Face Recognition based Security System Using Raspberry PI

Neelam S
Computer science and engineering
Adarsh Institute Of Enginerring
Vita, india.
niluprinces0502@gmail.com

Gauri Anil More
Computer science and engineering
Adarsh Institute Of Enginerring
Vita, India.
moregauri044@gmail.com

Kishor Vijay Yevale
Computer science and engineering
Adarsh Institute Of Engineering.
Vita, India.
kishoryevale96@gmail.com

Kalyani Anil Mane
Computer Science and Engineering
Adarsh Institute Of Enginerring
Vita, India
kalyanianilmane1997@gmail.com

Abhijeet Dhanaji Jadhav
Computer Science and Engineering
Adarsh Institute Of Enginerring
Vita,India
abhijitdj1999@gmail.com

Mr. S. R. Mali
Computer Science and Engineering
Adarsh Institute Of Enginerring
Vita,India
aitrc.cseit.srm@gmail.com

***Abstract*—** Most doors square measure controlled by persons with the employment of keys, security cards, parole 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 victimization face detection and recognition. Face may be a advanced flat structure and desires sensible computing techniques for detection and recognition. This paper is comprised primarily of 3 subsystems: particularly face detection, face recognition and automatic door access management. Face detection is that the method of police investigation the region of face in a picture. The face is detected by victimization the viola Jones technique and face recognition is enforced by victimization the Principal part Analysis (PCA). Face Recognition supported PCA is usually brought up because the use of Eigenfaces.If a face is recognized, it's better-known, else it's unknown. The door can open mechanically for the better-known person because of the command of the microcontroller. On the opposite hand, alarm can ring for the unknown person. Since PCA reduces the size of face pictures while not losing vital options, facial pictures for several persons may be hold on within the info. though several coaching pictures square measure used, machine potency cannot be remittent considerably. Therefore, face recognition victimization PCA may be a lot of helpful for door security system than alternative face recognition schemes.

Keywords—: Viola-jones face detection method, PCA,Eigenvector, Covariance, Euclidean distance, Eigenface, microcontroller

Introduction

Nowadays, automatic personal identification in access management has become in style by exploitation statistics knowledge rather than exploitation cards, passwords or pattern. Most of the statistics knowledge need to be collected by exploitation special hardware like fingerprint scanner, palm print scanner,DNA analyzer. And, the target objects need to bit with the desired hardware within the stage of knowledge assortment. The advantage of this technique is that face recognition doesn't need to be touched with any hardware. Face is detected mechanically by exploitation face detection technique and therefore the entire face recognition is completed while not touching with any hardware. Face detection is that the opening of the face recognition system. The performance of the whole face recognition system is influenced by the dependableness of the face detection. By exploitation face detection, it will determine solely the facial a part of a picture no matter the background of this image. During this system, Viola-Jones face detection methodology is employed. Viola-Jones rescales the detector rather than the input image and run the detector again and again through the image – every time with a distinct size. Viola-Jones have devised a scale invariant detector that needs identical range of calculations regardless of the size. This detector is constructed employing a alleged integral image and a few straightforward rectangular options remindful of Haar wavelets [1]. Face recognition ordinarily includes feature extraction, feature reduction and recognition or classification.PCA is a good feature extraction methodology supported face as a world feature. It reduces the dimension of pictures effectively and holds the first data at identical time. during this paper, face recognition system is enforced exploitation PCA algorithmic rule. Recognition or classification is finished by the live methodology like geometer distance that is employed to classify the feature of pictures gift within the information and take a look at image. [2].Home automation system is a computer-based application that has the ability to connect different electronic devices for the sake of monitoring and controlling the home appliances. Home automation system is an area that has caught several attentions by both the academic and business fields. The earliest effort of home security system was relied on wired home networks however, due to the appropriate planning and construction works required to offer a wired home, such effort tend to be insufficient. As a solution for this problem, wireless communication has been emerged to provide more flexible platform where the installation cost is significantly lower than the wired one. Therefore, it has been applied for different security home systems in order to provide an alarm for critical threats such as intrusions or other environmental risks such as gas leaking or fire [2]. Recently, electronic door lock systems are one of the most popular security systems that is being installed for many residents and business places. The key characteristic behind such systems lies on the reliability in which the authorized individuals can gain the permission to access the doors throughout a secure system that has an interactive interface. A new system has been emerged which is called Near Field Communication

(NFC) door lock system [3]. Such system is based on a pattern recognition technology where the individuals' faces are being analyzed in order to identify their personalities [4]. Such analysis takes different forms such as analyzing facial image or video stream. In addition, the size and position of the face's elements are being also considered in the analysis This paper aims to present a novel security home system based on Bluetooth network. The main goal is to develop a prototype that has the ability to simulate the wireless tasks including monitoring and controlling digital door lock. Such system would have the capability to provide secure and controlled home appliances

I. Literature Review

Several remote systems have been proposed whether for the academic or business domain. Such systems were intended to provide a remote control and monitoring tasks. For instance, a system has been proposed by [5] which is based on Zigbee technology. This system is composed of multiple modules such as the human detection module (HDM) which aims to detect the user at the door. This can be performed using the camera module in which the images or the video stream is being processed. Consequentially, the results of the two-mentioned module will go through the Zigbee module that would identify a verification tag for each user. Once the user got failure in terms of the zigbee verification tag, a speaker phone will be provided with the owner of the property.

Digital door lock in home automation system provides proper control and home environment monitoring to the user. A system has proposed by [6] based on the RFID technology which provides a touch LCD monitor.

