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Credit Card Reader with Face Recognition Using Webcam

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ABSTRACT

Facial recognition software is a biometric computer application that is capable of identifying an individual by analysing or comparing his/her facial features. This paper proposes to use facial recognition in ATM systems to enhance security. Face recognition begins with an image, attempting to find a person in it. This can be accomplished using several strategies including movement, skin tones, or blurred human shapes. An ATM model that uses facial recognition would protect customers and financial organisations alike from intruders and identity thieves.

Keywords : Face recognition, ATM, biometric, voice modulation, principal component analysis.

I. INTRODUCTION

With the innovative advances in both technology and banking, most bank clients like to utilize Automatic Teller Machines (ATMs) and the internet for carrying out their financial transactions. Customers particularly use ATMs for transactions like withdrawal of money or deposit. However, ATMs also face a number of security and identity theft issues. The use of biometrics, specifically facial recognition in ATMs offer a promising solution to these issues. Biometrics is a computerized methodology to uniquely identify individuals using their behavioural or biological characteristics.

However, these fields have their own set of challenges. For example, the human face is not a distinctive, firm entity. Several instances and circumstances can cause the appearance of the face to differ. These include brightness, posture, ageing, external factors like beard, glasses, hair style etc. Even facial expression influences the face recognition. All these factors affect the accuracy of face recognition. Therefore, in this research, the approach of hybrid face recognition is used. This system is developed using split PCA (Principal Component Analysis) and constant hyperplane for SVM (Support Vector Machine) classifier.

II. Principal Component Analysis

Principal Component Analysis is a statistical algorithm that uses orthogonal conversion to obtain principal components from multidimensional data. The primary principal component is the linear combination of the original scopes that has the highest unpredictability. The nth principal component is the linear combination with the highest unpredictability, being orthogonal to the n-1 primary principal components.

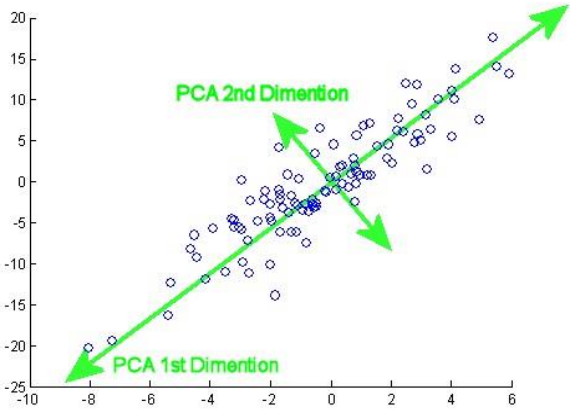

Fig: PCA for Multi-Dimensional data

III. SUPPORT VECTOR MACHINE

Support-vector machines are supervised learning models with corresponding learning models that examine the data used for classification and regression. SVM is a grouping algorithm that intends to split two data sets with maximum gap between them. SVM finds the hyperplane that splits the most sizeable viable group of points of the same class on the same side, while maximizing the gap from either class to the hyperplane.

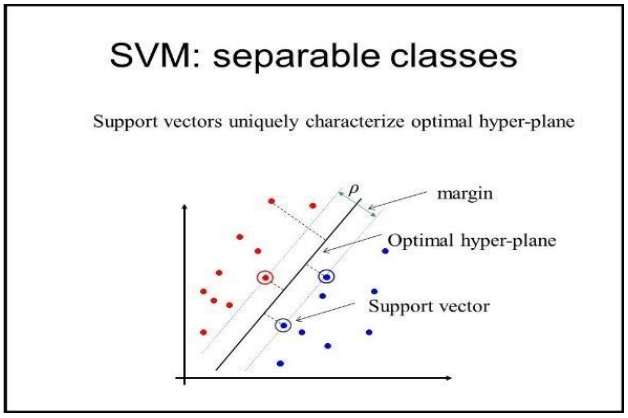

Fig: SVM Class

We modify SVM to face recognition by adapting the understanding of the output of an SVM classifier and designing a illustration of facial pictures that is similar to a two-class problem. To direct our SVM algorithm, we express the problem in a variation space, which specifically identifies the dissimilarities and variations between two facial images.

