



Smart Face Recognition Security Based On Raspberry Pi

Saurabh K. Patil¹, Dr. Narendra G. Narole²

M.Tech Scholar¹, HOD²

Department of ETC

Rajiv Gandhi College of Engineering and Research, Nagpur, India

Abstract:

We have witnessed the tremendous advancements in the human life through advancing technology. Even though the technology goes on advancing, it still required to get advance with time. Even though the image capture technique looks easy in the observing scenario but still it's a complex and very important aspect when it comes for the face recognition scenario. As we know, the human eyes are working on the principle of the image replication process, the same phenomena is used in the cameras. The cameras in the present time are digital and their working and performances are improving the image capture process. When any camera takes the image, it may get error due to additive noise or other factors; that's why they need image processing algorithms for detecting the various phenomena such as background, image edges, grey levels, etc. for this purpose we have several amount of algorithms such as HAAR, Cosine, Sine, Viola-Jones, KL, Hough, PCA, etc. Hence to create a better image processing we are using advance PCA algorithm. This algorithm can be compatible on the automation instrument such as, microcontroller, arduino, raspberry pi, etc. the raspberry pi as a controlling instrument thus for the best result along with the cost effectiveness. This instrument provides the ability of the store data in the form of database. Thus this will help to improve the security. Thus, this paper consists of the work review of the various face detection projects based on the raspberry pi module.

Keyword: GSM Module, Numerical Keypad, Raspberry Pi Module, Relay, USB Camera, Etc.

I. INTRODUCTION:

Face detection based security systems evolution creates the optimized security system which restricts the entry of unknown. There were so many new technical instruments like door intercoms but the security was still the question of matter as it is not that much compact and have no storage. So to improve the existing security and reduce the risks we come with this advance PCA algorithm for face detection based security. A Face recognition System is a system which usually automatically identifies or verifies the identity of a person from digital images or a video frames from a video source and allow the user to interface with scenario. The image capitulation and identification is done by OPEN CV and stores in database. The basic work structure of the face recognition system is: - the camera captures the image. After this, using advance PCA algorithm, system compares the captured images with data base images which provide the result as image matched or not. Based on comparison result GSM module sends a security alert to the authorised person which is 'entry successful for known intruder or unknown intruder trying to unlock, take action'. But, if the unknown person is in knowledge with authorized user then he can get entry just by entering the password which the authorised owner will provide. As soon as the door gets unlocked it will reset the system.

II. LITERATURE REVIEW:-

The author Akshay N. Patil and etl. [1] describes the working of the face recognized door unlocking system in which they use the raspberry pi along with the GSM module. This module contains a secured face recognizer for automatic door opening. In this

project they have the facility of the informing to the user regarding the door unlocking. But, this system lags the feature of making the door unlocking for known persons to the user. This system uses the basic PCA algorithm to execute the process, but still lacks in many feature; hence need to improve. The author Sarath Chandu Gaddam and etl. [2] describes the working of face recognized attendance system in which they use raspberry pi along with GSM module and Ethernet cable. In this project the automatic attendance of the students can be possible without wasting the time and send the attendance to the respective student after 24 hours. But, this system lags the feature of making the latecomers attendance available. In this system they have used the Eigen algorithm to execute the system, but due to huge mathematical calculation there may be chance of failure. Hence need to improve. The author K. Shiva Prasad [3] describes the working of the technique for real time human face detection and tracking using a modified version of the algorithm by using the raspberry pi module along with USB camera. In this project Simulation results of this developed algorithm shows the Real time human face detection and tracking supporting up to 50 human faces. This lags the feature of the making more than 50 faces storage in the database. This system uses the viola jones algorithm for the execution but this system lacks the efficiency in the harsh backlighting and occlusions. The author Mr. Ashwin K Kashyap and etl. [4] describes the working of face recognition using raspberry pi module by using the python language. In this project the saved faces are detected using OPEN CV simulation. But, this project lags the feature of informing the user regarding the any unknown intruder and hence any burglary. This system uses the HAAR algorithm for execution but this system to depend on the OPEN CV simulation. The author Akshay Kumar C and etl. [5] describes ORB-PCA based face extraction

