Authentication of Credit Card Using Facial Recognition

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Abstract: **Credit cards are widely being used all over the world. There is an assumption, that if one has a credit card and passes verification, the access is granted. Such an approach entails few threats: using of credit card being in possession of unauthorized people (stolen or just borrowed), risk of cloning card. One of the solution is verification of the biometric linkage between the signed facial image of the credit card holder embedded in credit card and the user's facial image captured by a webcam during usage of the card. Our goal is to compare the similarity of faces embedded in the credit card and user. The face scanning is done using efficient facial image representation based on Eigen face texture features. It uses Eigen's Principal Component Analysis (PCA) for the dimensionality reduction.**

Keywords: **Eigen Faces, Fisherface, Generalization, Linear Binary Pattern, PCA, Specialization.**

I. INTRODUCTION

Nowadays, credit cards are being used worldwide. Credit and debit cards are fast becoming the most common payment mode of big purchasers; pushing more and more businesses towards credit card processing services. People use credit cards for online transactions, in shopping malls, for taking cash out of ATM, etc. Credit card fraud is the biggest risk in credit card transactions. Credit cards and the pin codes of the credit cards can be stolen.

The proposed solution provides a secure method for credit card authentication using Eigen Faces facial recognition technology. As the problems stated above motivated us to use Digital Image processing that can secure the overall credit card system by using face recognition of the user. Face recognition is a both challenging and important recognition technique.

Among all the biometric techniques, face recognition approach possesses one great advantage, which is its user-friendliness (or non-intrusiveness). The survey made also explains the ease of using the proposed algorithm and the benefits of face recognition technique.

II. LITERATURE SURVEY

Different Algorithms and techniques have been designed to implement the facial recognition as a key element for authentication of card holder. These cards were not normal office cards or any other card than the credit card. Many institutions use e-ID cards as access control authorization, it means that one just needs to possess card in order to get access to resources e.g. room or elevator. In such a scenario it is sufficient to steal or duplicate a card of legitimate user in order to get all its credentials. It is also possible to borrow such an e-ID card from third parties in an unlimited way. Based on these arguments we propose a new solution preventing from using electronic cards by unauthorized persons as well as limiting the usage of stolen cards. Simultaneously the whole system should be as transparent as possible for users and not force them to change their habits in major way. We aim to provide such a solution that fulfils the following criteria: it is based on electronic card technology (e-ID/RFID cards), almost transparent for users, does not require any special additional actions, increases system security, and eliminates undesired behaviors e.g. borrowing cards.

In face recognition, there are also various techniques. Some of them are: -Linear Binary Pattern

-Eigen faces

-Fisher faces

Linear Binary Pattern:

This technique is used by the author Timo Ahonen [3] The LBP is one of the best performing texture descriptors and it has been widely used in various applications. It has proven to be highly discriminative and its key advantages, namely, its invariance to monotonic gray-level changes and computational efficiency, make it suitable for demanding image analysis tasks.

Eigen faces:

This technique was used by author Matthew A. Turk and Alex P. Pentland. [2] Much of the previous work on automated face recognition has ignored the issue of just what aspects of the face stimulus are important for identification, assuming that predefined measurements were relevant and sufficient. This suggested to us that an information theory approach of coding and decoding face images may give insight into the information content of face images, emphasizing the significant local and global "features". Such features may or may not be directly related to our intuitive notion of face features such as the eyes, nose, lips, and hair. In the language of information theory, we want to extract the relevant

information in a face image, encode it as efficiently as possible, and compare one face encoding with a database of models encoded similarly. A simple approach to extracting the information contained in an image of a face is to somehow capture the variation in a collection of face images, independent of any judgement of features, and use this information to encode and compare individual face images.

Fisher Faces:

This technique was used by author Chengjun Liu & Harry Wechsler[4]. This paper introduces a new face coding and recognition method that employs the enhanced Fisher classifier (EFC) operating on integrated shape and texture features, and assesses comparatively the types of input for face representation against some popular face recognition methods. The dimensionalities of the shape and the texture spaces are first reduced using principal component analysis (PCA). The corresponding but reduced shape and texture features are then combined through a normalization procedure to form the integrated shape and texture features. The other two types of input assessed in this paper are the shape images and the masked images. Shape images undergo the same alignment procedure as the shapes do, but preserve the intensity information within the contours of the faces.

