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# Retina and Face Recognition Removing Facial Distortion Using PCA Algorithm

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**ABSTRACT:** Biometric recognition technology is fast gaining popularity as means of security measures to reduce cases of fraud and stolen due to its use of physical characteristics and traits for the identification of individuals. The earliest methods of biometric identification included iris/eye scan, retina scan, face scan. Biometric technology focuses on training the system to find an individual unique iris scan, retina scan & face scan pattern characteristics. The technology lends itself well to a variety of uses and applications. Face recognition and Retina recognition can be applied in Security measure at Passport verification, Criminals list verify police department, Air Ports, Visa Processing, Verification of Electoral identification and Card Security measure at ATM's and may other. In this paper, we present an implementation of a security system based on Retina recognition as the access control key. Verification algorithm in this system which is capable of authenticating a person identity by his or her Iris scan (Retina Scan) & face scan pattern. It is found out that the developed Biometric system software has successfully activated the door opening mechanism using a biometric system that ONLY works for the authenticated individual. The system is proven to be able to provide high-security access control. Experimental result shows that our system is successfully work on face and retina recognition and also removing of facial distortion of the image takes place.

**KEYWORDS:** Face Recognition, Facial Distortion, Retina Recognition, Principal Component Analysis.

## I. INTRODUCTION

### a. Background

In recent year authentication using biometric system has been considerably improved in reliability & accuracy. In many of organization still biometric system are using for the authentication of the individuals. Even many of biometric systems are still facing problems & generally suffers from many difficulties such as intra-class variability, limited Degree of Freedom, noisy input data & data sets, spoof attack & other related parameters problems which affect the Performance, Reliability & Accuracy of Biometric authentication system. The word 'Biometric' is taken from the Greek word, of which 'Bio' means life and 'Metric', means measure. By combining these two words, 'Biometric' can be defined as the measure (study) of life, which includes humans, animals, and plants. Collectively, biometric technologies are defined as 'automated methods of verifying or recognizing the identity of a living person based on a physiological or behavioral characteristic'. In analyzing the definition of biometrics, several distinct terms must be elaborated upon to completely understand the framework of biometric technology. The phrase "automated methods" refers to three basic methods connected with biometric devices: (1) a mechanism to scan and capture a digital or analog image of a living personal characteristic; (2) compression, processing and comparison of the image to a database of

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Vol. 6, Issue 5, May 2017

stored images; and (3) interface with applications systems. These methods can be configured in a number of different topographies depending upon the biometric device and application. For example, a common issue is whether the stored images (reference templates) reside on a card, in the device or at a host or database. When referring to a biometric technology, it is important to distinguish between physiological and behavioral human characteristics. A physiological characteristic is a relatively stable human physical characteristic, such as a face pattern, hand silhouette, iris pattern, or retina pattern. This type of measurement is unchanging and unalterable without significant duress. The application of biometric technology is limitless. We use the median filter for removing facial distortion. The median filter is a nonlinear digital filtering technique, often used to remove noise i.e. distortion from an image or signal. Such noise reduction is a typical pre-processing step to improve the results of later processing (for example, edge detection on an image). Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise also having applications in signal processing.

### b. Motivation

Face and Retina recognition has been a sought after problem of biometrics and it has a variety of applications in modern life. The problems of face & Retina recognition attracts researchers working in biometrics, pattern recognition field and computer vision. Several face & Retina recognition algorithms are also used in many different applications apart from biometrics, such as video compressions, indexing etc. They can also be used to classify multimedia content, to allow fast and efficient searching for material that is of interest to the user. An efficient face & Retina recognition system can be of great help in forensic sciences, identification for law enforcement, surveillance, authentication for banking and security system, and giving preferential access to authorized users i.e. access control for secured areas etc. In this approach of Retina & Face Recognition removing facial distortion using Principle Component Analysis even though various classifiers are specified already but less accuracy are matched in available Real Image. Also this system works to remove the facial distortion. So this is the challenging part when we think about designing this application.