technique for face recognition to overcome the problems of SIFT-PCA and SURF-PCA techniques. It improves the efficiency in face detection and also reduces the face detection time in comparison to other PCA techniques. But this technique is very much complex and much may produce the errors while combining the results of ORB and PCA techniques. Hence need to improve. The author HemantMakwana and etl. [6] describes comparisons in various types of face detection algorithms such as geometry based and face appearance based algorithms. This kind of comparison will be helpful in the construction of this project. The author Sungyoung Lee and etl. [7] describes improvement in the PCA algorithm for face recognition which shows that the PCA algorithm can be improved and some of this improved features will be used for our project. The author Ms.Varsha Gupta and etl. [8] describes study of various face detection methods which focuses on the adaptations in various face detection algorithms such as Viola-Jones, LPB, Adaboost, SQMT. This kind of literature will be helpful. The author Liton Chandra Paul and etl. [9] describes face recognition using principle component analysis method which shows the statistical approach to reduce the variable based on the eigen values. This paper shows the image identification along with changes in poses. This system will help to produce a good face detection result. But this system only deals with the eigen values and if this values may get mismatch for huge amount of images hence need to improve. The author Santosh Kumar and etl. [10] describes advance approach for face detection using PCA algorithm and region based colour segmentation which Eigen values and noise removal in image. This system may get failed if there may have any noise disturbance. Practically this system is for testing captured images with stored images in database and based on that it will give result. This technique achieves much higher efficiency and execution time reduces but don't have ability to provide self-storage as well as reduction in errors. Hence need to improve. The author Sougata Das and etl. [11] describes an embedded system for home automation using SMS where the system uses the microcontroller as a main controlling component. In this system GSM module was used and it sends the SMS over the authorised users cell. In this system the appliance condition can be monitored over a remote place. The status is send over the wireless network. Hence it provide the wireless control. But the system uses the GSM module along with microcontroller and some electronic circuit making system more bulkier and even more complicated when it comes to improvement. Hence it needs to improve and it comes with a raspberry pi module. The author Kuen-Min Lee and etl.[12] describes the an intelligent universal remote control system for home appliances uses the IOT technology for creating the point – n – press remote controller. In this system IR transceiver is used to connect the home appliances. This leads to the reduction in the malfunctioning of the appliances and also creates a user controlled system which leads to the simplification of life. As this system is connected to the various time varying systems, it will create decoration in performance in the system as long it works. Also this system totally depends on the IR transceivers work hence may get complicated when in any disturbance. Hence need to improve. The author MrutyunjayaSahani and etl. [13] describes an wireless network based system for monitoring of the kitchen on the internet. In this system it uses GSM model and zigbee and microcontroller as a sensor module. This system works for the any kind of extreme scenario such as fire ,LPG

detection, room temperature,etc. it send message or email over the wireless network and allow the user to take action. But as we know this kind of system works on the JAVA. Hence it may create confusion when detection of so many kind of gases has to do. Hence proper care has to be taken. Hence need to improve. The author BiplavChoudhury and etl. [14] describes the sms based home security system. This system is equipped with the GSM module, microcontroller, etc. to control the android over the remote place. Hence it is cost very negligible when comparing to other security system. But this system mostly works on the GPS performance and the advancing GPS in today's time limits the scope of this system. Hence need to improve the system and also to increase its performing areas.

III. PROPOSED SYSTEM: -

1) Proposed Architecture

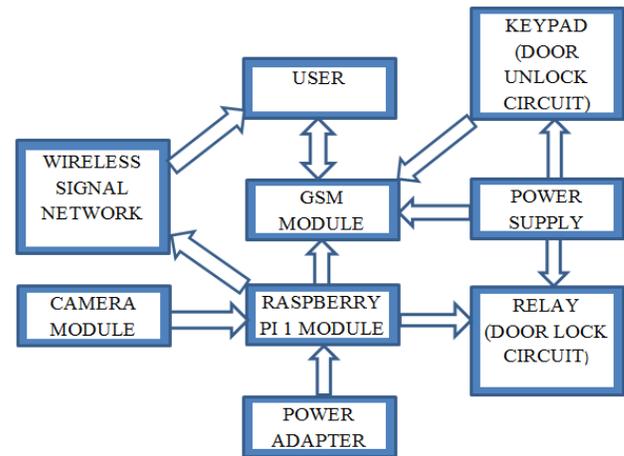


Figure.1. Block diagram of “Smart Face Recognition Security based on Raspberry Pi”.

2) Working of the Components

In above figure 1 shows the basic block diagram of “Smart Face Recognition Security Based on Raspberry Pi”. Our project system will operate in three different sections, i.e. one for capturing and creating a data base and the second section is to capture the image and which is used for identifying or comparing the images in the database and third section is to provide the intruders report to authorised user and allow him to take actions over the network. Based on the result of advance PCA algorithm and user interface, system will take appropriate action. The working of the each component is specified as follows: -

Camera module: Camera module is USB camera interface to the raspberry pi module. It is used for captures an image and send captured image to the Raspberry pi module. Raspberry pi module: Raspberry pi module is small board having the ability to act like a controller. When image provided by camera module to pi module, the raspberry pi compares it with stored face image. At the first time, we capture the image to create a data base for raspberry pi modules storage system and this data base is compared with the live captured image. After comparing two images output is considered to be positive/negative as this controller is digital; and based on the output response, it gives commands to GSM module.

