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Face Recognition System for Door Security using Raspberry Pi

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***Abstract*: All of us know that the security is important in our real life. By giving high or peculiar security we can avoid thefts and identify frauds a face recognition system can created. The aim of this project is to develop a security access control application based on face recognition. The haar-cascade like characteristic is used for face detection and LBPH algorithm is used for recognition of face. In order to give a higher security and accuracy we use OpenCV libraries and python language. Preparing and recognizable proof is worn out implemented gadget known as Raspberry pi.**

***Keywords*: Confront discovery, Confront acknowledgement, raspberry pi, security.**

1. Introduction

In this current time a parcel of occurrence happens like theft taking undesirable entrance happens suddenly. People are always busy in their day - to - day work, and they also want to make sure their beloved things are safe. They sometimes forget to take care of their necessary things such as keys, wallet, credit cards etc. Without them, they cannot access their home or any place they want. Traditional security system requires a key, security password, RFID card, or ID card for the user to access the system. There are deficiencies in these security systems; they can be forgotten or stolen by unauthorized people, for example. As a result, a template is necessary to develop software that ensures a higher level of security. One of our brain's unique features is that it can only think in pictures, not in words. Once you forget to keep the key to your car, but never forget to bring a face.

2. Literature survey

Many organizations, companies and institutions are taking periodic attendance using [1] RFID methods, [2] Biometric Fingerprint method and Registers. These methods generally take more time for calculation. RFID [1] uses electromagnetic fields to automatically identify and track tags that are attached to individuals. RFID may infringe human privacy and security.

Biometric fingerprint identification [2] systems employ fingerprint as a unique identity. It is one of the most accurate systems running effectively today. But recognition of an individual fingerprint from a set of enrolled fingerprints is a difficult process. The fingerprint system does not reveal any information regarding the original fingerprint.

As many algorithms [3] reveal that a fingerprint can be reconstructed using minute templates, this may have been proven to be false.

Iris Recognition [4] is another type of implementation where people's iris is scanned, stored and then automatically managed on the server for comparison and attendance. But there is difficulty in capturing student or employee iris and can therefore be used to quickly implement face recognition [4] with reduced lighting effect.

3. Proposed model

Some face recognition algorithms identify facial features by extracting landmarks, or features, from an image of the subject's face. For example, an algorithm can analyze the relative eyes, nose, cheekbones, and jaw position, size, and/or shape. These features are then used with matching features to search for other images.

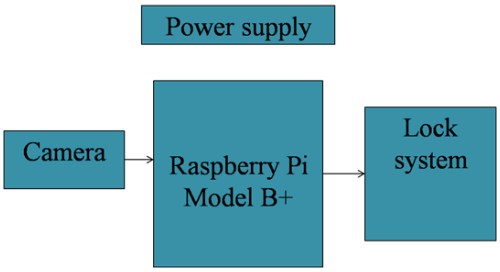

Fig. 1. Block diagram

A. Capturing image

The camera module is placed in a region where people enter college or office and video is captured within less than 5 meters of distance. A camera is used to capture video that contains many frames from which any of the frames can be used to recognize the face and open the door.

B. Creating database

As a biometric method has been chosen for implementation, it is crucial for enrolment of every individual whose attendance needs to be taken. Here every person's face is captured and stored in an appropriate database that includes the name of the person and other credentials. Here, multiple samples are taken with different lighting conditions for a single individual. A

database of one student has been created by taking of 100 images of each user.

C. Detecting faces

Choosing an efficient algorithm for face recognition is critical in this proposed work. There are many face detection algorithms available in OpenCV such as Eigenfaces, Fisherfaces and Local Binary Pattern Histograms. The Haar Cascade Algorithm [5] for face detection and recognition is considering the need for real - time recognition of an algorithm that has been chosen. Choosing an efficient algorithm for face recognition is critical in this proposed work.

4. Preprocessing

Because an image may contain unnecessary background noises and other elements than faces, removing these elements is important. Thus extraction of the feature is key to reducing the image to just one face in the image. The image is reduced by this method to a size of 150x150. On the reduced image, the histogram equalization is performed, making the image easier to process.

A. Recognition of faces and classification

An algorithm's ability to recognize faces is based on how well the faces can be extracted and classified. Extraction of the feature is done through Principal Local Binary Pattern Histogram (LBPH) in this work. Based on the comparison of many methods for extraction of features and based on the analysis and results of different methods, they have arrived at this method. The first method to represent Principal Local Binary Pattern Histogram(LBPH) faces quickly.

$$D = \sqrt{\sum_{i=1}^{n}(hist1_i - hist2_i)^2}$$

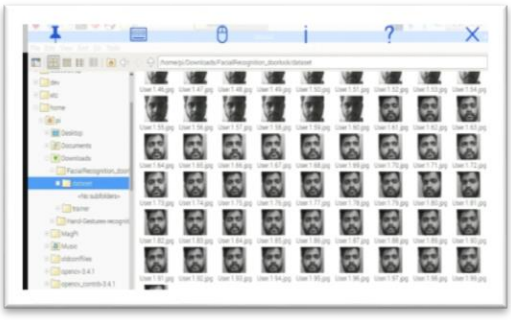

Fig. 2. Data set

So the output of the algorithm is the image ID with the nearest histogram. The algorithm should also return the distance calculated, which can be used as a measurement of confidence. Note: don't be fooled about the 'confidence' name, as lower confidences are better because it means the distance between the two histograms is closer. Then we can use a threshold and confidence to automatically estimate if the image has been recognized correctly by the algorithm. We can assume that if the confidence is below the defined threshold, the algorithm has been successfully recognized.

These are compared to features obtained in real-world scenarios such as various types of facial expressions, conditions of lighting. Work performance improves as it starts to increase accuracy by considering more than 100 real-time images through continuous training of the face recognition system. The distance from the camera to face is critical while training and recognition and the ideal distance between 1 and 5 is found.

Fig. 3. Recognition of face and door Unlock

5. Conclusion

As a result, facial recognition attendance systems can be proven safe and efficient. The Haar Cascade Classifiers outperform other algorithms in real - time scenarios and found it suitable for carrying out this work. With a low false rate, it gives a better recognition rate. Using Raspberry Pi improves the work's mobility independently and acts as an independent hardware. The work can be further developed by improving the recognition rate and this system can be used as a security surveillance system by using the Raspberry Pi Infra-Red camera module.

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