## II. LITERATURE SURVEY

Paper Name	Author Name	Proposed System	For this paper we referred
1. Face Spoof Detection with Image Distortion Analysis	Di Wen, Hu Han, <i>Member</i> , and Anil K. Jain, <i>Fellow</i> ,	The proposed technique is extended to multi-frame face image spoof detection in videos using a voting based scheme. We also collect a face image spoof database, MSU Mobile Face Spoofing Database (MSU MFSD), using two mobile devices (Google Nexus 5 and MacBook Air) with three types of spoof attacks (printed photo, replayed video with iPhone 5S and iPad Air). Experimental results on two public-domain face image spoof databases (Idiap REPLAY-ATTACK and CASIA FASD), and the MSU MFSD database show that the proposed approach outperforms state-of-the-art methods in spoof detection in image. Our results also highlight the difficulty in separating genuine and spoof face	Image Distortion technique.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

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Vol. 6, Issue 5, May 2017

		images, especially in cross-database and cross device scenarios.	
2. A Robust Non-Vascular Retina Recognition System using Structural Features of Retinal Image	Zahra Waheed, AmnaWaheed, M. UsmanAkram.	This paper states a simple and fast non-vascular based retina recognition system. It computes similarity measure using novel features based upon structural information of a retina image. It extracts illuminance, contrast and structural features from a color retina image and combines these extracted attributes using an empirically optimized function to generate a similarity score between two candidate images. Finally matching decision is obtained on the basis of highest score value.	A simple and fast retina recognition system is presented in the paper using structural features instead of minutiae points. It takes original color retinal image as input and extracts structural features; luminance, contrast and structure. It reduces execution time of the system while keeping its good performance.
3. IRIS & Finger Print Recognition Using PCA for Multi Modal Biometric System	Piyush G. Kale, Khandelwal C.S.	In this system we will use two types of authentication traits of biometric systems i.e. IRIS and Finger print. IRIS images & Finger print images of person we will use in system for authentication ofthem also we will check the reliability and accuracyof the system, so this system can be helpful in privacy also.	In this paper we have studied how to apply authentication of IRIS images and Finger print images of person. Also, we referred how to keep our system secure.
4.Face and Ear Biometric Recognition using PCA and LLE Algorithm	GandhimathiAmirthalingam	This paper present multimodal face and ear biometric verification system to improvethe recognition rate of image. This paper, a solution based on Principal Component Analysis (PCA) and Locally Linear Embedding (LLE) algorithms are presented for the face and ear recognition respectively.	The Principal Component Analysis (PCA) is one of the most successful techniques that have been used to recognize face in images. In this paper we have referred the PCA algorithm.
5. Image Quality Assessment for Fake Biometric Detection: Application to Face and Fingerprint Recognition	ShrutiGhorpade, DhanashriGund, SwapnadaKadam, Prof.Mr.R.A.Jamadar	In this paper, to develop a system which assures two times security against the dissemble biometric scanning of face or fingerprint using two stages for confirmation that the user who gets access to the system is authorized.	Develop a system to enhance the security of biometric recognition framework, by providing a two stage security using finger print and face detection applications.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 5, May 2017

6. Analysis of various Biometric Techniques	Mr. Sanjay Kumar, Dr. EktaWalia.	This paper presented an overview of the different biometric technique with some advantages and disadvantages. Than we will try to find out which technique is more reliable and secure.	Biometrics technique which refers to identifying an individual based on his or her physiological or behavioral characteristics. In this paper we referred the different biometric technique to secure our system.
7.A Survey Based on Fingerprint, Face and Iris Biometric Recognition System, Image Quality Assessment and Fake Biometric	Pradnya M. Shende, Dr.Milind V. Sarode, Prof. Mangesh M. Ghonge	This paper introduce three biometric techniques which are face recognition, fingerprint recognition, and iris recognition (Multi Biometric System) and also introduce the attacks on that system and by using Image Quality Assessment For Liveness Detection how to protect the system from fake biometrics. How the multi biometric system is secure than unibiometric system.	Biometric system is challenging system. It is more secure than unibiometric system. In this paper studied about the three biometric systems. We have referred the face recognition technique to detect the exact match and also referred how to protect our system from the attacks and fake biometric.
8. PCA Algorithm for Efficient Face Recognition System	ManishaNirania, Mr. Krishan Kumar	In this paper, the PCA algorithm has been proposed and training will be initial points for train the proposed algorithm and this complete work have been chosen for analyze and improve the efficiency of that algorithm.	IRIS & Face Recognition using Principle Component Analysis i.e. PCA Algorithm is more suitable and secure. In this paper we have referred the PCA Algorithm to find the best result in image.
9. Intelligent Anti-Theft and Tracking System for Automobiles	Montaser N. Ramadan, Mohammad A. Al-Khedher and Sharaf A. Al-Kheder	The proposed security system in this paper is designed to track and monitor vehicles that are used by certain party for particular purposes, also to stop the vehicle if stolen and to track it online for retrieval, this presented system is an integration of several modern embedded and communication technologies.	In this paper we have referred how to track and also monitor the system and also how to protect our system or data to be stolen or hack.
10. Retina	Ryszard S. Chora.	This paper proposed a general	In this paper we study

