AUTOMATED DOOR ACCESS CONTROL SYSTEM USING MACHINE LEARNING

Mr Shishir Bhople[1], Prof. V. V. Palmur [2]

[1]Master of Engineering student, Department of Computer Science and Engineering, V.V.P.I.E.T. Solapur, Maharashtra, India.
[2]Professor, Department of Computer Science and Engineering, V.V.P.I.E.T. Solapur, Maharashtra, India.

---***---

Abstract- *In the world of automation the peoples are more likely to move towards implementing and using advanced technologies for their comfort. As we can say the Authentication is one of the significant issues raised in the era of the information system. To overcome this problem various security and authenticity algorithms are used. Among the many techniques used to this purpose, the Face Recognition stands as an effective means of authentication and security. Human face is one of the easiest and accurate ways to identify the authorized person. Face recognition mainly consist of two important processes i.e. detection of face and correct recognition of face according to patterns. So this is the most secured way for locking systems in many fields. This project proposes an advanced method for automatic door access control system using Machine Learning technique with the help of OpenCV and Raspberry pi.*

Key Words: *Raspberry Pi, Motor, relay module, Raspberry Pi Camera.*

1. INTRODUCTION

We are living in the modern era in this modern era crime has become ultra-modern too! In this ultra – modern era we are facing lots of problems like robbery, stealing things, unwanted entrance in private house or secure environment happens frequently. So apparently people are not feel safe even in their own house. We all are always busy in our day to day activities and work also we want to ensure our safety of our loved ones safety. In this busy schedule of day sometimes we forget to look towards our necessary things like keys, wallet, credit cards etc. Without these things, we are unable to access our home or any place we actually want. In today's era we also to consider the things are getting connected with the internet and that are very vulnerable too. Using our idea we are going to manage the security concerned issues in a cost effective way.

The people are very aware about Security and i.e. mainly dealing with protecting against loss or damage of things and asset, security systems have been evolving over time. Since the influence of modern technology has reached its peak, demands for security systems have gone up progressively. Our modern Homes require enough intelligent systems with minimum human efforts.

Face recognition actually deals with recognition and authentication of a particular face based on algorithm and predictions, which is extensively used in modern security application. The majority of Face Recognition system is used in the field of Home Securities and Real time application for Face Based Locking system in industry.

This paper deals with the idea of secure locking automation utilizing Machine Learning Techniques for door locking/ unlocking system to provide advanced security to our homes, bank lockers and related control operations .To achieve this we will use an image capturing technique with the help of High Resolution Raspberry Pi camera in an embedded system Connected to raspberry pi server.

RPi (Raspberry pi) controls the video camera for Face Reorganization and after successful identification it will turning on a relay for door unlocking procedure. The Prototyping module contains one secured face recognizer mechanism for automatic door unlocking. The camera catches the facial picture and compares it with the image which is stored in the database with the help of Machine Learning Algorithms.

2. LITERATURE REVIEW

This section describes various technology surveys used in the secure door locking system. In the old days, only mechanical locks were available that was not sufficiently secure.

In this paper we get about a door locking mechanism that can recognize the face of the owner of the house and his family members who will have access to pass through the door in the house. This could be done by using face recognition algorithm and predictions which are gaining much importance in this era of Artificial Intelligence. The advantage of using face recognition over other identification features like RFID or Passcode is because it is less intrusive. There are plenty of methods for face detection and recognition, in this paper face detection is done based on haar features and face recognition is done based on local binary pattern histogram using OpenCV library. This paper also provides a detailed explanation about kNN image classifier, its working and computational abilities which is used to classify images consistent with their location.[1]

In (2017) a survey on various door lock access control was done which consider five systems for comparative analysis includes Password lock system, RFID, Bio-matric, OTP (one-time password) and cryptography-based lock system. They made a conclusion after the analysis of all five system that single system would not work perfectly therefore in high secure door lock system is required than combination of all these five mechanisms should be utilized [2].

