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IoT and Face Recognition based Automated Door Lock System

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***Abstract*— This research work uses face recognition to unlock door using IOT. This system is used for monitoring whether unknown person is entering into the house. System was established with communication and electronic devices through face detection with the help of Raspberry Pi platform. The face of authorized persons is then stored in database. It checks whether the person is authorized or not. If the person is authorized then the door opens automatically and if not, the authorized person receives a message that someone is trying to intrude. If the authorized person wants to open the door for the unauthorized person it can be done and if authorized person doesn't want to open the door, then the unauthorized person receives a voice message from the authorized person. This automated door lock system can be widely deployed in homes, educational entities etc.**

Keywords*— *Internet of Things (IoT), face recognition, voice message, One Time Password, Haar classifier, Raspberry Pi

I. INTRODUCTION

Now-a-days there are more modern features applicable in telecommunications technology to advance human existence these make connections between people more straightforward than it ever was people have different ways of communicating in the current period the majority of transmission between people takes place via wireless technologies both a message system and a speech system are used. The term "Internet of Things" (IoT) refers to a network of physical objects (things) that are embedded with sensors, software, and other technologies in order to connect and communicate with other systems or devices over the internet. Transparency, control, and performance have all improved in the IoT system.

Fig 1. Iot Technology

Fig 2. Smart Technology

A method which is used to verify and recognize a person with the help of their faces is facial recognition. With the help of this technique, faces can be recognized in real time and also in images and videos. The face recognition technology that unlocks mobile phones is well known to many people. This technique identifies a single person as the owner and not giving access to others.

II. LITERATURE SURVEY

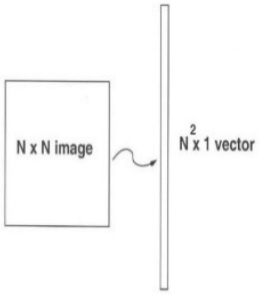
We have done a survey on the following papers based on our requirement. The paper by Raju A Nadafa describes about designing a security system for home using Raspberry Pi. This Automation Door Lock System requires hardware components like Raspberry Pi, Cam, Touch screen and mobile. Some technologies like Python, Node.js and OpenCV are used for coding. The paper by P Bhatia uses LBPH to know the person from the local DB which included the members of the house. The advantages of this system are Security, monitoring and control in real time are vital things of this system. The paper by M Nandini proposes a system for identifying the faces. This is done by relating the characteristics of the new face to that of known.

III. EXISTING METHOD

The present existing system doesn't have face unlock, voice feature and an alternate method for opening door if the face is not recognized. If sometimes the face is not recognized then it will be difficult to unlock the door in the

present existing system. It doesn't have alternate to open the door. This is the disadvantage the existing systemhas.

Fig 3.Example faces



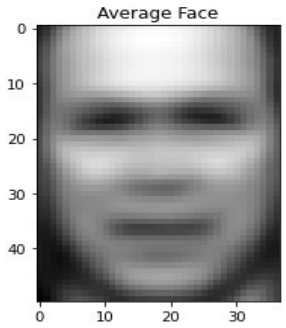


Fig 4. Average face

A. *Disadvantages*

- Understanding the concepts is time taking in addition to it is very grim to update the DB.
- This eigenface algorithm contain some common drawbacks because of its 'Appearance-based' nature.
- Proper centered face is required for training/testing.
- The algorithm is sensitive to lightening, shadows and also scale of face in the image .
- Front view of the face is required for this algorithm to work properly.

