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PC -Z Security using Eigen face and Adaboost

#1Dwarkadas Badak, #2Rahul Chitnis, #3Vishal Dhavale, #4Govardhan Kunthe

1dwarkadasbadak@gmail.com
2chitnis.rahul26@gmail.com
3dhavalevishal77@gmail.com
4govardhan1kunthe@gmail.com

#1234Department of Computer Engineering
JSPM'S
Imperial College of Engineering & Reserch
Wagholi, Pune-412207

ABSTRACT

Nowadays all the people are using the internet. So the Cybercrime or hacking are increases on the internet day by day. For giving security to pc is very much important so we are developing this system personal computer-z security. We are used as SMSLIB, SMTP, MIME technologies. In our project we are developing a System such that we capture the image of the authorized as well as unauthorized person by using the web-cam. Then image matching of that image is done with admin stored image from the database. Image matches admin image, admin can access the system and if image does not match then the person will be unauthorized, so for security we send a message on the admin mobile phone with help of any gateway and a mail on admin email-id with hackers' image and some notification. In the reverse we are changing the password by random string generation and then Shut-Down the computer remotely. Image matching is not visible to new user so he is unaware from this software so this will definitely be helpful to make them fool.

Keywords— **Image processing, Spontaneous facial expression, Eigen face, Adaboost algorithm.**

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I. INTRODUCTION

To make able various organisations to provide satisfactory & secure working to their employees & make sure for complete security to data in organisation it should be necessary to maintain application providing security. Face recognition gives several benefits over other biometric technique, a few of which are outlined here: Almost all technologies require some action by the user, i.e., the user needs to place his hand on hand-rest for fingerprinting or hand detection and for irisor retina identification person has to tand in a fixed position in front of a camera[1].

Biometric is particularly beneficial for security. Iris and retina detection need costly equipment and are much too sensitive to any body motion. Voice recognition is affected by background noises in public places. Voice Signatures can be modified or forgot. Facial images can be easily captured with cameras. Face recognition is totally non-intrusive and does not carry any such health risks. When the biometric devices recognize some part of human part the laser beam which omit by devices its harmful for health. Now a day's people are aware of capacity and power of Computers. They often use Computers for storing confidential information or huge Servers are maintained to store large Database of any organization. With increase in use of these servers, frauds or abused actions are also getting increased[4], which is hazardous to such huge Servers. So Security of such system is so important [1].

We are basically working in Security domain. We are developing a system that makes use of Image processing concept for intrusion detection and that named as PCZ Security. It detects the intrusion by matching user's image with administrator's image [2]. But if image does not match, then it informs it to administrator so that quick actions can be takes place. With intrusion detection, our proposed system also gives information (Image) of Novice User who

tried to access administrators system, so that he can be tracked easily. In Proposed system also send a e-mail on administrator accounts using SMTP protocol and also sends sms on admistrators mobile using SMS gateway [3].

We are creating such applications which will help us to stop the cybercrime. It is not visible to novice user which means he is unaware of this software so this will definitely helpful to make them fool. So PCZ Security will be such a powerful intrusion detection system which provides image based detection. There are two general categories of attacks which intrusion detection technologies attempt to identify Anomaly detection and Misuse detection. So our System covers both detections [6].

II. RELATED WORK

Face recognition is one of the applications of image analysis. In 2009, a simple search on ―Face Recognition‖ in the IEEE Digital Library throws 9422 results 1332 articles. Examples are Video surveillance, human-machine interaction, photo cameras, and virtual reality. Face recognition is a relevant term in pattern recognition, neural networks, computer graphics, image processing and psychology. In the 1950's in psychology the work on this subject has been made. They belong to other issues like face expressions, emotions and perception. The research on this subject was Woodrow W. Bledsoe. During 1964 and 1965, Bledsoe, along with Helen Chanand Charles Bisson, worked on to recognize faces using computers. He continued later his researches at Stanford Research Institute. Bledsoe designed and implemented a semi-automatic system. Some face coordinates were selected by a human operator, and then computers used this information for recognition [2].

Face recognition allows variation in illumination, head rotation and aging. Researches trying to measure subjective face features as ear size or between-eye distance. In 1973, Fischler and Elschanger tried to measure similar features automatically. Algorithm used local template matching to measure facial features. There were approaches back on the 1970's. A face as a set of geometric parameters and based on those parameters performs some pattern recognition. In 1973 Kenade was developed a fully automated face recognition system. Kenade compares this automated extraction to a human or manual extraction, showing only a small difference. He got a correct identification rate of 45-75%. In 1986, the Eigen Faces in image processing technique was made by L. Sirovich and Kirby.This methods were based on the Principal Component Analysis. The goal was to represent an image in a lower dimension without losing information, and then reconstructing it.