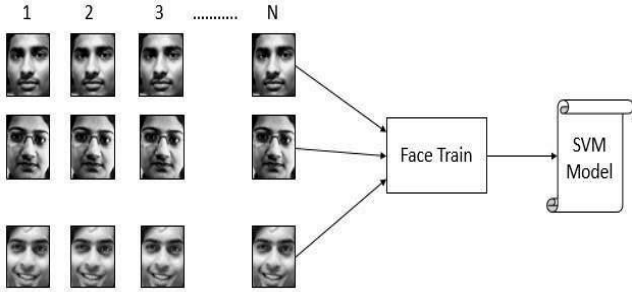

Fig: Processing of Face through Webcam

In variation space, we are concerned about the following two classes: the dissimilarities between images of the same person, and dissimilarities between images of different people. These two classes are the input to the SVM algorithm. An SVM algorithm produces a decision graph which separates these two classes. For face recognition, we re-interpret the decision surface to produce a similarity measure between two facial images. This allows us to generate face-recognition algorithms. To test the ability of the algorithm to identify faces, the algorithms need to be trained on a varying set of faces.

IV. COMBATING AUTOMATED TELLER MACHINE FRAUDS THROUGH FACIAL RECOGNITION ATM TECHNOLOGY

In the recent decade the usage of technology is exponential increased. Through this nonetheless it has made our lives easy but also brought in many fraud techniques. Hence, it there is an utmost need to improvise security in the banking region. Therefore, in this paper a discussion is made about face along with voice recognition, an important field of biometrics which can cut down the number of frauds using ATMs. There are several algorithms being developed among which some have made great efforts to rescue the unsafe situations at an ATM. The two most popular techniques namely are appearance based and geometric based.

A. About Credit Cards:

- Strong algorithms are used to generate PANs
- Storage of card details is done on one protected system
- While communicating PAN is masked

B. About PIN:

- PIN mailers are not usually dispatched with the cards and usually a different medium is used
- PIN selectable options are used to prevent insider compromise
- PINs are masked during usage.

V. PROPOSED METHODOLOGY

I. Partial Synchrony: Partial synchrony may be outlined as follows:

1. Fit an appropriate nonlinear model to each of the two concurrently noted complex cells with interleaving receptive columns.
2. Note the time course of certain logical quantity of the functional mutual input. The input/output designs built for the couple of complex cells would quantify to two precise spike-activity functions, say $f(\underset{x}{\rightarrow})$ and $g(\underset{x}{\rightarrow})$, of the strength image $\underset{x}{\rightarrow}$, as calculated over the merger of the receptive fields. (Feasibly $\underset{x}{\rightarrow}$ would first be normalized, or otherwise pre-processed. One normal logical measure of functional common input, would be the total of the products of the partial derivatives, i.e. the inner product of the gradients: $\nabla f(\underset{x}{\rightarrow}).\nabla g\left(\underset{x}{\rightarrow}\right)$.
3. Note the time course of the significance of synchronous events in, say, the last one-hundred milliseconds.

II. Principal Component Analysis: It is a statistical algorithm that executes a dimensionality reduction by drawing out the principal components of the multidimensional data.

Method of Finding the principal component:

Find the linear combination of the primary variables with high variance.

The covariance matrix C or correlation matrix R is computed.

The eigen values and eigen vectors of C or R is calculated.

The eigen values e1,e2,e3……ep are computed in descending order.

The corresponding eigen vectors a1,a2,a3….ap are calculated.

$Y_{1=}a_{11}x_1+a_{12}x_{2.....}+a_{1p}x_p$ is the first principal component

$Y_2=a_{21}x_1+a_{22}x_{2.....}+a_{2p}x_p$ is the second principal component

…

$Y_p=a_{p1}x_1+a_{p2}x_2……..+a_{pp}x_p$ is the pth principal component.