B. *Equations*

We calculate the average of all these face vectors and subtract it from each vector.

$$x_1, x_2, x_3, \ldots, x_m$$

$$\psi = \frac{1}{m}\sum_{i=1}^{m} x_i$$

$$a_i = x_i - \psi$$

m=no.of images

ψ=average of the face vectors

C. *Flow*

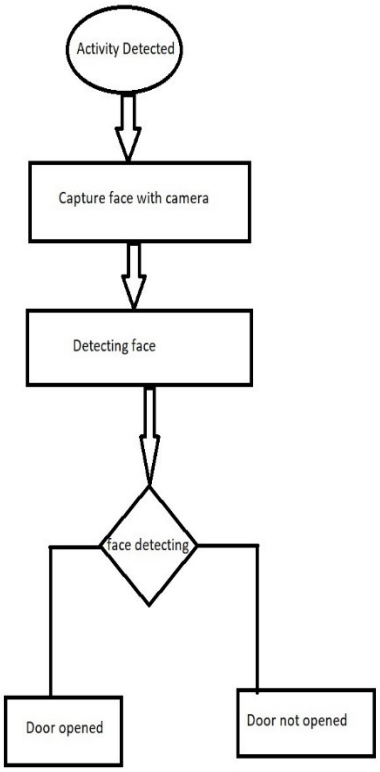


Fig 5.Flow of existing system

IV. PROPOSED METHOD

This proposed system overcome the drawbacks of the existing system by having voice message, face recognition and pin lock together. In existing system, we have only face lock but in addition to it we have voice message which was added to it. The main application of this voice message is if the owner busy with his works and he can't open the door for the person who is waiting outside through text message he can communicate to the person. The person hears the message through speaker. The owner has access to open the door or he can send the message.

To detect the face haar classifier algorithm is used. Firstly, it was trained by single face images which are called positive images and negatives images which contain empty

faces. The images are preprocessed like resizing and cropped. Features of haar are divided into various stages.

In each stage image testing is done. At the starting phases images have less haar cascade features. If the image s fails initially then it will discard. If all the phases were passed successfully then the image is detected check the images in the file system of raspberry pi. The advantages are fast image detection compared to other classifiers. This algorithm uses line edge detection features. This classifier used to detect eyes, lips, number plate etc. Alternatively, pin system also used in this proposed system in case if the face is not detected door will open through the otp which was generated by owner mobile.

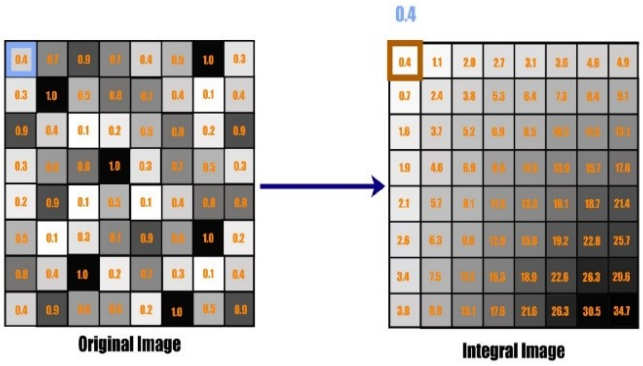


Fig 6. Face values

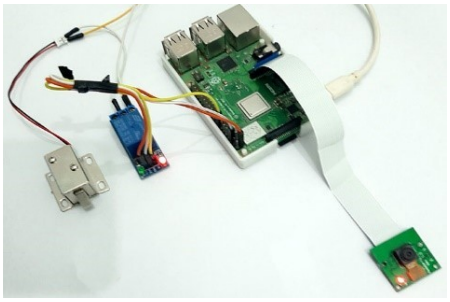


Fig 7. Connection of components

The voice feature in this system helps us if owner couldn't open door or don't want to open. The owner can send a message from his mobile phone and the one who is outside the door can listen from the speaker which is attached to the door.

An alternative method for opening the door is OTP generation. Rather than pin method otp is better because it is not fixed and changes every time. This technique is secure than pin system.

A. *Advantages*

- In spite of their size and location in the image, objects can be found in photographs using the Haar cascade technique.
- This procedure can function in actual time and isn't difficult.
- A haar-cascade classifier can be trained to identify in many various areas, including automobiles, bikes, structures, fruits, etc.