Table 1:- Literature Survey

SN	Author Name	Advantages and Disadvantages	Algorithm
1	Timo Ahonen	Advantage: LBPH is significantly more robust under illumination and pose variations. Disadvantage: Takes a lot of time to recognize the face as compared to other two techniques.	Linear Binary Pattern
2	Matthew . A. Turk and Alex P. Pentland	Advantage: It uses PCA method which helps to reduce the dimension of an image matrix.	Eigen Faces
3	Chengjun Liu & Harry Wechsler	Advantage:It recognizes the face more accurately and also in very less time as compared with other two techniques. Disadvantage: Less efficient.	Fisher Faces

III. EXISTING SYSTEM

The first bank card was issued in the fifties of the last century in the United States, the first ATM was installed in London in 1967, payment cards with magnetic strips and terminals for their servicing appeared in 1971, chip cards were invented in 1974, contactless – in 2002. All the time the banks sought to protect savings of their clients maximally. For a long time PIN-code was the main mean of protection – technology, invented by Scottish engineer back in 1965. A personal identification number (PIN) is a numerical code used in many electronic financial transactions. Personal identification numbers (PINs) are usually used in conjunction with usernames or other passwords.

Advantages:

Attack by key logger is not possible. Attack by brute force / rainbow tables / social engineering are more difficult.

Disadvantage:

Pin code can get stolen or could be forgotten.

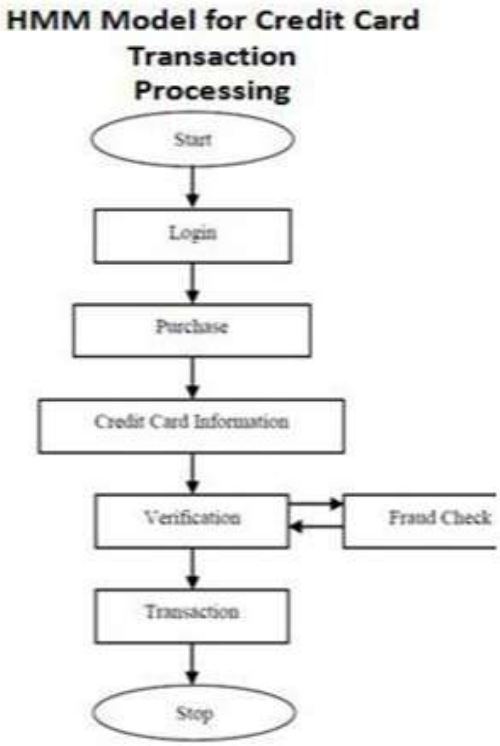

Figure 1: Architecture of Existing Credit Card System

IV. PROPOSED SYSTEM

Now a days, applications in the field of surveillance, banking and multimedia equipment are becoming more important, but since each application related to face analysis demands different requirements on the analysis process, almost all algorithms and approaches for face analysis are application dependent and a standardization or generalization is quite difficult.

Most consumer electronic devices such as mobile phones, laptops, video game consoles and even televisions include a small camera enabling a wide range of image processing functionalities including face detection and recognition

applications. The users' presence is perceived by detecting faces, motion, and position and even age, in the area in front of the television and after a certain time with no audience, the set turns off automatically, thus saving both energy and TV life. Face detection is a specific case of object-class detection, which main task is to find the position and size of objects in an image belonging to a given class. Binary patterns are used for this purpose.

Eigenface is based on PCA that classify images to extract features using a set of images. It is important that the images are in the same lighting condition and the eyes match in each image. Also, images used in this method must contain the same number of pixels and in grayscale. For this example, consider an image with n x n pixels. Each raw is concatenated to create a vector, resulting a matrix. All the images in the dataset are stored in a single matrix resulting a matrix with columns corresponding the number of images. The matrix is averaged (normalised) to get an average human face. By subtracting the average face from each imagevector unique features to each face are computed.

Advantage and disadvantage:

Biometric systems are usually more secure than the standard Proximity mean. A Proximity card can be lost or stolen and a PIN can be announced or viewed. Biometric systems are usually more expensive than PIN or Proximity systems for the following reasons:

- Hardware such as Biometric readers are likely to cost more than PIN or Proximity readers
- The Biometric software usually requires a license which is purchased upon initial setup.
- There are usually ongoing costs such as Annual license fees with Biometric systems.

V. IMPLEMENTATION

Below are the methodology and descriptions of the applications used for data gathering, face detection, training and face recognition.

Face Detection

First stage was creating a face detection system using Haar-cascades. Although, training is required for creating new Haar-cascades, **OpenCV** has a robust set of Haar-cascades that was used for the project. Using face-cascades alone caused random objects to be identified and eye cascades were incorporated to obtain stable face detection.

Face and eye classifier objects are created using classifier class in OpenCV through the **cv2.CascadeClassifier()** and loading predict identity.