In 1990's, the recognition of the mentioned Eigen face approach was the first industrial applications. In1992, Mathew Turk and Alex Pentland of the MIT presented a work which used Eigen faces for recognition. Many approaches which has led to different algorithms like PCA, ICA, LDA and their derivatives. That algorithm was able to locate, track the subject's head.

EIGEN FACE ALGORITHM

Face recognition done by using Eigen face algorithm. Eigen faces are a set of eigenvectors. This is first successful example of facial recognition. The eigenvectors are derived from the covariance matrix. A set of Eigen faces can be generated by performing a mathematical process principal component analysis (PCA) on a large set of images. This algorithm does not take many Eigen faces combined together to generate a fair approximation most of the human faces.

Face Recognition methods

- **Featured-based**

In Feature-based method the input image to identify and extract (and measure) facial features such as the eyes, mouth, and nose then calculate the geometric relationships among those facial points, thus reducing the input facial image to a vector of geometric features [3].

Simple image processing methods to extract a vector of 16 facial parameters - which were ratios of distances, areas and angles and used a simple Euclidean distance measure for matching to achieve a good performance. It requires 2 images per person one for reference and one for testing.

- **Elastic bunch graph matching method**

The elastic bunch graph matching method is a feature based approach proposed by Wiskott. It is based on Dynamic Link Structures. A graph for an individual face is generated as following steps: a set of points on the human face are chosen. A full connected graph having node as point on human face. A representative set of such graphs is combined into a stack structure. This graph is called a face bunch graph. *B*y Elastic Bunch Graph Matching Recognition the graphs for new input face images can then be generated automatically [1].

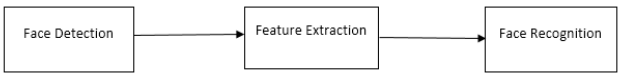

Figure 1: A generic face recognition system [1]

In existing system only recognize the face and then provide the authorized access to particular person in proposed system provides extra features like through the sms remotely shutdown the computer and sends the image to the admin email-id. If admin wants to give authorized access to the unauthorized person he give it through sms also [6].

THE ADABooST ALGORITHM FOR CLASSIFIER LEARNING

Viola introduced an boosted cascade of simple classifiers Using Haarlike features, each cascade stage classifier is set to reach a very high detection rate and a low false positive rate. There are three kinds of features are used, as is shown in figure 1. Two-rectangle features are shown in and. Figure shows a three-rectangle feature, and a four-rectangle feature.

Rectangle features can be computed very rapidly using an intermediate representation for the image which called the integral image. The learning algorithm based on AdaBoost selects a small number of critical visual features from a larger set and yields extremely efficient classifiers. Each stage of the boosting process, which selects a new weak classifier, can be viewed as a feature selection process. In its original form, the AdaBoost learning algorithm is used to boost the classification performance of a weak learning

algorithm [9]. Viola and Jones provided a variant of Ada Boost both to select a small set of features and train the classifier. In our system, we have over 180,000 rectangle features associated with each image sub-window, which is much larger than the number of pixels. Even though each feature can be computed very efficiently, computing the complete set is still expensive. How to select a small set of these features is the main challenge. In order to use the Adaboost learning method, we have to define the weak classifiers for this goal. Each rectangle feature can be considered as a weak classifier if we assign a threshold to each feature [9]. For each feature, the weak learner determines the optimal threshold classification function, such that the minimum number of examples is misclassified. A weak classifier
h(_) consists of a feature _ , a threshold _ and a parity _ indicating the direction of the inequality sign
hj(x) = {1 if pjfj(x)<pjQj
0 otherwise
Where is a 24x24 pixel sub-window of an image? No single weak classifier can achieve high performance in the detection task. However, the boosting procedure can select
some of them to build a strong classifier so that it can perform the classification with low error. Figure 3 gives us a sense of how to use boosting technique in our bank of weak classifiers [3].