B. *Flow*

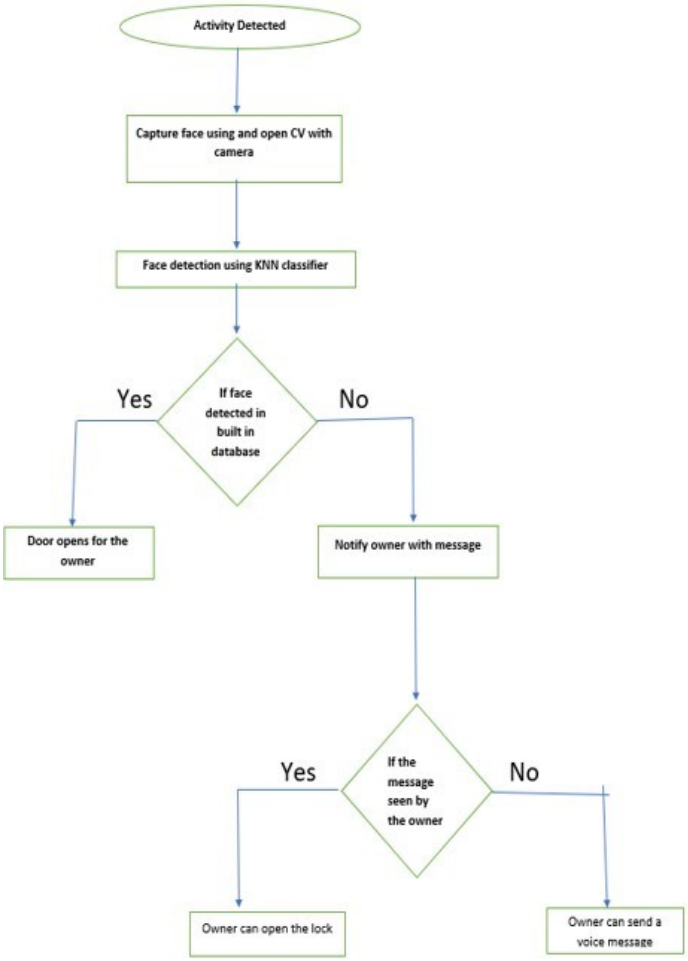


Figure 6. Flow of proposed system

V. RESULTS

The lock will be automatically opened when the face of the owner or the person who has access is recognized.

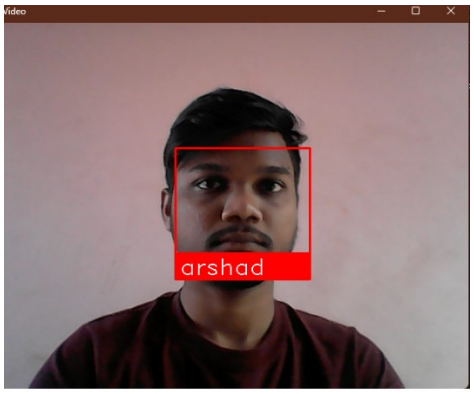


Fig 8. Recognition of known face

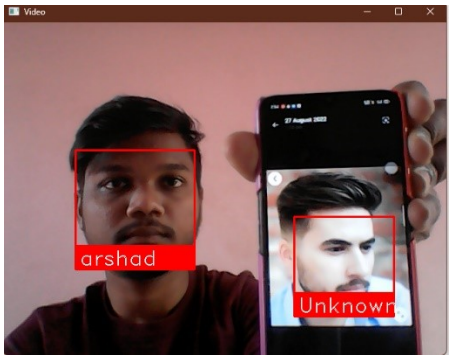


Fig 9. Recognition of unknown face

If the owner couldn't open door or don't want to open. The owner can send a message from his mobile phone and the one who is outside the door can listen from the speaker which is attached to the door.

