

Smart and Savvy Door Lock System Using Raspberry Pi

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Abstract -This paper deals with the proposed system for smart and savvy door lock recognition system which is basically for identification of human faces and for home security. This system consists of subsystems namely image capture, face detection and recognition, and automatic door access management. Face Recognition works well with Open CV because it uses Eigenfaces and reduces the scale of face images without losing vital features, facial images of different persons will be stored in the database. This paper aims at taking face recognition to a level in which the system can replace the use of passwords.

Key Words:Face detection, Face recognition, Haar Cascade, Raspberry Pi, IoT

1.INTRODUCTION

There is a need for faster and accurate user identification and authentication method [1]. In our face recognition approach, a given face will be compared with the stored faces in the database in order to identify the person [2].Once the image given is identified as an image in the database, the door will be automatically opened without any restriction [2][4]. The Main motto here is to search out the face in the database, which has the highest similarity with the given face. Face recognition technology wants the capabilities of human eyes to detect the face. Certain features of the face will be used for detection.

Detection of image and these features are called templates. These templates will be compared to the face detected [1]. For this, survey we inferred Raspberry pi Solenoid lock, External dc power source, Relay module, Raspberry pi camera.

Face recognition has been a crucial element in this era for researchers due to various human activities found in

applications of security like criminal detection, forensic, face tracking, airport etc. Compared to other biometric traits like a fingerprint, Iris, finger, palm etc., face bio metrics can be non-intrusive. They can be taken even without user's knowledge and also can be used for many security applications. Also Face authentication has a fascinating approach that other approaches lack: facial images can be captured from a distance, any special actions are not always required for authentication, and crimes can be reduced because the captured images can be recorded and shown as proof.

1.2 DEMERITS OF EXISTING SYSTEM

1.21Usage of internet makes the security at risk due to hacking possibilities.

1.22 There are even manual door lock and unlock systems without and proper security measures.

1.23 These methods may lead to malpractices or replicate the data easily.

1.24 Firstly, the system mainly uses a facial recognition module, and the user will have to remember the password or keyword. This again creates confusion in them in recollecting the keyword. Thus, a new model which rectifies all the above issues is developed.

2. LITERATURE SURVEY

[1.1] In the paper, a "Smart Door Access Using Facial Recognition" as Face recognition technology emulates the capabilities of human eyes to detect. This is done by smart computing that creates "face bunch" that consists of 70 nodal points. Features are extracted from the face and saved as templates. These templates are compared to the face detected, and the name of the detected person will be displayed on LCD. Finally motor will rotate indicating opening and closing of the gate. The eigenfaces may be considered as a set of features which characterize the global variation among face images.

Then each face image is approximated using a subset of the eigenfaces, those associated with the largest eigenvalues. These features account for the most variance in the training set. In the language of information theory, they extract the relevant information in the face image, encode it as efficiently as possible, and compare one face with a database of models encoded similarly. A simple approach to extracting the information contained in an image is to somehow capture the variations in a collection of face images, independently encode and compare the individual face images.

[1.2] The paper explains the technique of remotely controlling the door via internet connection and messages through which the owner and the person at the door can communicate with each other. The door unlocking system aims at creating a more secure and a safe way to provide access to visitors authorized by the owner of the house into their homes. The system can be controlled by any small single-board computers. IoT is a technology which is growing fast and has many applications. The main purpose of their project is to incorporate the IoT locking mechanism