1. Choosing principal components:

$$\frac{\sum_{Ei=1}\lambda i}{\sum_{i=1}^{M}\lambda i} \rightarrow \text{threshold}$$

By using this criterion, the requirement of the number of principal components can be determined.

Support Vector Machine:

SVM is a classification algorithm that intends to split two data sets with the largest gap between them. SVM finds the hyperplane that separates the largest possible collection of points of the same class, while maximizing the gap from either class to the hyperplane.

Combining Voice and Facial Recognition:

The system operation starts when the user pronounces a voice password through the mic. If the voice password is recognised, the next step goes to face detection. Using a USB camera interface an image of the face is captured and stored in the database and when the user uses the card again, his image is

captured again and compared with the previous database. If the images match, the access is granted.

Comparison of the facial image is done using Adaboost and PCA (Principal Component Analysis). If the images match, the ID is displayed and the buzzer beeps.

The major steps in facial image and voice recognition are real time image recognition, USB interface, image processing, pronouncing the password and voice processing.

VI. SECURING CUSTOMERS THROUGH FACIAL RECOGNITION

Face recognition software:

1. The face key recognition technology performs the following tasks:

Locates a moving object with a camera view

Determines if the moving object is a face

Compares the live face with samples from database

Face recognition technology works using camera and low- or high resolution CCTV cameras.

Face capturing technology: Face finding technology captures all the faces in a cameras view. Then is stores each image in a separate folder for quick reviews-or for use with another face key technology. Each face

is saved with a time and date stamp. In addition to faces, facial profiles and images of human bodies can be captured and stored.

Search and Match:

Search and match advisory technology is available to assist in the identification of facial images extracted from the video stream or from a watch list database. This function operates by comparing a subject's photo to a database of faces and selecting the faces from the database which look the most like the subject's face.

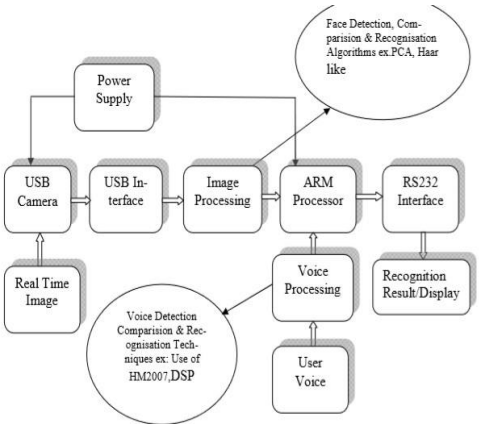

Fig: Block diagram explaining the working of ATMs with facial recognition technology

VII. FRAUDS THAT CAN BE PREVENTED BY FACIAL RECOGNITION TECHNOLOGY

Unauthorised financial operations using lost or stolen cards and pin codes which many inexperienced card owners write down on a card or sore the PIN code together with the card.

Fraud based on Trust- The card or its duplicate can be used by a fraudster without the permission of the card owner.

VIII. ADVANTAGES OF FACIAL RECOGNITION TECHNOLOGY

- Delivers a practical and workable solution that addresses the requirements of the regulatory authority Reduces financial risks
- Provides a framework that allows high withdrawal limits to cater for the demands of a cash-focused customer base
- Takes societal responsibility to reduce rising levels of crime Increase customer satisfaction

IX. CONCLUSION

This paper deals with various methods of facial recognition that makes credit card transactions and hence the entire finance world more secure. The

principles, basics and physics behind the working of the human eye and image processing inside the human brain i.e., invariant and selective vision, is used to improve the working of the webcam and hence make systems based on facial recognition more effective. The problems in facial recognition may also be solved using the method of split PCA which employs mathematical procedures and dimensionality reduction. Multi-biometric security systems may also be used in credit card readers i.e., facial recognition (spectral analysis) using Matlab and voice recognition using ARM. This paper therefore deals with methods and procedures that make credit card transactions secure and fool proof.

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