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 5, May 2017

Recognition for Biometrics		framework for image processing of retina images with a particular view on feature extraction. The method uses the set of geometrical and texture features and based on the information of the complex vessel structure of the retina. The feature extraction contains the image preprocessing, locating, segmentation of the region of interest (ROI). The image processing of ROI and the feature extraction are proceeded, and then the feature vector is determined for the human recognition.	the framework for image processing of retina images with a particular view on feature extraction. This approach is promising to improve retina recognition for person identification.
11. Analysis of Retina Recognition by Correlation and Covariance Matrix	S. N. Kakarwal, Dr. R.R. Deshmukh.	In this paper proposed an automated technique for person recognition based on retina of the human eye. In this paper we compare the performance of retina recognition by calculating correlation and covariance matrix of the retinal images. 20 images are used for the purpose of training and testing. Experimental results on DRIVE database show that these two methods are significantly better.	In this paper we study Retina Recognition system. Recognition system is quite-simple. It requires few components and is effective enough to be integrated within security systems that require an identity check. Retina recognition systems can be used at ATMs, Network access, Internet access, telephone transaction etc.

### III. PCA ALGORITHM MECHANISM

The principal component analysis (PCA) is a kind of algorithms in biometrics. It is a statistics technical and used orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables. PCA also is a tool to reduce multidimensional data to lower dimensions while retaining most of the information. It covers standard deviation, covariance, and eigenvectors.

#### PCA Steps:

1. Let a face or retina image  $X(x, y)$  be a two dimensional  $m \times n$  array of intensity values.

An image may also be considering the vector of dimension  $m \times n$ .

Let the training set of images  $\{X_1, X_2, X_3, \dots, X_N\}$ . The average face of the set is defined by

$$\bar{X} = \frac{1}{N} \sum_{i=1}^N X_i$$

2. Calculate the Covariance matrix to represent the scatter degree of all feature vectors related to the average vector. The Covariance matrix  $C$  is defined by

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

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Vol. 6, Issue 5, May 2017

$$C = \frac{1}{N} \sum_{i=1}^N (X_i - \bar{X})(X_i - \bar{X})^T$$

3. The Eigenvectors and corresponding eigenvalues are computed by using

$$CV = \lambda V$$

Where V is the set of eigenvectors associated with its eigenvalue  $\lambda$ .

4. Sort the eigenvector according to their corresponding eigenvalues from high to low.

5. Each of the mean centered image project into eigenspace using

$$W_i = V_i^T (X_i - \bar{X})$$

6. In the testing phase each test image should be mean Centered, now project the test image into the same eigenspace as defined during the training phase.

7. This projected image is now compared with projected training image in eigenspace. Images are compared with similarity measures. The training image that is closest to the test image will be matched as used to identify.

### Advantage of PCA

- 1) Lack of redundancy of data given the orthogonal components.
- 2) Reduced complexity in images' grouping with the use of PCA.
- 3) Smaller database representation since only the trainee images are stored in the form of their projections on a reduced basis.
- 4) Reduction of noise since the maximum variation basis is chosen and so the small variations in the back-ground are ignored automatically.