There are many existing databases of facial expressions, Exhaustive surveys of which are detailed in and .Constructing such a database consists of two main steps: database collection, and annotation. In the first step, elicitation methods, elicitor selection, and elicitor evaluation are considered. In the second step, expression description, video segmentation, labeling, and interpreter reliability are considered. Currently, researchers primarily use one of three possible approaches to elicit spontaneous affective behaviors: human-human conversation human-computer interaction, or emotion-inducing videos. Because the NVIE database focuses only on facial expressions instead of on speech or language, the use of emotion-inducing videos is a suitable approach, particularly because the data sets do not include any facial changes caused by speech. Recent research has also noted the necessity of studying affect patterns in situ, for example, using intelligent tutoring systems, because this approach provides more meaningful interpretations. Although data collection using emotion-inducing videos provides limited experimental control, it has potential applications for the implicit tagging of videos [3].

Few database constructors have attempted to analyze the Effectiveness of their elicitation methods, although it is the first and the most fundamental step in creating a database. Psychologists have proposed using self-reported measures to evaluate the efficacy of the elicitor. Coan and Allen, and Gross and Levenson have developed an emotion stimulus video set and adopted the mean rating of subjects' self-reported data for each emotion state to select videos and validate their efficacy by discriminability, discreteness, and similarity. Petrantonakis and Hadjileontiadis use electroencephalogram (EEG)-based emotion recognition as an emotion elicitation evaluation measure inspired by the frontal brain asymmetry concept. We believe the effectiveness of the emotion elicitor relies on subjects' elicited emotions, including a psychological response (e.g., subjects' self-reported data), a physiological response (such as EEG), and some visible clues (such as facial expressions). We do believe that self-reported data are a good starting point and provide a foundation for determining whether such elicitors also produce behavioral and physiological signs of the target emotion. Thus, in this paper, we analyze the effectiveness of emotion-eliciting videos using the mean and variance of the experiment participants' self-reported data.

Both the segmentation and labeling of emotions or expressions are normally performed using post hoc self-reports of the subjects or the subjective reports of multiple raters . If these multiple raters' evaluation categories are different, a consistency strategy, such as a majority rule , must be used to determine the final category. The Kappa coefficient and the Kendall's coefficient are widely used to analyze the interrater
reliability of multiple observers' evaluations ,. In this paper, self-reports are used to indicate each subjects' truly induced feelings immediately after watching the emotion-eliciting videos. An observer first segments the expression videos to isolate clips containing affective cognitive states of interest. The segmented clips are then evaluated by several raters. Then, the interrater reliability of raters' evaluations is examined using Kappa and Kendall's coefficients.

Some psychologists believe that facial expressions have
a primarily communicative function in conveying information
about affective states . Therefore, the study of the relationship between naturally displayed facial expressions and felt affective states is significant for research on emotional reasoning and the analysis of facial expressions. This paper provides the first quantitative analysis of the degree of agreement between subjects' internal feelings and their displayed facial expressions using our proposed MRM, [1].

EIGENSPACE-BASED RECOGNITION OF FACES

Standard Eigen space-based approaches project input faces onto a dimensionally reduced space where the recognition is carried out. In 1987, Sirovich and Kirby used PCA in order to obtain a reduced representation of face images. Then, in 1991, Turk and Pentland used PCA projections as the feature vectors to solve the problem of face recognition using the Euclidean distance as similarity function. This system, later called *Eigen faces*, was the first Eigen space-based face recognition approach and, from then on, many Eigen space-based systems have been proposed using different projection methods and similarity functions. In particular, Belhumeur *et al.* proposed in 1997 the use of FLD as projection algorithm in the so-called *Fisher faces* system. In all standards Eigen space-based approaches a similarity function, which works as a nearest-neighbor classifier is employed [9]

In 1997, Pentland and Moghaddam proposed a differential Eigen space-based approach that allows the application of statistical analysis in the recognition process [13]. The main idea is to work with differences between face images, rather than with single face images. In this way the recognition problem becomes a two-class problem, because the so-called "differential image" contains information of whether the two subtracted images belong to the same class or to different classes. In this case the number of training images per class increases so that statistical information becomes available and a statistical

classifier can be used for performing the recognition. The system proposed in used Dual-PCA projections and a Bayesian classifier. Following the same approach, a system using Single-PCA projections and a SVM classifier was proposed in [9].

In the differential approach all the face images need to be stored in the database, which slows down the recognition process. This is a serious drawback in practical implementations. To overcome this drawback a so-called post-differential approach was proposed in. Under this approach, differences between reduced face vectors instead of differences between face images are used. This allows a decrease in the number of computations and the required storage capacity (only reduced face vectors are stored in the database), without losing the recognition performance of the differential approaches. Both Bayesian and SVM classifiers were used to implement this approach in idea behind these projection algorithms is to use linear methods applied to high-dimensional mapped vectors instead of the original [12].

