ISSN 2319 - 5975

Volume 1, No.1, July August- September 2012
International Journal of Networks and Systems
Available Online at http://warse.org/pdfs/ijns01112012.pdf

Hybrid Biometric Recognition Based Secured Database Retrieval

Prof. Venu Shah[1], Mr. Kushal Parmar[2], Ms.Payal Salot[3], Manasi Chavan[4], Jai Desai[5]
[1]University of Mumbai, India, shah_venu@yahoo.com
[2] University of Mumbai, India, kushalparmar26@gmail.com
[3] University of Mumbai, India, payal.salot@gmail.com
[4] University of Mumbai, India, manchav20@yahoo.co.in
[5] University of Mumbai, India, jaiidesai@gmail.com

ABSTRACT

In this paper image retrieval technique based on features extraction using Kekre transform is presented. This transform is applied on combination of row mean and column mean. Today, Biometric recognition is a common & reliable way to authenticate the identity of a person based on the physiological or behavioral characteristics. A physiological characteristic is relatively stable physical characteristic and includes face, iris pattern, finger print, hand silhouette etc. The reason is that physiological features are often non-alterable except by severe injury. The behavioral patterns, on the other hand, may fluctuate due to stress, fatigue, or illness. An algorithm that integrates both face and iris recognition to extract data is discussed. It is a low cost system with multiple security levels.

Keywords: Database Retrieval, Face Recognition, Iris Recognition, Kekre Transform.

1. INTRODUCTION

Highlight a section that you want to designate with a certain style, then select the appropriate name on the style menu. Face recognition and Iris recognition are one of the few biometric [4] methods that possess the merits of both high accuracy and low intrusiveness [1]. Kekre's algorithm [1][2][3] can be easily implemented and number of coefficients required for recognition reduces drastically compared to benchmark algorithm PCA. Thus computational burden decreases. The performance of this transform is compared to other conventional transforms like DCT, DST, Slant transform and WHT. The algorithm was tested for occlusion as well as different percentage of image energy levels. This transform needs minimum energy as compared to other transforms for reliable recognition. Here we have tested proposed scheme on standard ORL database and locally generated unconstrained database. ORL database [8] gave the accurate results and local database gave accuracy of 80% which is higher than conventional transforms and PCA [1][2][3] while the database locally created tested on color images also gives 60%. The style will adjust your fonts and line spacing.

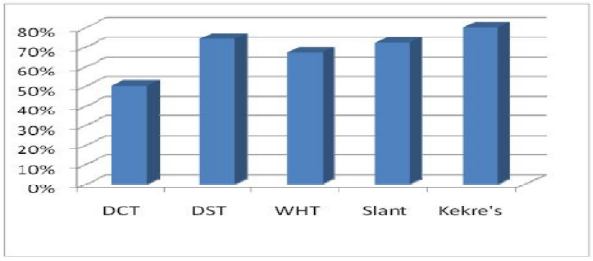

Figure 1: Performance Comparison of Different Transforms

$$[K] = \begin{bmatrix} 1 & 1 & 1 & \cdots & 1 & 1 \\ -m+1 & 1 & 1 & \cdots & 1 & 1 \\ 0 & -m+2 & 1 & \cdots & 1 & 1 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & 1 & 1 \\ 0 & 0 & 0 & \cdots & -1 & 1 \end{bmatrix}$$

Figure 2: General Form of Kekre's Matrix

2. KEKRE'S MATRIX & ITS PROPERTIES

Let us generate the Kekre's Matrix [1][2][3] [K] for size m X m where, m can be any integer not necessarily the power of 2. This matrix has all 1's on the main diagonal and upper triangle of the matrix. The sub-diagonal just below the main diagonal has the value (-m + i) where 'm' is the order of matrix and 'i' is the column number. Rest all the elements of lower triangle below the sub diagonal are all zeros. The main idea of this matrix is to mitigate the effects of expression, illumination and occlusion variations by performing transform analysis. The value of m in the matrix determines the accuracy and speed of operation. As value of m increases accuracy increases but speed of operation decreases. So, there is a trade off in speed and accuracy.