## IV. PROPOSED SYSTEM ARCHITECTURE

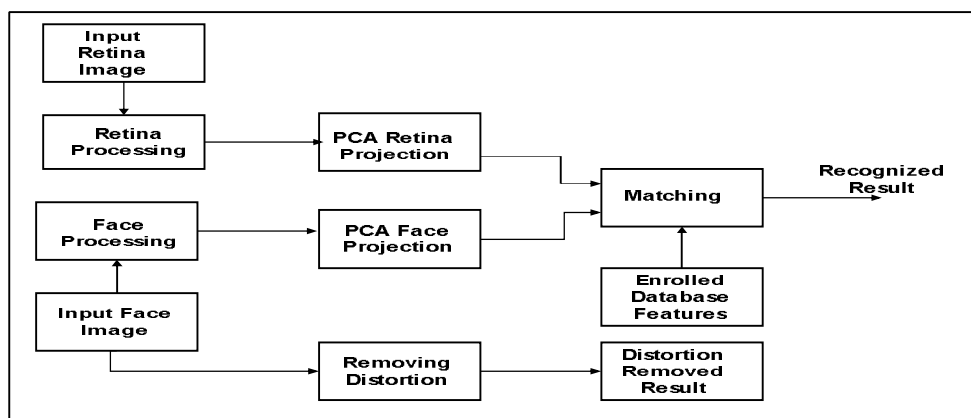


Fig No 01 Proposed System Architecture

## V. RESULT

For the purpose of this experiment, the face and retina recognition is obtained on our users registered images and it gives the above result. Face and retina Authentication was performed on each selected user. We apply standard implementation of the PCA-based algorithm in the experiments reported here for face

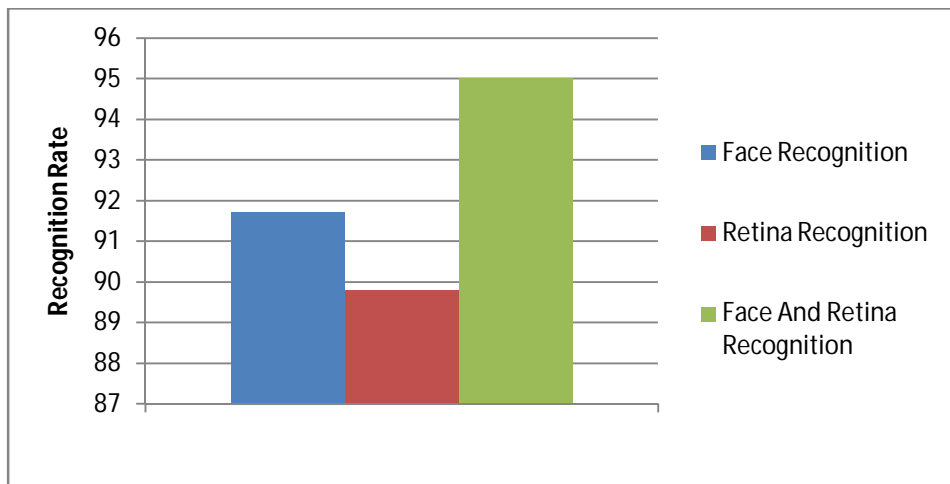
## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

Vol. 6, Issue 5, May 2017

recognition. Also PCA algorithm is introduced to deal with retina recognition. The performance of the proposed approach is determined by its recognition accuracy. The experiment based on users images of face and, and it shows the recognition rate. The table 1 shows the individual recognition of face, retina respectively and also face and retina combine recognition. The proposed system is to reduce the error rate as low as possible and improve the performance of the system by achieving good acceptable rate during recognition. Based on this experiment, it was suggested that recognition based on authentication by using the face and retina, performs better than conventional recognition technique.



**Fig. Individual and combined accuracy of the system**

**Table:**

Biometrics	Using PCA Recognition Rate (%)
Face Recognition	91.7
Retina Recognition	89.8
Face And Retina	95