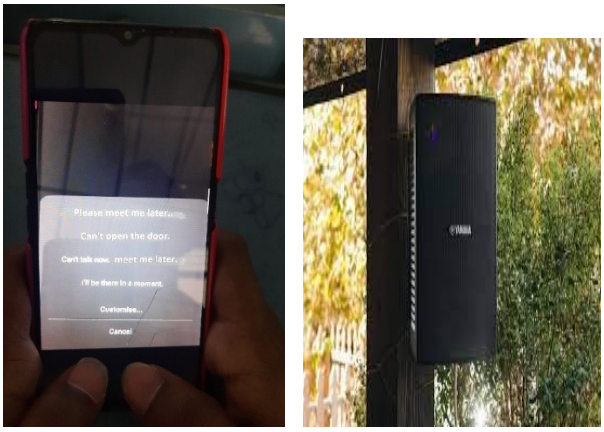


Fig 10. Sending Voice message

VI. CONCLUSION

In this paper, a door lock system using face recognition method is implemented. We have created a smart system that requires less human effort and makes operating the smart door simple, allowing access from anywhere in the world. It is simple to upgrade, faces may be recognized on the go with excellent accuracy, and the data is stored in the database. In the IOT, computer vision is used. We have created the Eigen face algorithm for real-time face detection for security purposes. Therefore, this technique can be helpful for elderly individuals who live alone and for people who are disabled. As a result, the projected system is very simple towards build besides straightforward to trace.

VII. REFERENCES

[1] Nadafa, Raju A., et al. "Home Security against Human Intrusion Using Raspberry Pi." Procedia Computer Science, 167, 2020, pp. 181120. DOI. or (Crossref), doi: 10.016/j.procs. 2020.03.200

[2] P. Bhatia, S. Rajput, S. Pathak and S. Prasad, "IOT based facial recognition system for home Security using LBPH algorithm," 2018 3rd International Conference on Inventive Computation Technologies (ICICT), Coimbatore, India, 2018, pp. 191-193, doi: 10.1109/ICICT43934.2018.9034420

[3] Aishwarya D, Dr. J Arokia Renjith Enhanced Home Security Using IOT and Raspberry Pi.

[4] M.Nandini, P.Bhargavi, G.Raja Sekhar Face Recognition Using Neural Networks.

[5] Mohammadjaved R. Mulla; Rohita P. Patil; S. K. Shah 2015. Facial Image Based Security System using PCA.

[6] M.Nandini, P.Bhargavi, G.Raja Sekhar Face Recognition Using Neural Networks.

[7] Mohammadjaved R. Mulla; Rohita P. Patil; S. K. Shah 2015. Facial Image Based Security System using PCA.

[8] I. Aydin and N. A. Othman, "A new IoT combined face detection of people by using computer Vision for security application, "International Artificial Intelligence and Data Processing Symposium (IDAP), Malatya, 2017, pp. 1-6, doi: 10.1109/IDAP.2017.8090171.

[9] Sourav Roy; Md Nasir Uddin; Md Zahirul Haque; Md Jahidul Kabir, "Design and Implementation of the Smart Door Lock System with Face Recognition Method Using the Linux Platform Raspberry Pi", by IJCSN – International Journal of Computer Science and Network, 7(6), December 2018

[10] Neetu Saini, zukhwinder Kaur, Hari Singh, A Review: Face Detection Methods and Algorithms, International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, 2 (6), June – 2013.

[11] Jhansi Rani G, Raghava Kumari D, Anitha M and Sarita B 2020 Analysis Of raspberry pi-based ATM theft monitoring and security system International Journal of Psychosocial Rehabilitation, 24(8) 15376-15383 10.37200/IJPR/V24I8/PR281514

[12] Raghava Kumari D, Anitha M, Jhansi Rani G and Ramesh Babu D, 2020 Road traffic control by using Li-Fi technology between vehicle to vehicle communication International Journal of Psychosocial Rehabilitation, 24(8) 15393-15397 10.37200/IJPR/V24I8/PR281516