Assume n=8

Step1: put zeros

$$K = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

@ 2012, IJNS All Rights Reserved

Step2: put 1's on right side of diagonal using for loop
For i=1 to n
For j=1 to n
K(i,j) = 1;

$$K = \begin{matrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{matrix}$$

Step3: put elements diagonally
For i= 2 to n
K(i,i-1) = (-n)+(i-1);

$$K = \begin{matrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ -7 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & -5 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & -3 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & -1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 3 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 5 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 7 & 1 \end{matrix}$$

Properties of Kekre's Transform [1][2][3]:

1. The Kekre's transform is real and orthogonal transform.

$$[K][K]^T = [\mu] \quad (1)$$

Where [K]T is transpose of [K] and [μ] is a diagonal matrix and its elements are given by

$$[\mu]_{11} = m \quad (2)$$

$$[\mu]ii = (m - i + 1)(m - i + 2) \quad (3)$$

2. It has a fast algorithm as it contains m (m + 1)/2 number of ones and (m - 1)(m - 2)/2 number of zeros leaving only (m - 1) integer multiplications and only (m - 1)(m /2) additions for transforming a column vector of dimension mx1. For a normal matrix transformation we require m2 multiplications and m (m - 1) additions.

3. The transform of a vector f is given by

$$F = [K]f \quad (4)$$

And inverse is given by

$$f = [K]^T [\mu]^{-1} F \quad (5)$$

4. For image [I] the transform [A] is calculated as

$$A = [K][I][K]^T \quad (6)$$

And inverse transform is given by

$$I = [K]^T [A/\mu][K] \quad (7)$$

where $[A/\mu]ij = aij / \mu ij$ and $\mu_{ij} = \mu_{ii}\, \mu_{jj}$

Algorithm for Content Extraction (face/ iris) using Kekre`s Transform [1][2][3][6][7]

Step 1: Get the query image (Face/ Iris).
Step 2: Calculate Row and Column mean vectors.
Step 3: Multiply by Kekre`s Transform matrix.
Step 4: Scan and find out the number of images in the databases.
Step 5: Calculate Row and Column mean vectors.
Step 6: Multiply by Kekre`s Transform matrix.
Step 7: Calculate the Euclidean distances from Kekre Row Mean (T1) and Column Mean (T2) vectors.
Step 8: Take the Mean(M) of T1 and T2.
Step 9: Select the next database image and repeat steps 5 to 8.
Step 10: Arrange images in Ascending order according to the value of M.
Step 11: Display the Result.

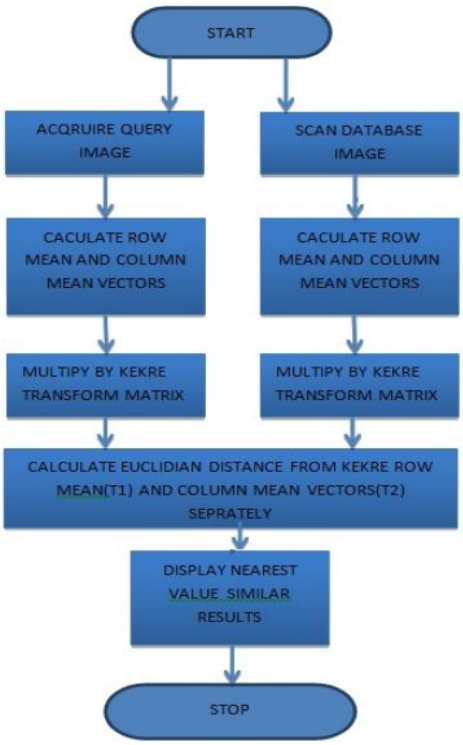

Figure 3: Flow chart for Kekre's algorithm

3. COMBINATION OF FACE AND IRIS RECOGNITION FOR DATABASE RETRIEVAL ALGORITHM FOR COMBINATION OF FACE & IRIS RECOGNITION USING KEKRE'S TRANSFORM[1][2][6][7].

