

IOT BASED DOOR ACCESS CONTROL USING FACE RECOGNITION

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Abstract—In recent years, it is important to own a reliable security system that can secure our assets as well as to protect our privacy. The traditional security system needs an individual to use a key, identification (ID) card or password to access an area such as home and workplace. However, the present security system has many weaknesses wherever it is simply cast and taken. Most doors are controlled by persons with the employment of keys, security cards, countersign or pattern to open the door. The aim of this paper is to assist users for improvement of the door security of sensitive locations by using face detection and recognition. The proposed system mainly consists of subsystems namely image capture, face detection and recognition, email notification and automatic door access management. Face Recognition supported openCV is brought up because it uses Eigen faces and reduces the scale of face images without losing vital features, facial images for many persons can be stored in the database. The door lock can also be accessed remotely from any part of the world by using Telegram android application. The captured image from pi camera will be sent to the authorized person through email for safety purposes.

Keywords—OpenCV, Raspberry pi, Telegram application, E-mail.

I. INTRODUCTION

Human beings are recognized by their distinctive facial characteristics. In the face recognition approach, a given face is compared with the faces stored in the database in order to identify the person. The aim is to search out a face in the database, which has the highest similarity with the given face. In the field of bio science, face recognition technology is one among the fastest growing fields. The need of face recognition in security systems is attributed to the rise of commercial interest and therefore the development of feasible technologies to support the development of face recognition. Major areas of commercial interest comprises of bio science, law enforcement and surveillance, human-computer interaction, multimedia management (for example, automatic tagging of a particular individual within a collection of digital photographs) smart cards, passport check, Criminal investigations, access control management. However, face detection is more challenging because of some irregular characteristics, for example, glasses and beard will results in detecting effectiveness. Moreover, different sorts and angles of lighting will make detecting face generate uneven brightness on the face, which will have influence on the detection and recognition process. To overcome these issues, the system primarily used openCV based face recognition system using

Haar classifiers for face. The main processing element is Raspberry pi. The pi camera is employed to capture the image and send it to the authorized person for security purposes. The authorized person can remotely control the lock and unlock mechanism of the door using Telegram android application which is freely available on Google play store. The entry log every person is captured using pi camera and picture is sent to the email address of the prescribed user.

II. METHODOLOGY

The proposed system was built using a high performance processor i.e., Raspberry Pi model which runs on a Debian based Linux Operating system called Raspbian. Initially, the PIR sensor senses the presence of human at the door. As and when a human is detected, the Pi camera captures the image of the person and sends the image to the remote user through mail. Haar face recognition algorithm is run on the captured image using OpenCV in the Raspbian on the basis of the images saved in the system.

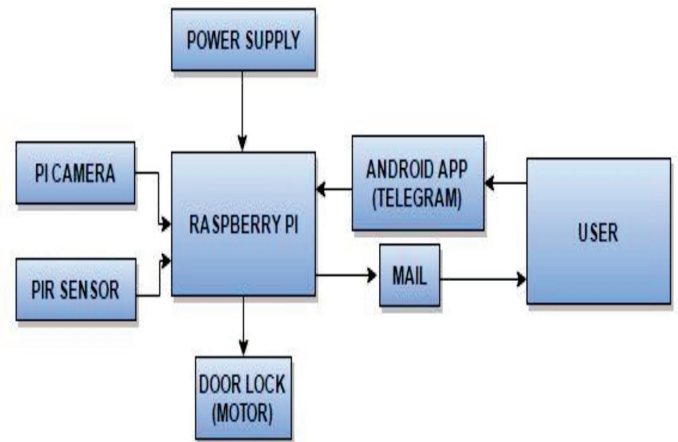


Fig. 1: Block Diagram

If the face is recognized it implies that an authorized person is trying for the door access and hence, the door lock is opened. if the face is not recognized, then the remote user can check the mail for the image of the person trying to access the door and allow or deny the access of the door through an android application- Telegram. If the user sends "allow" from

the Telegram app, the door is opened and if the user sends "deny" from the Telegram app, the person trying to access the door is denied from accessing it.

III. SYSTEM REQUIREMENTS

A. Hardware

1) *Raspberry Pi 3 Model B*: The Raspberry Pi 3 model B is considered as a portable mini-computer. It is a quad core 64-bit Cortex- A53 processor with a very high performance. It features a Broadcom SoC that has an ARM compatible CPU with a speed of 1.2 GHz and also has an on-chip GPU. It has an on-board memory of 1GB RAM. The processor generally runs on a Debian based Linux Operating system called Raspbian but also can be run using other third party operating systems like Windows10 IOT, Ubuntu, etc., An SD card is used to store the OS and program memory. The Raspbian OS supports programming flexibility as it provides a variety of programming platforms like C, C++, Python, Java, etc., The processor has a number of GPIO pins for lower level input/output. It also supports protocols like I2C. The processor has slots for USB, HDMI, composite video output, and a 3.5mm jack for audio output, ethernet, etc.,

2) *PIR Sensor*: The PIR (Passive Infrared) sensor used is HCSR-501. the sensor is usually used for human and motion detections. it is a digital sensor that senses the presences of human beings. human body emits thermal radiations of the range 0.8- 0.14nm. the PIR sensor captures these thermal radiations and gives 1 or 0 for presence or absence of a human being. the range of the sensor is 10-15cm.