Vectors, and at the same time to avoid the explicit mapping Of these vectors by means of the so-called "kernel-trick" (the same strategy is employed in SVM). As in the case of the standard Eigen space methods, a similarity function, which works as a nearest-neighbor classifier, is employed. A kernel-based system for the recognition of faces was proposed in. This system uses either KPCA or KFD as the projection algorithm.

Standard, differential, and kernel Eigen space approaches for the recognition of faces are described in the following subsections.

Standard Eigen space Face Recognition

Fig. 1 shows the block diagram of a generic standard eigenspace-based face recognition system. Standard eigenspace-based approaches approximate the face vectors (face images) by lower dimensional feature vectors. These approaches consider an off-line phase or training, where the *projection matrix* ($\mathbf{W} \in RN \times m$), the one that achieves the dimensional reduction, is obtained using all the database face images. In the off-line phase, the *mean face* ($\bar{x}$) and the reduced representation of each database image ($\mathbf{p}k$) are also calculated [9]. The recognition process works as follows. A preprocessing module transforms the face image into a unitary vector (normalization module in the case of Fig. 2) and then performs a subtraction of the mean face. The resulting vector is projected using the projection matrix that depends on the eigenspace method being used (PCA,FLD, etc.). This projection corresponds to a dimensional reduction of the input, starting with vectors in RN (where N is the dimension of the image vectors) and obtaining projected vectors $\mathbf{q}$ in Rm, with $m < N$ (usually $m \ll N$). Then, the similarity of $\mathbf{q}$ with each of the reduced vectors $\mathbf{p}k$ ($\mathbf{p}k \in Rm$) is computed using a certain criterion of similarity (Euclidean distance for example). The class of the most similar vector is the result of the recognition process; i.e., the identity of the face. In addition, a rejection system for unknown faces is used if the similarity matching measure is not good enough [9].

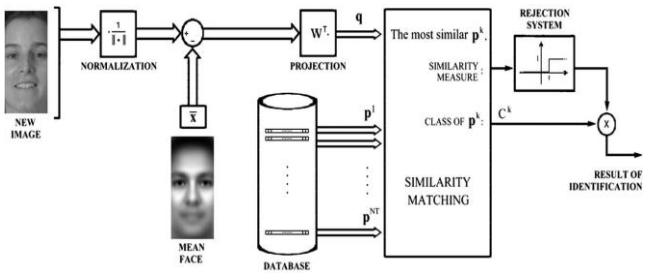

Figure 2: Block diagram of generic standard eigenspace-based face recognition systems [9].

III.EXISTING SYSTEM

The Existing System is not much modern its used for authentication process but its have only a Biometric and Scanning the eyes or face and match it with a authorized person images which are stored in a databases.

Existing System also recognizes the photographs of a particular authorized person and accepts it. It's doesn't recognize the motion when it recognize authorized person.When we implements the existing system its computational cost will be high as compared to proposed system.

Disadvantages of existing system:

- In existing system they used biometrics technology this technology its quietly harmful for human being.
- They used very costly devices for implementation.
- Doesn't recognize or compare between the face of authorized person or photograph of authorized person [9].

Algorithm steps of Eigen face Algorithm

1. The first step is to obtain a set S with M face images. In our example M = 25 as shown at the beginning of the tutorial. Each image is transformed into a vector of size N and placed into the set.

$$S = \{ \Gamma_1, \Gamma_2, \Gamma_3, \ldots\ldots\ldots, \Gamma_M \}$$

2. After you have obtained your set, you will obtain the mean image **Ψ**

$$\Psi = \frac{1}{M} \sum_{n=1}^{M} \Gamma_n$$

Figure 3:Simple Image

3. Then you will find the difference **Φ** between the input image and the mean image

$$\Phi_i = \Gamma_i - \Psi$$

4. Next we seek a set of M orthonormal vectors, $\mathbf{u_n}$, which best describes the distribution of the data. The kth vector, $\mathbf{u_k}$, is chosen such that

$$\lambda_k = \frac{1}{M}\sum_{n=1}^{M}\left(u_k^T \Phi_n\right)^2$$

is a maximum, subject to

$$u_l^T u_k = \delta_{lk} = \begin{cases} 1 & \text{if } l = k \\ 0 & \text{otherwise} \end{cases}$$

Note: $\mathbf{u_k}$ and λ_k are the eigenvectors and eigenvalues of the covariance matrix **C**

