

Two Layer Security System Using RFID & Face Detection

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Abstract- This project is mainly based on two layer security system which includes the use of RFID (Radio Frequency Identification) and biometric detection which is facial detection in our project. With the use of RFID we scan the tag (RFID card) in the hardware (RFID Reader) and the card id is generated for a particular user and then the webcam is opened for the facial detection, then the attendance is marked. The main purpose of our project is to ensure maximum security is provided for a particular student so that no other person can mark his attendance on his behalf. This two layer security system is useful as it provides authentication in two steps. In first step, it will let person with authorized card to complete the first layer of security. After completion of first step, camera will open for facial recognition. After detection, attendance will be marked. RFID based recognition provides faster process while face detection provides security as security system is having database of only authorized person and detection will be done on this base only. So by using these two steps, we can ensure better security for sure.

Keywords – Face detection, OpenCV, Eigen Face, RFID, RFID tags

I. INTRODUCTION

Our project is based on two layer security system; one is RFID and second is biometric based identification. There are different types of identification using biometric [1-4]. Some of examples are figure print, retina scan, iris scan, facial recognition etc. we are using facial recognition in our project. Facial recognition is using different marks in human face like length of eye socket, width of nose pins, distance between eyes etc[5,6]. By using these unique features, different features of human face have been extracted. After that face database will be created for recognition. Now, in first layer of security, we are using RFID (Radio Frequency Identification)[7,9], as physical identification which is done by employee itself. So we can conclude here that this project can be used as door security as well as for facial recognition and also for resolving attendance purposes to make it more authenticate and better. Traditionally we are using human based attendance system in different offices as well as in academic institutions [8]. Now days, few biometric based attendance system is introduced. Most of them are using Finger print scan. Facial recognition based attendance system is not that much popular. But as far as security measures are concerned, it is a better option to work with and also it can be act as a substitution of traditional methods. So it can make attendance process more effective and advanced. In this changing world of technology, we must adapt things like this to compete in this race.

The suitable solution for this problem is by designing a system that will record attendance automatically. In this project, RFID system [7,10] is used to record the numbers of employees' attendance automatically. The ID cards of the employees is embedded with RFID tag which is read by a reader. This RFID system is interfaced to a database through a computer. This method is more effective to prevent problem encountered when getting attendance manually. Once the card has been read then webcam opens for facial recognition then the facial detection once authorized then the attendance will be marked.

II. SURVEY

Various researches had already been done on face detection and feature extraction. Some of the important methods are as discussed below [5]:

2.1 Face Detection Methods: The different techniques used for face detection are classified as shown below [5]:

- Knowledge Based Method
- Feature Invariant Method
- Template Matching Method
- Appearance-Based Method

2.2 Face Feature Extraction Methods: The methods used for Face Recognition can be divided into two major categories:

- Holistic Approach
- Feature-based Approach

2.3 In the holistic approach, the face is taken as input for recognition purpose.

- Eigen Face Recognizer
We can use PCA (Principal Component Analysis), for reducing the dimensionality of the data by projecting, it onto a lower dimensional subspace.
- Fisher Face Recognizer
We can go for LDA (Linear Discriminant Analysis), where the dimensionality reduction takes place such that the within- class variance is reduced and between class, variance is maximized.
- Local Binary Pattern Histogram
We can go to LBPH where the local structure of the image is summarized by comparing each pixel with its neighborhood.

In Feature-based Approach, local features on the face such as eyes and nose are detected and based upon which recognition is performed.

The use of Radio-frequency identification (RFID) technology in automated electronic environment and for tracking objects has been widely researched upon by researchers and deployed by various organizations as part of their automation systems. References] provide examples of a real RFID contact less data link deployments that utilize RFID technology for object tracking and automated data collection solution. RFID is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object.

III. MODEL GENERATED

The working of this system has been divided into two parts

1. RFID
2. FACIAL RECOGNITION

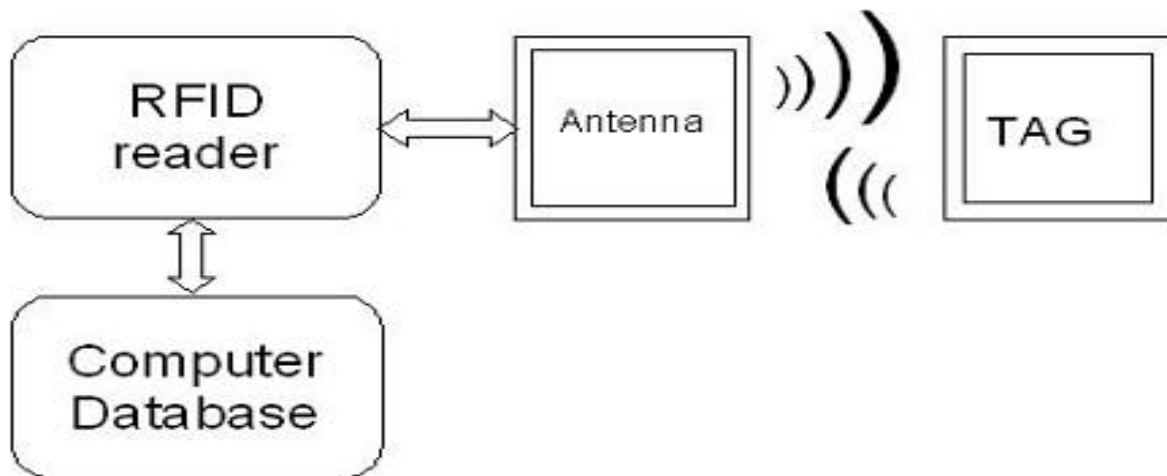


Figure 1: Step 1(RFID based authentication)

3.1 RFID

This is the first step of the two layer security system in which the user will scan the electronic tag allotted to him in the hardware given then the buzzer will make a sound once the tag has been scanned and the user ID will be generated. This ID generated will be unique for all so that no other person can mark his attendance on his behalf.