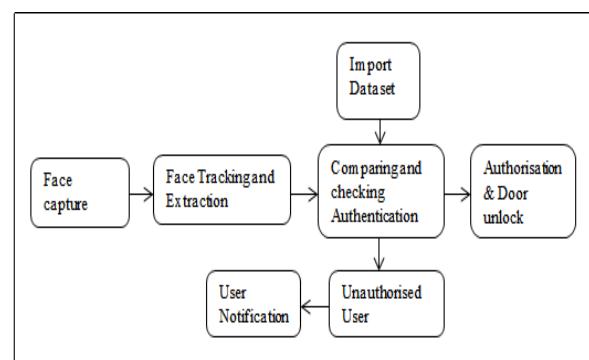
[1.3] The paper [4] "Pose and illumination Invariant Face Recognition for Automation Of Door Lock System" proposes a door lock system which is based on face recognition. The proposed system will automatically give access to the door only if the system recognizes the face of the person trying to access the door. In case of unauthorized access, the door will remain closed. The algorithm used for face recognition is Local Binary Pattern Histogram (LBPH). Our contribution to automatic door access system is to make it pose and illumination invariant.

[1.4] Embedded web server-based application is used in paper [7] where it describes the implementation and deployment of the wireless control system and accessibility into a home environment for authenticated people only. A wireless network technique ZigBee based and image processing technique PCA based, dedicatedly make the security system alive as per the request. ZigBee module and electromagnetic door lock module combined operate the door accessibility, has been designed and developed. Face detection and recognition algorithms, as well as a wireless interface are used to detect and identify visitors and send an email and/or an alert message about the current home environment status via GSM network automatically to the home owner's mobile phone or any communication devices. Users can monitor visitors and control the door lock on active Web pages enhanced with JavaScript and HTML. This system finds a wide application in areas where physical presence is not possible all the time.

3. PROPOSED SYSTEM

Several researchers have worked on face detection topic and we have surveyed a few. We have found the cons and disadvantages it had and we worked on improving the current scenario on face detection and making it an ideal solution for privacy issues.

3.1 DIAGRAM



3.2 MODULES

1. Face detection and data gathering: The first process what we do is to gather the data and store it. Once the person comes near the camera and shows their face, it will detect the face and check in the database, if it's a match then the door will open.

2. Training recognizer: A Haar Cascade Classifier is used to detect the object for which it has been trained for, from the source. This proposed system uses Haar Cascades Classifier as a face detection algorithm. Firstly, the algorithm needs a lot of positive images and negative images to train the Haar cascades classifier. Positive images are images with clear faces where negative images are those without any faces.

3. Facial recognition: Face recognition is matching the input signal with the pre-stored library. Though the input signal is noisy due to the different angle, position and intensity of light, the image could be recognized according to the position of eyes, face, and mouth in the face, and their relative distances between each other. These features are called Eigenfaces.

3.3 SYSTEM OPERATIONS

When a person comes near the camera to show his face, if it is a match in the database, the door

unlocks. We have worked on providing more security by not using an internet connection. Instead, we are implementing GSM service i.e. if any unauthorized person tries to access the door the system will connect a call to the admin. Admin can grant permission to enter by talking to the person. The person can talk with the admin through the microphone present in the door lock system. In this way, we can avoid intrusion and any malpractices.

4. COMPARISON

4.1 Table

Existing System	Proposed System
In the existing system, internet connection is used.	The proposed system we don't use the internet.
Usage of passwords and pins.	We have not used passwords and we have worked on facial recognition itself.
There are lots of complications and security issues in the previously existing systems.	We have tried to overcome those.

The above table compares the existing system and the proposed system. We can clearly see that the proposed system overcomes the drawbacks of the existing system.

5. CONCLUSION

The project is meant in such a way that has fast and efficient alert and monitoring system that may be used not just for door lock security system moreover as other applications also. The project is a sweet example of Raspberry pi and pi camera with Open CV. The systems are programmed by Python language. We have got used the technique that needs very less computational time and greater accuracy in detection, recognising of both Real times and from specific images, i.e. stored images. Also, we used the Eigenfaces to represent the features of vectors for human faces. The features are extracted from the first image to represent a unique identifier used as inputs to the neural network to live similarity in classification and recognition. The Eigenfaces has proven the aptitude to supply the numerous features and reduces the input size for the neural network. Thus, the network speed for recognition is increased.

7. REFERENCES

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