3) *Pi Camera*: Pi camera is a camera module specially designed for Raspberry Pi. It is an 8MP, 1080p resolution camera. it is mainly used for HD video recording and to capture still photographs. It is attached to the Raspberry Pi via a 15cm ribbon cable to the CSI port. While programming, Picamera python libraries are added to access the camera.

4) *Servo Motor*: It runs with a 12V DC power supply. It is a rotary or linear actuator for controlling angular, linear position, velocity and acceleration. It makes use of the closed loop control mechanism. They are used in various applications like robotics, machinery, etc.,

B. Software

1) *OpenCV (Open Source Computer Vision)*: OpenCV is an open platform for programmers for real time computer vision and computations. It supports many libraries of programming functions. It is built on C++ and has bindings with Java, Python and MATLAB. It runs on a huge variety of platforms like Windows, Linux, Android, iOS, macOS, and many more. Image and Video processing are two of the main applications of OpenCV.

2) *Telegram Application*: It is an android application used for instant messaging services. It allows exchanging of messages, photos, video files, audio files, etc., It assures end-to-end encryption between the users communicating with each other. it can be installed and used on any android devices. It is a fast, secure and an easy application.

IV. APPLICATIONS

- Banking using ATM: The software is quickly verify a customer 's image.
- Security/Counter Terrorism.
- Home security : Alert the home owners of approaching unknown persons.
- To know about the entry time and attendance verification of an employee.
- In Government services like passport verification, law enforcement investigation and etc.
- Document authentication and many more.

V. RESULT

The result of our project is that recognition of stored images in the data base after recognizing the face the door lock will get open. If any other person comes to the home whose image is not stored in the data base that time the image of the person will get captured and sends the image to the authorized email. If the other person known to the owner then the owner will send a command like "on" through telegram app to unlock the door.

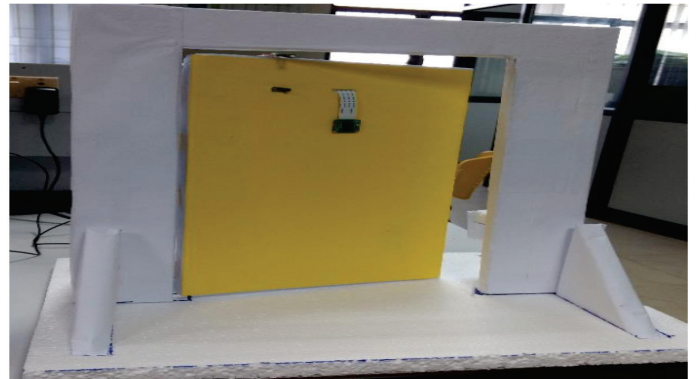


Fig. 2: Prototype of the IoT based door access and control system



Fig. 3: Hardware set-up of the system



Fig. 4: If the Intruder is known to the user, unlocking the door using Telegram Bot

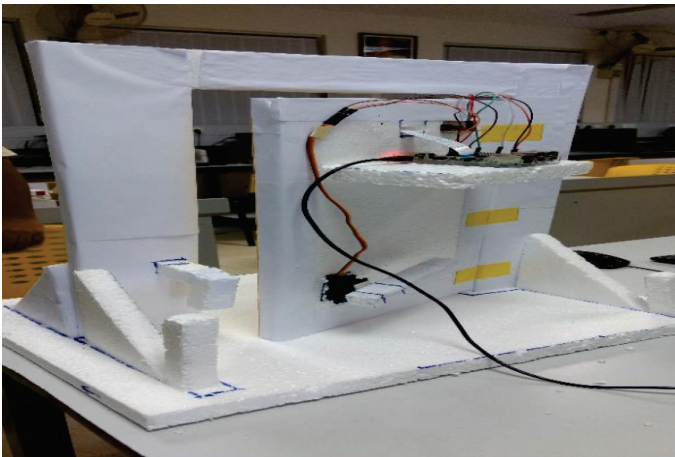


Fig. 5: Door is open after receiving unlock command from the use

VI. CONCLUSION

The project is good example of Raspberry pi and pi camera with Open CV.A face recognition system using Raspberry Pi was developed. The system was programmed by Python programming language. Both Real times face recognition from specific images, i.e. Stored images. The efficiency of the system was analyzed in terms of face recognition rate. The analysis revealed that the present system shows excellent performance efficiency.

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