GSM module: GSM module is used to sending a message to the authorities after comparing the captured image with the stored images and based on whether output is positive or negative. If

output comes out positive then "Person Identified!! DOOR OPENS!!" message send to the authority person otherwise send "unknown person is trying to unlock the door, take action". If the unauthorised person is detected then the relay will block the door. If the unknown person is known to authorised user, the user will provide a password to that person and after inserting password the door will open and will be informed to the owner.

Relay: It will blocks the door as soon as any unauthorised person attempts to open the door.

Keypad: The keypad will allow the person to insert the password allotted to him and resets the system by unlocking the door.

Wireless signal network: This network is basically an Ethernet cable which stores the data automatically to the database and send the data to authorized user over the wireless network. Once the door gets unlocked, the system will get reset and starts from initialization.

3) Work Flowchart

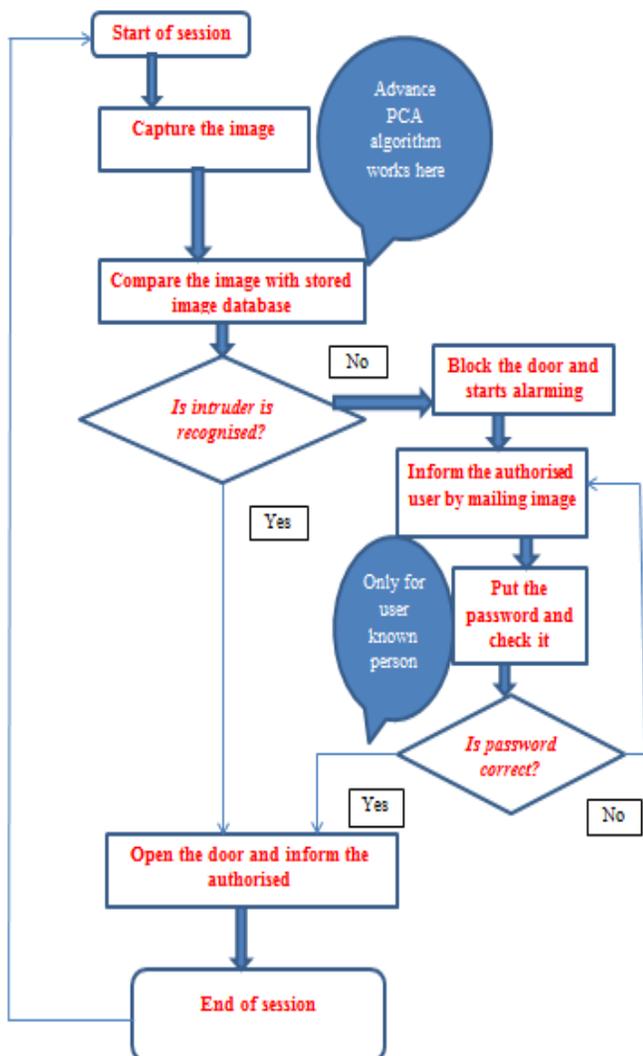


Figure.2. flowchart of proposed system

As we have seen the, working details of components as above, we will know how this system will work in a sequence as shown in fig 2 flowchart of the proposed system. Here we consider system in two cases:-

1) When the intruder is recognized:-

First when the session starts, it will work as follows: - the pi camera will first take the image and send it to the raspberry pi module. The raspberry pi module will then compare the captured image with the stored images in database. The advance pca algorithm comes in the action by comparing the captured image with stored images and based on this it produce the results. If the result is positive then door gets unlocked; the system informs the authorised user that known person has got entry over the GSM module and thye system gets reset.

2) When intruder is not recognized:-

When the result is negative, the system blocks the door and alarm starts ringing informing nearby about the unknown is trying to unlock the door. The system sends the message to the authorised user that unknown intruder is trying to unlock the door, take action and also the system sends the image of the intruder to authorised user over the wireless network. If the intruder is known to the authorised user, he will send a password to intruder and by inserting the correct password the intruder can unlock the blocked door. As soon as the door gets unlocked, the ringing alarm stops alarming and system gets reset. In this way the optimum security can be achieved over the raspberry pi module and thus allow the authorised user to interface and control in the existing scenario over the remote place.