**Table: Individual and combined accuracy of the system**

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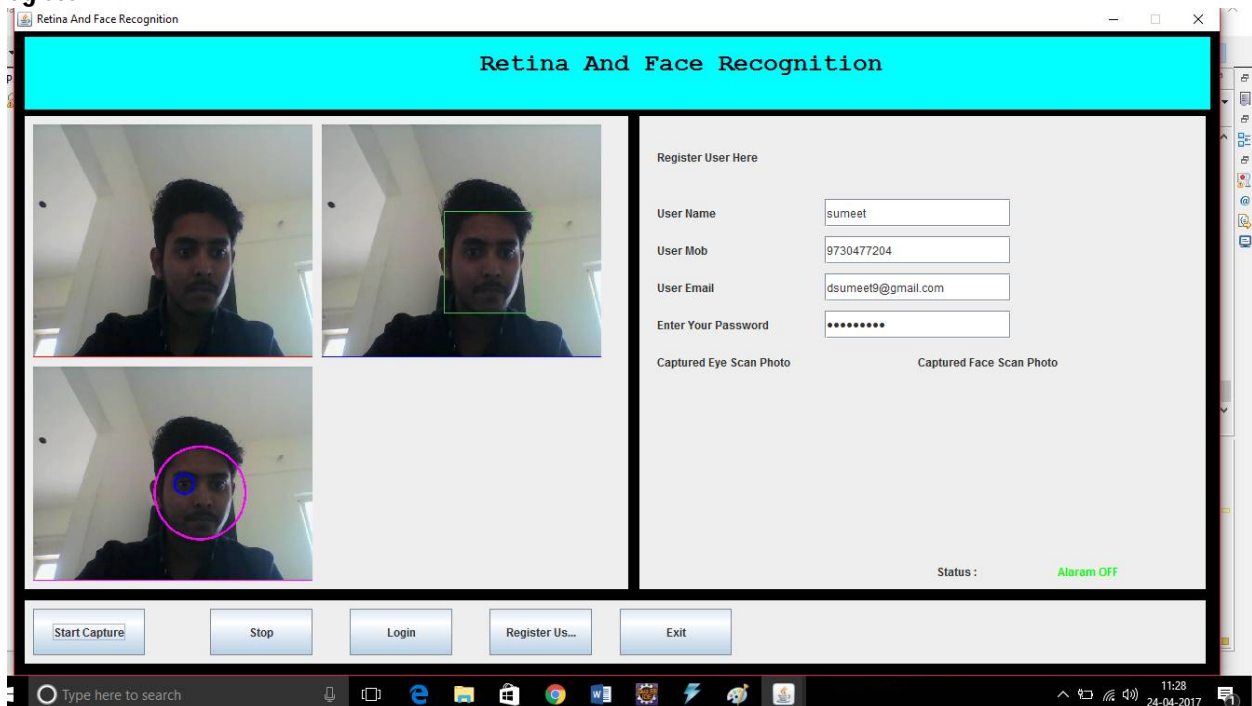
Vol. 6, Issue 5, May 2017