This paper describes a design of a door locking system to operate the door with a different control. It uses Bluetooth technology, which is easily available on almost every gadget and consumes less power. The design of the proposed system also includes a special feature to increase the security and to make it simpler for use. [3]

In (2019) a proposed door lock system for critical zone in which they made a security system for high alert areas using two factors authentication with OTP (one-time password) & RFID (radio frequency identification). In their research J. Mech. Cont.& Math. Sci., Special Issue, No.- 6, January (2020) pp 53-64 Copyright reserved © J. Mech. Cont.& Math. Sci. Umm-e-Laila et al. 56 paper they also made a secure wallet application which help them to remember passwords and established a secure system for red zone areas which only allow authorized person [4].

This paper proposes an idea to provide high level security to home by using IoT technology. A standard UBS camera captures the image to spot the person. It's a prototype that identifies the visitor. If the door recognizes the visitor, it will greet them by name, and therefore the door is going to be unlocked. If they are not identified the door will remain firmly locked. This paper talks about four features: security, safety, control and monitoring to home automation. When an unauthenticated user tries to log in, the face will be captured and would be sent as an email [5].

The door sensors open the door as soon as the homeowner sends a push notification. The user will receive this notification regardless of whether the phone is locked or unlocked, or if another app has been opened at that time. This was the main purpose of their project, which made the user feel safe. This setup can also be used in commercial offices where some areas are restricted to certain personnel; such a system will immediately notify any unauthorized personnel who try to gain access to the area. So, the expansion and application of such a system is limited by imagination [6].

In this research, it provides a foundation of software and Algorithms that can be used for Image processing and Facial Recognition software library. The library has a lot of optimized algorithms, which may be utilized in many IOT related sectors including face detection and recognition. Image processing is a mathematically intensive operation that converts the image into desired looking output. The Eigen face classifier then will try to recognize the cropped face and return the confidence of its prediction at the same time. This paper gives enhanced information about face Recognition and the most used Algorithms for the process. Also, there is high accuracy in recognizing house owner faces and it could realize sending the matched face image to a different Raspberry Pi in time and provides a good output [7].

3. PROPOSED SYSTEM

This Architecture of the proposed system shows the actual design diagram of the system which describes the scope of project with system design. In architecture diagram, we see the modules with its various functions which are acts as separate a process. This proposed system aims to convey the internal design of the proposed system the following Fig-1 shows the entire architecture of the proposed system
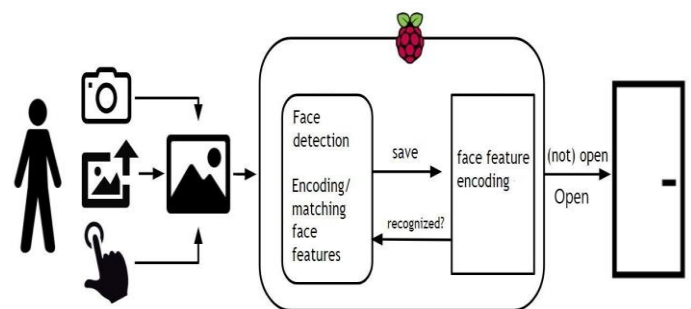

Fig -1: Architecture of automated door access control system

There are different mechanisms of security such as fingerprint scan, facial recognition, pin, and password. The application will learn from the user behavior according to algorithm and increase security when required .The details of the user accessing the lock will be stored in the server along with date and time which can be further used to predict the times when the user will enter the house and handle security accordingly.
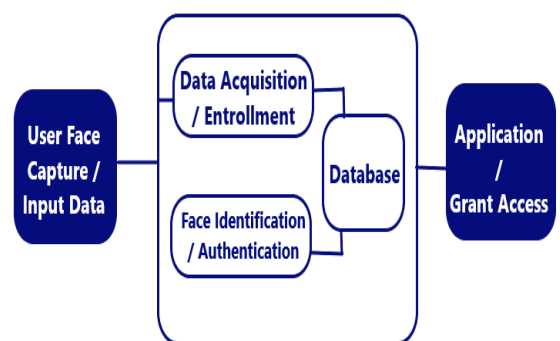

Fig -2: Block Diagram of automated door access control system

3.1 User Face Capture:

In this module, the Facial images and Video frames are captured for Face Recognition and Detection with the help of

Input Devices like Web Camera, Raspberry Pi Camera. These captured images acts as training data of our Machine Learning Algorithm to Achieve the Automatic Door access control system.