Applications: -

The " smart face recognition security based on raspberry pi" is basically based on embeded security system; the applications of this project are not limited as the each application gives rise to the new applications. so it can be implement in the following area of securities; for example,

- In car security.
- In home security.
- In budgeted industries .
- In survillance from remote place(depending on the communication network).
- In the office cabins.
- In the shopping malls , etc.

Future Scope:-

There are many future scopes regarding this project such as follows: -

- 1.If the condition improved, we can implement this system by using multimedia GSM module,in future.
2. To achieve more sound security, we can use the iris scan method.
3. To improve the system performance, we can use the advance versions of the raspberry pi module as per requirement.
4. If needed, we can make this system to be used in the air services.
5. If user needs to operate this system through android application, it is possible.

Software used:-

1. Linux:- as an operating system for the raspberry pi module, it will work as an working environment.
2. Python:- as an programming language, it will help the coder to create and debug the code without compiling.
3. Open cv:- as a open source computer vision it will help to capture and process the image.

IV. REFERENCES:-

- [1]. Akshay N. Patil ,Rohit B. Ranavare, Dayasagar V. Ballal: “Raspberry pi based face recognition system for door unlocking”,International journal of innovative research in science and engineering vol.no.2,issue 3 march 2016.
- [2].SarathChanduGaddam, N. V. K. Ramesh and Hemadhanekula: “facerecognition based attendance management system with raspberry pi 2 using eigen faces algorithm”, ARPN Journal of Engineering and Applied Sciences vol. 11, no. 13, July 2016 ISSN 1819-6608
- [3]. K.ShivaPrasad: “Human Face Detection and Tracking Using Raspberry PI processor”,International Journal & Magazine of Engineering, Technology, Management and Research,Volume No: 2 (2015), Issue No: 8 (August)
- [4].Mr.Ashwin K Kashyap, Mr.Abhishek S, Mr.Abhishek S A, Ms.Ratnakumari. C: “Face Detection using Raspberry Pi and Python”, National Conference on Product Design (NCPD 2016), July 2016.
- [5]. Vinat A., Akshay Kumar C., GauravShenoy, K.N. Balasubramanayam Murthy, S. Natarajan: “ORB-PCA based features extraction technique for face recognition”, second international symposium on computer vision and internet-2015.
- [6]. Hemant Makwana& Taranpreet Singh: “Comparison of Different Algorithm for Face Recognition”,Global Journal of Computer Science and Technology Graphics & Vision Volume 13 Issue 9 Version 1.0 Year 2013
- [7]. Vo Dinh Minh Nhat and SungyoungLee : “An Improvement on PCA Algorithm for Face Recognition”, J. Wang, X. Liao, and Z. Yi (Eds.): ISBN 2005, LNCS 3496, pp. 1016.1021, 2005. © Springer-Verlag Berlin Heidelberg 2005
- [8]. Ms.Varsha Gupta, Mr.Dipesh Sharma: “A Study of Various Face Detection Methods”,International Journal of Advanced Research in Computer and Communication Engineering *Vol. 3, Issue 5, May 2014*
- [9].Liton Chandra Paul1, Abdulla Al Sumam2: “Face Recognition Using Principal Component Analysis Method”, International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 1, Issue 9, November 2012
- [10] Santosh Kumar, Ajmer Manish Mathuria, AtulChaudhary, Ajmer KailashRathore: “An Advance Approach of Face Recognition Using PCA and Region Base Color Segmentation”, International Journal Of Computer Applications (0975 – 8887) Volume 89 – No 17, March 2014
- [11]. Sougata Das, NilavaDebabhuti, Rishabh Das, Sayantan Dutta, ApurbaGhosh:-“Embedded SystemFor Home Automation Using Sms”, International Conference On Automation, Control, Energy And Systems(Aces),Feb 2014,978- 1 -4799- 3732 – 5/14@2014 IEEE
- [12]. Kuan – Min Lee, Wei-GuangTeng,Ting Wei Hon:- “ Point-N –Press: An Intelligent Universal Remote Controlsystem For Home Appliances” , Ieee Transactions On Automation Science And Engineering , 1545-5955@2016 IEEE
- [13]. MrutyunjayaSahani, AvinashNayak, RishabhAgrawal, DebhanshuSahu:- “ A Gsm, Wsn And Embedded Web Server Architecture For Internet Based Kitchen Monitoring System” , International Conference On Circuit, Power And Computing Technologies(Iccpct), 978-1-4799 -7075-9/15@2015 IEEE
- [14]. BiplavChoudhary, TameemS.Choudhary, AniketPramanik, WasimArif ,J. Mehandi:- “ Design And Implementation Of An Sms Based Home Security System”,978-1-4799-6085-9/15@2015 IEEE