## VI. EXPERIMENTAL SET UP

Home



Register





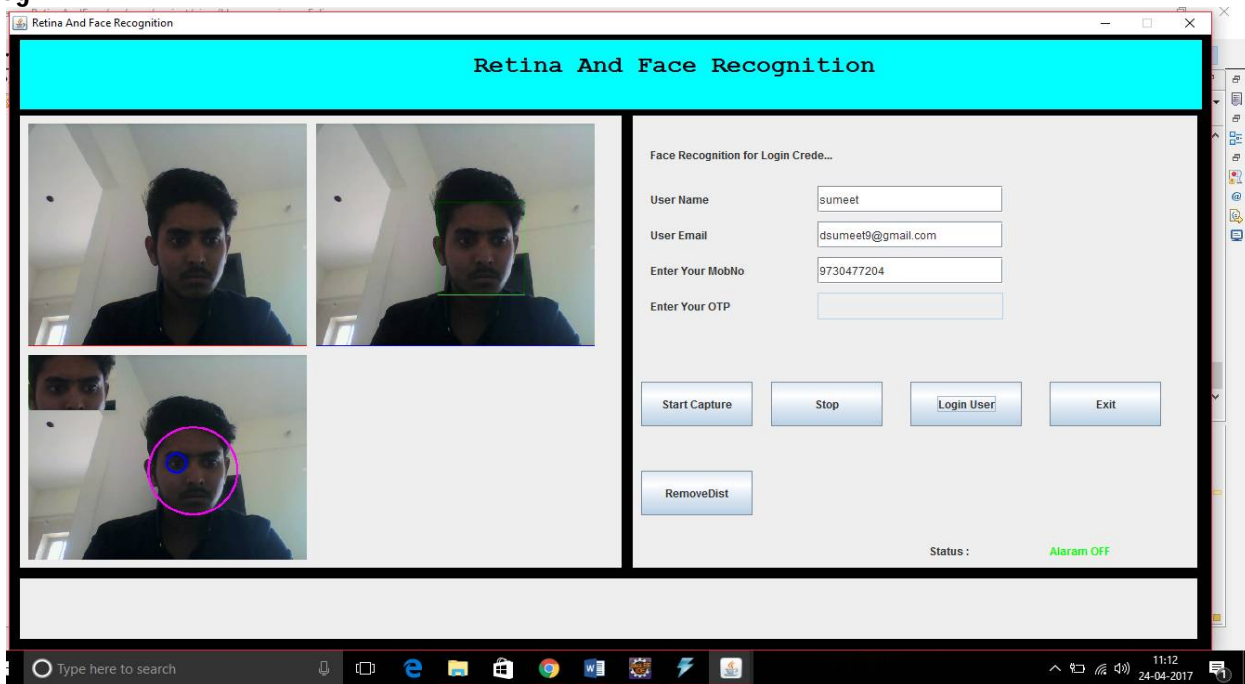
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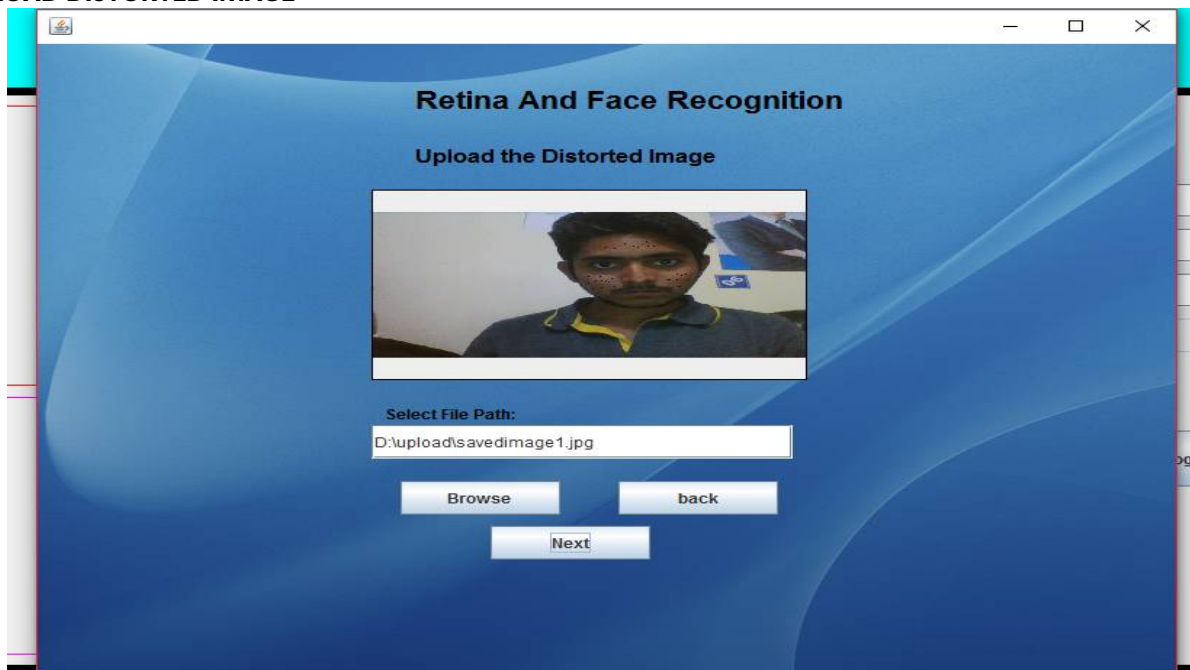
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Vol. 6, Issue 5, May 2017

