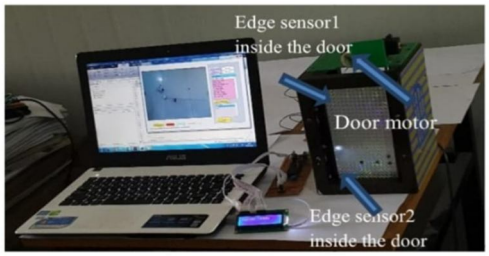


Figure 22. Hardware test for normal condition when no face detected.

When face is detected, the name of the honored person is shown in the left corner of the detecting box on MATLAB GUI. Once the face is recognized, the door is opened automatically as shown in figure 23.

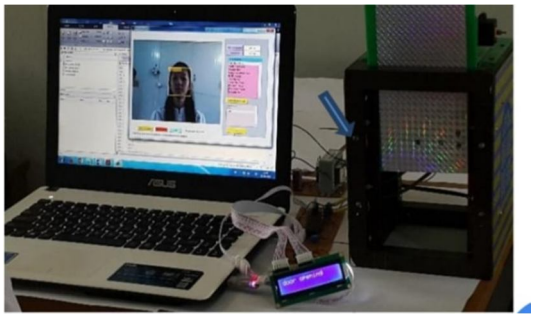


Figure 23. Hardware test for authenticated person



Figure 24. Hardware test for unauthenticated person.

VIII. CONCLUSION

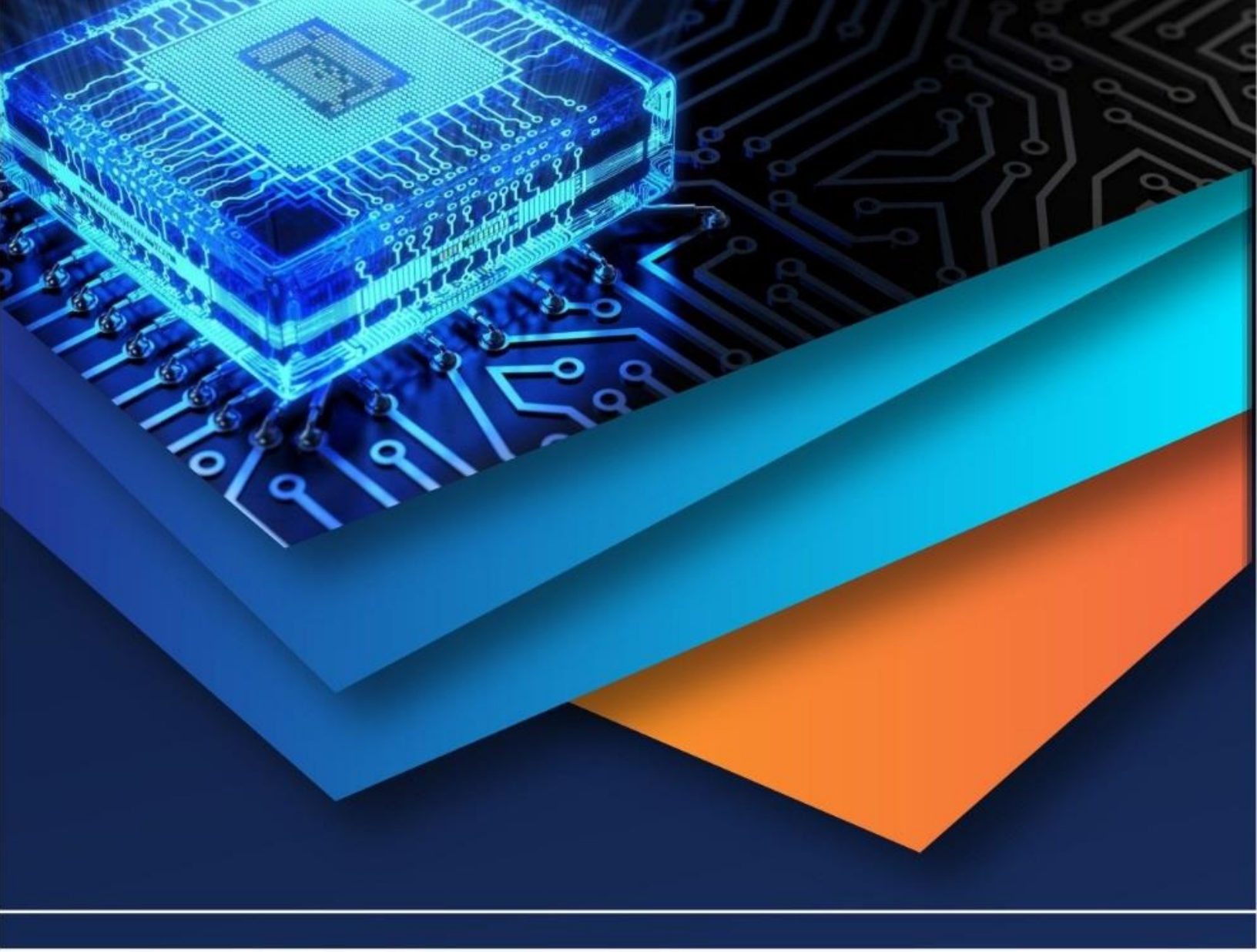
This face recognition system isn't 100 accurate, but it works well in good light conditions. The problem is it can also descry faces from filmland for case, someone can unleash it by showing your picture from his mobile phone. We can ameliorate this by training our own waterfall classifier., Face recognition grounded door locking has been developed to give better security. It's stoner friendly system. The use of Eigen face recognition fashion makes system more secure. This system can be used in several places where high security is needed where nonpublic information and outfit is kept. For illustration, exploration institutes, banks, forensic Laboratories. This system can also be used for national purposes. This design helps to reduce problem of thefts and frauds. In case of unauthorized person's entry, system cautions authorized person with SMS and at the same time the buzzer beeps to warn people. This is a cost effective and dependable door locking system. In this paper we've enforced a face recognition door cinch system. Feting of faces is done by using waterfall classifiers, which gets a high delicacy and will store in the database. For this testing, we've used 40 images only. Computer vision is used in the IOT. For security purpose, we've enforced real time face discovery by Haar classifier. Therefore this system can useful for elderly citizens living alone and for mustered people. Hence the proposed system is virtually easy to construct and easy to track the path.

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