5. We obtain the covariance matrix **C** in the following manner

$$C = \frac{1}{M}\sum_{n=1}^{M}\Phi_n \Phi_n^T$$
$$= AA^T$$

$$A = \{\Phi_1, \Phi_2, \Phi_3, \ldots\ldots, \Phi_n\}$$

6. A^T

$$L_{mn} = \Phi_m^T \Phi_n$$

7. Once we have found the eigenvectors, $\mathbf{v_l}$, $\mathbf{u_l}$

$$u_l = \sum_{k=1}^{M} v_{lk}\Phi_k \qquad l = 1, \ldots\ldots, M$$

Figure 4: These are the Eigen faces of our set of original images [15]

Recognition Procedure

1. A new face is transformed into its Eigen face components. First we compare our input image with our mean image and multiply their difference with each eigenvector of the L matrix. Each value would represent a weight and would be saved on a vector Ω.

$$\omega_k = u_k^T(\Gamma - \Psi)$$
$$\Omega^T = [\omega_1, \omega_2, \ldots\ldots, \omega_M]$$

2. We now determine which face class provides the best description for the input image. This is done by minimizing the Euclidean distance

$$\varepsilon_k = \left\|\Omega - \Omega_k\right\|^2$$

3. The input face is considered to belong to a class if ε_k is bellowing an established threshold θ_ε. Then the face image is considered to be a known face. If the difference is above the given threshold, but bellow a second threshold, the image can be determined as a unknown face. If the input image is above these two thresholds, the image is determined NOT to be a face.

4. If the image is found to be an unknown face, you could decide whether or not you want to add the image to your training set for future recognitions. You would have to repeat steps 1 through 7 to incorporate this new face image [15].

IV. PROPOSED SYSTEM

In Proposed System when recognize the face of particular person its match it with the stored admin images if it doesn't match it sends the SMS on admin mobile phone and E-mail on administrator email id.

It capable for remotely shutdown computer through mobile if unauthorized person wants to access administrator computer.

If someone will be disconnect the admin computer from the network then administrator computer will be automatically shut down.

Advantages of proposed system:

- It provide better security than existing system
- In this paper we used Eigen face algorithm for better security purpose
- It provide remotely shutdown facility
- It is inexpensive

V. SYSTEM ARCHITECTURE

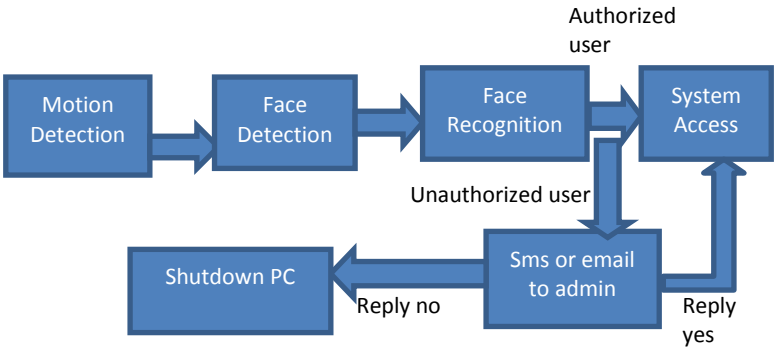

Figure 5: System Architecture

The input of a face detection system is an image or video stream. The output is an identification or verification of subjects that present in the image or video stream. Face recognition system contain the face detection, feature extraction, face recognition.

Face detection is the process in which it extracts the faces from scenes. Then the system can identifies a certain image region as a face. Feature extraction means obtaining related facial features from the data. These features may be certain face regions like eyes, nose, chick, mouth. And finally it recognizes the face. For this different algorithms are use.

If the Person is authorized then take System access to that authorized Person, if it unauthorized person then Sms or email send on admin mobile number or email id through the sms if admin want to give permission for the unauthorized person to access the PC then it sent yes reply to system through the sms gateway then system will be accessed by unauthorized person and if admin send reply no then pc can be shutdown remotely. Also the unauthorized person image store on admin email id.

VI. CONLUSION

In this paper we have proposed better security as combination of Eigen Face and Adaboost algorithm is used. It is having extra features like remotely shutdown computer through mobile phone. This paper provides security like capturing face of unauthorized person and sends it to the owners email.

Face recognition is also resulting in other dares, like expression recognition or body motion recognition. Overall, face recognition techniques and the emerging methods can see use in other areas. Therefore, it isn't just an unresolved problem but also the source of new applications and challenges. Administrator can get complete idea of who is trying to access the system with help of image capturing of unauthorized person and then sending image via SMS and E-Mail alert. Enhance security should be provide with the help of face recognition technique.

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