Another system consists of a build in NFC capabilities of a smart phone which would eventually be the key to open the door by means of logical link control protocol, which then matches the user's own set of passwords to verify that user should be given permission or not [7]. Another system has been proposed by [7] which based on an NFC featuring smart phone abilities. Such system uses logic link control to identify the permission of the user's identities.

In addition, a system proposed by [8] based on design of GSM digital door lock system using PIC platform.5-digit password is used to lock/unlock the door. If the user submits an incorrect password the system notifies the owner.

In [9] a system has designed that contains sensors to detect obstacle, touch, heat, smoke, sound. The whole system is controlled by a PIC microcontroller 16F76. It gathers the information from the sensors, makes a decision and sends SMS to a corresponding number by using a GSM modem. If an interruption has been identified, then PIC will send a SMS to the owner and another SMS to the Police Station. Similarly, for environmental threats such as fire interruption a SMS will be sent to the fire brigade and another to the owner [9]. In this system require extra hardware components like Sensors, GSM Modem. Alerts are sent through only SMS.

In [10] an intelligent system for home security using illumination sensitive background model is presented. Such system enables tracking and detection of intruder and it is based on providing home security. For this purpose, a face recognition technique is utilized to identify the intruder and on finding him, an image of the intruder is sent on the owner mail id for further action. The implementation of this system also includes the comparison of different approaches for object tracking and then used an illumination-sensitive background modeling approach for the proposed security system. But this system doesn't use password for identification.

II. Proposed System

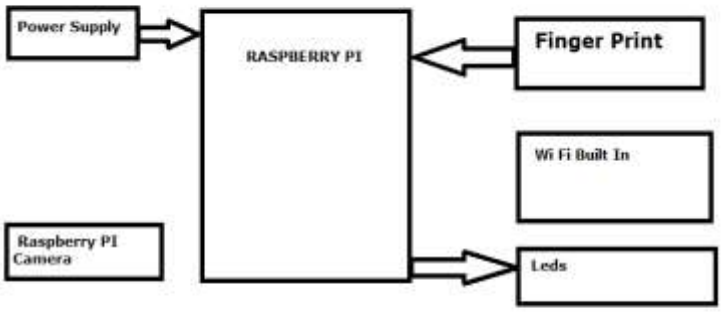

Figure 1.Work flow of Proposed System

A. Hardware Description

1. Raspberry PI

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. We want to see the Raspberry Pi being used by kids all over the world to learn to program and understand how computers work.

The raspberry pi comes in two models; they are model A and model B. The main difference between model A and model B is USB port. Model a board will consume less power and that does not include an Ethernet port. But, the model B board includes an Ethernet port and designed in china. The raspberry pi comes with a set of open source technologies, i.e. communication and multimedia web technologies. In the year 2014, the foundation of the raspberry pi board launched the computer module that packages a model B raspberry pi board

into module for use as a part of embedded systems, to encourage their use.

2. Camera Module

The Raspberry Pi Camera Modules are official products from the Raspberry Pi Foundation. The original 5-megapixel model was released in 2013, and an 8-megapixel Camera Module v2 was released in 2016. For both iterations, there are visible light and infrared versions. A 12-megapixel High Quality Camera was released in 2020. There is no infrared version of the HQ Camera; however the IR Filter can be removed if required.

CONCLUSION

In this paper, automatic door access system by using face recognition and detection is presented. Automatic face detection and recognition is done by python program on PC. Microcontroller is used to control the door access system depending on the incoming data sent from the personal computer (PC).Door is opened immediately after confirming that the person is authenticated. After 2 seconds, door is closed automatically. However, in real time, 2 seconds are not enough time to enter a person. So, longer time should be set for real-time condition. Viola-Jones face detection method is used to detect the location of the face in an image. Since this detection method can detect only face images for frontal view correctly, this system has limitations in head orientation. For face recognition, Principal Component Analysis method is used to extract the important features of facial images. Since PCA method reduces the dimension of the dataset, this system can detect and recognize an image within one second. Therefore, this system can be used in automatic verification of people to improve door security for strangers without needing security guards and wasting too many time.

ACKNOWLEDGMENT *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

REFERENCES

[1] 1. Guessoum, M. T. Laskri, and J. Lieber, “RespiDiag: A case- Paul Viola, Michael J. Jones, Robust Real-Time Face Detection, International Journal of Cumputer Vision 57(2), 2004.

[2] Ayushi Gupta, Ekta Sharma, NehaSachan and Neha Tiwari. Door Lock System through Face Recognition Using MATLAB. International Journal of Scientific Research in Computer Science and Engineering, Vol-1, Issue-3, 30 June 2013.

[3] Daniel Georgescu, A Real-Time Face Recognition System Using Eigenfaces, Journal of Mobile, Embedded and Distributed Systems, vol. III, no. 4, 2011.

[4] Ole Helvig Jensen, Implementing the Viola-Jones Face Detection Algorithm, 2008.

[5] M. A. Turk and A. P. Pentland. Eigenfaces for Recognition. Journal of Cognitive Neuroscience, 3(1):71 - 86, 1991.

[6] M. A. Turk and A. P. Pentland. Face recognition using eigenfaces. IEEE Computer SocietyConference on Computer Vision and Pattern Recognition, CVPR 91, pages 586 - 591, 1991.

[7] I.Yugashini, S. Vidhyasri, K.Gayathri Devi, Design And Implementation Of Automated Door Accsessing System With Face Recognition, International Journal of Science and Modern Engineering(IJISME), Volume-1, Issue-12, November 2013.

[8] Liton Chandra Paul, Abdulla Al Sumam. Face Recognition Using Principal Component Analysis Method. International Journal of Advanced Research in Computer Engineering & Technology (IJARCET),Volume 1, Issue 9, November 2012.