## Login



## UPLOAD DISTORTED IMAGE



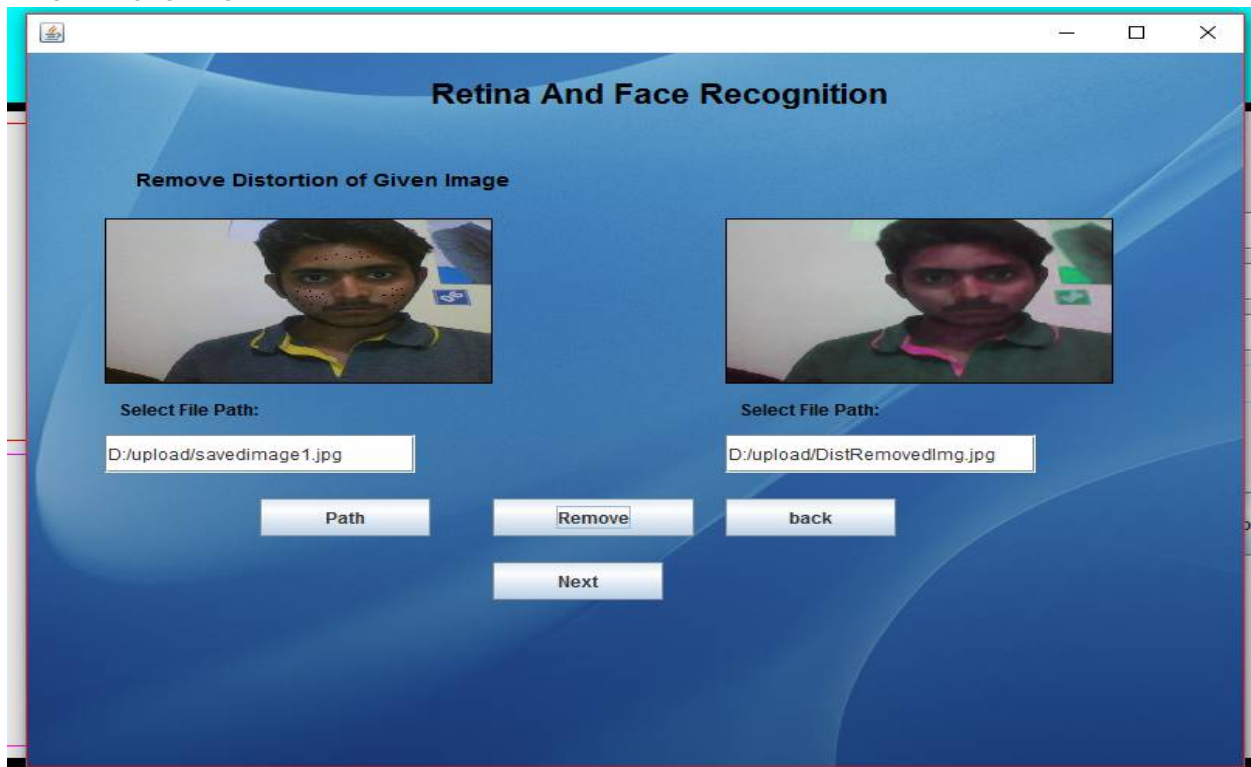
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Vol. 6, Issue 5, May 2017

### REMOVE DISTORTION



### VII. CONCLUSION AND FUTURE WORK

In recent years face and also retina recognition has received substantial attention from researchers in biometrics, pattern recognition, and computer vision communities. There are a large number of commercial, securities, and forensic applications requiring the use of face and also retina recognition technologies. As you can see, face and retina recognition system is very important in our daily life. It is possesses a really great advantage. Among the whole types of biometric, face recognition system is the most accurate. This is first kind of implementation on RETINA & FACE recognition using PCA for biometric system with this specialized hardware's & software. This paper presented biometric recognition based on the face and retina. Also we used median filter to remove facial distortion of image. For testing our system, we use some face images with facial expressions and retinal images. The authors apply PCA algorithm for face and retinal biometric system. For future work we want to repeat our experiment on larger databases. We also intent to conduct the same experiment using a different face database and compare the results with our current experiment to ensure the validity of our enhanced algorithm verify different types and sizes of database. Our system is not appropriate to recognize the system which are having large beard so this is our future work experiment.

# International Journal of Innovative Research in Science, Engineering and Technology

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Vol. 6, Issue 5, May 2017

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