3.2 Processing Module/ Unit:

The Facial data which is collected from the Input devices that are captured Image of Human Face and Video frames. This input is then provided to the processing unit in which the processing or calculations based on algorithm are performed on the proposed person detection and door lock system module, here the processing unit is Raspberry Pi board, along with our code which implements the resultant output.

3.2.1 Pre-Processing Module/ Unit:

In this Pre-processing module, the data which collected from input camera i.e. image is stored in the database. Before storing the image it will perform the some classification and machine learning algorithm and store in database.

Also we recognize and detect the input images in this module. This module is connected to the outer side of the door, where the captured image compared with database and after matching is found in that images the lock gets accessible to that person.

4 FUTURE WORKS

Unauthorized person gets blocked at initial entry point of your surroundings.

This system can be presented with advanced methodology like if a blacklisted person tries to open the door, the system will send a message to the admin using GSM module regarding the same.

Also a real time speaking assistant can be developed and integrate with this system to make the system more user friendly and efficient.

If the real time application required then this Database can be linked to cloud in case of power failures and data loss.

5. CONCLUSION

Today's most famous security system is nothing but Face based Identification and Door locking Mechanism.

This Device is most popular and relatively cheaper than heavy locking systems also consumes less power, and quite user friendly. Nowadays, we can say that this unique and affordable solution over the bulky, costly security solutions. The proposed system in this paper is light in weight and easily attachable to door with very less human efforts. Using face recognition, Raspberry pi and Machine learning, we have proposed an advanced system for door lock to provide access to the user for entering into the house. As we know that Human face is very distinctive and it is intrusion free, means one cannot steal any other's face pattern. Hence, it is more secure to use Face based recognition system to unlock the door rather than worrying about losing keys or forgetting password.

REFERENCES

[1]   Omkar Pawar, Prathamesh Lomkar, Randhir Singh, Vivek Salunke and Prof. D.M. Ujlambkar,. "Door Lock System using Facial Recognition ", IJRASET March 2019.K.Y.Durga Prasad , S.Alekhya , A.Naresh , K.V.N Rajesh," Voice Recognition Based Home Automation using Raspberry Pi ",2018, July, International Journal of Innovative Science and Research Technology.

[2]   R. S. Divya and M. Mathew, "Survey on various door lock access control mechanisms," in 2017 International Conference on Circuit ,Power and Computing Technologies (ICCPCT), (2017)

[3]   Muhammad Sabirin Hadis, Elyas Palantei, Amil Ahmad Ilham, Akbar Hendra, "Design of smart lock system for doors with special features using bluetooth technology", 2018 International Conference on Information and Communications Technology (ICOIACT).

[4] "Super secure door lock system for critical zones - IEEE Conference Publication." Third International Conference on Science Technology Engineering & Management (ICONSTEM),2018,January.

[5]   Sandesh Kulkarni, Minakshee Bagul, Akansha Dukare and Prof. Archana Gaikwad, "Face Recognition System Using IoT", IJARCET November 2017. Waheb A. Jabbar*, Mohammed Hayyan Alsibai, Nur Syaira S. Amran, and Samiah K. Mahayadin," Design and Implementation of IoT-Based Automation System for Smart Home", 2018, November.

[6]   A. Anitha, "Home security system using internet of things," IOP Conf. Ser. Mater. Sci. Eng., vol. 263, p. 042026, Nov. (2017)

[7]   Sourav Roy, Md Nasir Uddin, Md Zahirul Haque and Md Jahidul Kabir, "Design and Implementation of the Smart Lock System with Face Recognition Method using the Linux Platform Raspberry Pi", IJCSN December 2018.