3.2 Facial Recognition

This is the second step of marking attendance after the RFID tag has been scanned and the user ID has been generated then the module can be started for the facial recognition. The webcam will be opened once we start the module the user data has been already filled with their unique ID generated so that when the facial recognition takes place it does not mark the attendance of the other person. Once the attendance has been marked then the message will be displayed and then the data will be stored in the database with the status if the person is still in the infrastructure or has left the infrastructure with status showing in or out.

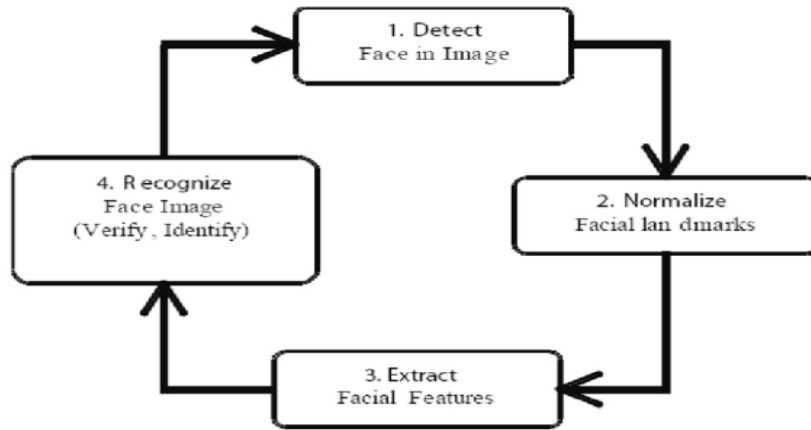


Figure 2: Step 2(Face Recognition)

IV. WORKING OF ALGORITHM

Eigen Face algorithm works on the basis of facial recognition by using eigen face. Eigen face can be obtained by generating training set of images.

Firstly we need to create a database. For creating database, we need to capture at least 10 to 15 images. We need to create strong database for better accuracy. After capturing, PCA will extract features from the faces. There are around 80 different features in a single human face. These all will get extracted to created a database of faces. Now by using these images, we will firstly calculate average image. Then we will have the eigen face. In the database, we will have eigen face as well as captured images. At the time of detection, if we will find an image which is not present in the database, our system will automatically add that particular image into it. So we can say that our software is feature a feature called self update. Now following are the steps involved in it:

1. Capture images from camera.
2. Extract its feature.
3. Create a training set of images.
4. Create face database.
5. Calculate average image.
6. Calculate eigen face.
7. Update database by adding eigen faces into it.
8. Facial recognition.
9. If the test image is not present in the database, update it by adding that into it.

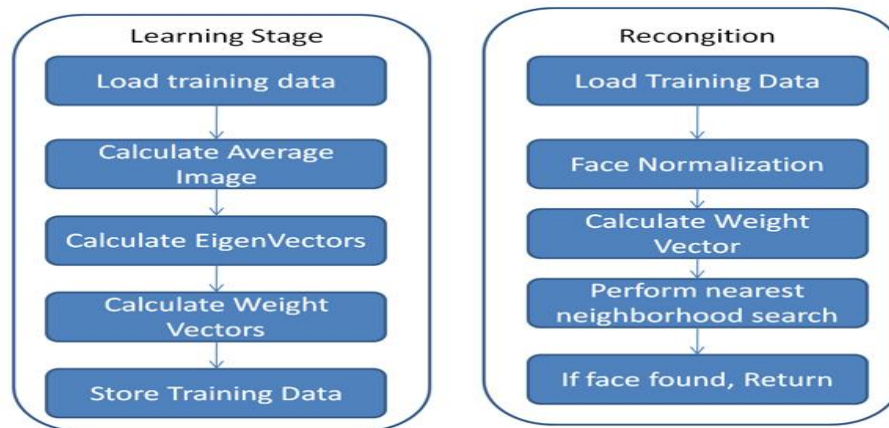


Figure 3: Working of Eigen Face algorithm

RFID is abbreviated as Radio Frequency identification. There are two parts of RFID, one is card and second is reader, card is having all the information of employee stored on it. It is handled by the admin and generated at the time of enrollment of new employee. It is also termed as the first layer of security. Second part of RFID is reader. we need to apply card on the reader so that reader will read the card to extract its features and information stored on it. There is also a buzzer added on it. It will ring an alarm whenever we will apply card on it. Card id will be worked as primary key. When an authorized user will apply its card on the reader, it will complete its first step and let user mark it attendance by facial recognition, which second layer of authentication.

The benefit of two layer security is that as one can make a duplicate card by some other means. So that he can enter into the first layer. But on the second layer, he will not get the access as his face is not present into the database. So by virtue of this we can say that our system is providing security at vast level.

V. EXPERIMENT RESULTS AND CONCLUSION

Microsoft SQL Server Management Studio 2008 is used for database. It is a database introduced by Microsoft in early 2000. It provides a vast range of application and it minimized all the drawbacks which previous software has faced. Firstly we installed its setup in our system. In the code, we linked our project with database by coding. The following major features were implemented in the Software developed. Mentioned below is an insight of the tasks the application performs.

- The software helps in managing two layer security systems which generates card id with the help of RFID.
- After the RFID card has been scanned then we are allowed to mark attendance for the particular user through facial detection.
- This ensures proper security for a person and is automatically updated after each marked attendance.
- We can easily check the attendance of the employee at the end of the month.
- It plays a very important role in employee management system.
- The software is developed in visual studio using c# language.

The software is developed so as to support windows platform

VI. REFERENCES

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