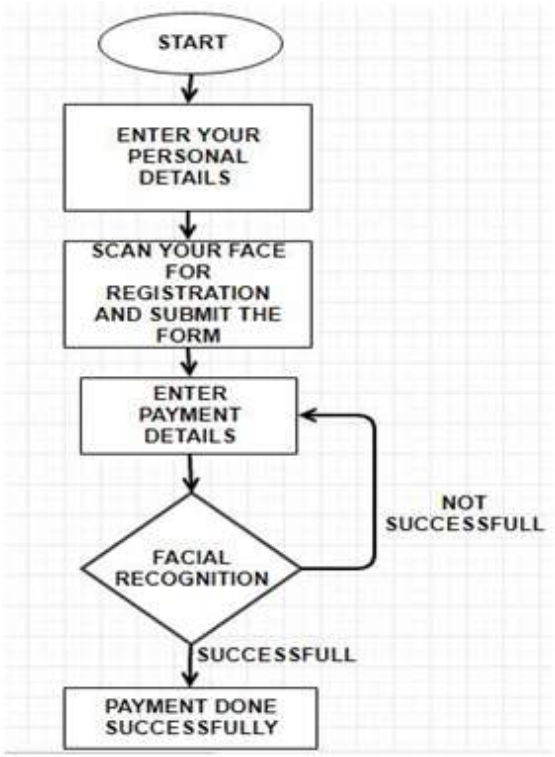

Figure B:- (Architecture of Proposed credit card system)

The respective XML files. A camera object is created using the **cv2.VideoCapture()** to capture images. By using the **CascadeClassifier.detectMultiScale()** object of various sizes are matched and location is returned.

Face Recognition Process

For this project three algorithms are implemented independently. These are Linear binary pattern histogram, Eigenface and Fisherface respectively. All three can be implemented using OpenCV libraries. There are three stages for the face recognition as follows:

1. Collecting images Ids.

2. Extracting unique features, classifying them and storing in XML files.

3. Matching features of an input image to the features in the saved XML files and

Training the classifiers

OpenCV enables the creation of XML files to store features extracted from datasets using the FaceRe-cognizer class. The stored images are imported, converted to grayscale and saved with IDs in two lists with same indexes.

Eigen Faces

cv2.createEigenFaceRecognizer()

1. Takes in the number of components for the PCA for crating Eigenfaces. OpenCV documentation

mentions 80 can provide satisfactory reconstruction capabilities.

2. Takes in the threshold in recognising faces. If the distance to the likeliest Eigenface is above this threshold, the function will return a -1, that can be used state the face is unrecognisable.

The Face Recognition

Face recogniser object is created using the desired parameters. Face detector is used to detect faces in the image, cropped and transferred to be recognised. This is done using the same technique used for the image capture application. For each face detected, a prediction is made using 22 **FaceRecognizer.predict()** which return the ID of the class and confidence.

Calliberation of Training and Testing The following process depicts how exactly facial detection takes place:-

Image 1) First the test image is taken and below it shows the screenshot of how the image gets trained in the training set.

Image2) After training we go ahead for testing the facial detection. Once the face has been detected it shows the users name and the distance. The following screenshot shows how successful detection takes place.

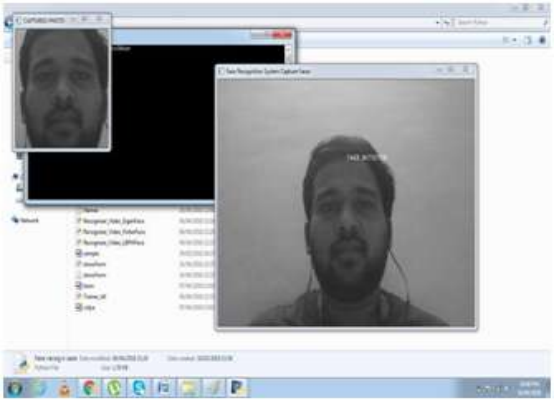

Image 1

Image 2

VI. SUMMARY

In this report, the study of different facial recognition techniques is presented. The different techniques such as Linear Binary Pattern, Eigenfaces, Fisherfaces is explained. The comparative study of various techniques mentioned above is presented in this report. Fisherfaces have been chosen because it recognizes face faster compared to other two techniques. The proposed system provides high level of security which includes OTP generation and facial recognition. The applications of the system is identified and presented. The proposed system provides more application and security compared to regular system.

REFERENCES

[1]. Sebastian Zientek,Wojciech Wodo, "Biometric linkage between identity document card and its holder based on real-time facial recognition", July 28-30, 2015.
[2]. Matthew A. Turk and Alex P. Pentland, "Face Recognition Using Eigenfaces", 1991.
[3]. Timo Ahonen, Matti Pietikainen, "Face Description with Local Binary Patterns: Application to Face Recognition", IEEE, DECEMBER 2006.
[4]. Fatma zohra CHELALI. A. DJERABA and R. DJERIDI, "Linear Discriminant Analysis for Face Recognition", IEEE, 2009.