Step 1: Get the image of face and iris using the identity number.
Step 2: Calculate Row and Column mean vectors for both the images.
Step 3: Multiply by Kekre`s Transform matrix.
Step 4: Scan and find out the number of images in the respective databases.
Step 5: Calculate Row and Column mean vectors for respective images.
Step 6: Multiply by Kekre`s Transform matrix.

@ 2012, IJNS All Rights Reserved

Step 7: Calculate the Euclidean distances from Kekre Row Mean (T1) and Column Mean (T2) vectors for the respective images.
Step 8: Take the Mean(M) of T1 and T2 for the respective images.
Step 9: Select the next database image from both databases and repeat steps 5 to 8.
Step 10: Arrange images in Ascending order and select the value of M, which is minimum or nearest to the value of actual image M for both face as well as iris images
Step 11: Display the results

4. STEPS FOR PROPOSED ALGORITHM FOR DATABASE RETRIEVAL

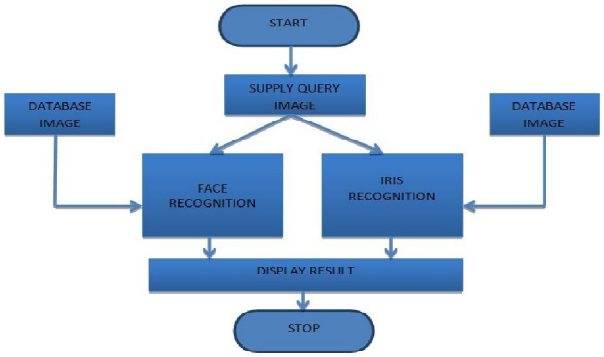

Figure 4: Combination of face and iris recognition for database retrieval

The submitting author is responsible for obtaining agreement of all coauthors and any consent required from sponsors before submitting a paper. It is the obligation of the authors to cite relevant prior work.

5. GRAPHICAL USER INTERFACE

A graphical user interface (GUI) is a pictorial interface to a program. A good GUI can make programs easier to use by providing them with a consistent appearance and with intuitive controls like pushbuttons, list boxes, sliders, menus, and so forth. The GUI should behave in an understandable and predictable manner, so that a user knows what to expect when he or she performs an action.

1.) A Graphical User Interface will be displayed on the screen showing 'Login Title'.
2.) Enter the correct Login and Password and then click on OK.
3.) A Graphical User Interface will be displayed showing Secured Database Retrieval.
4.) Click on the QUERY INPUT button to select the name of the face to be recognized.
5.) Click on the QUERY INPUT button to select the name of the iris to be recognized.
6.) Click on CHECK SIMILAR PERSON button to obtain the recognized face and iris of a person from the database.
7.) To obtain the bio-data of the recognized individual click on profile button.

Figure 5: Login Screen

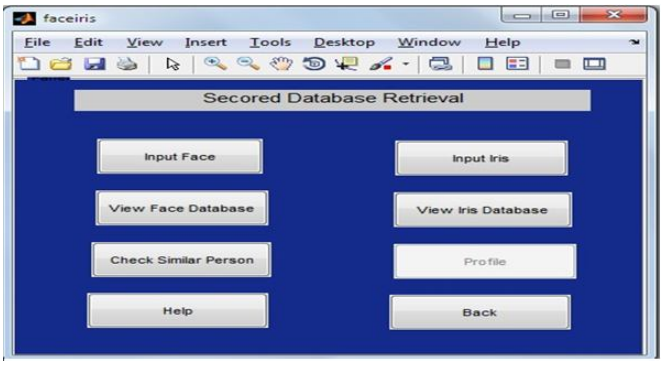

Figure 6: GUI after Successful Login

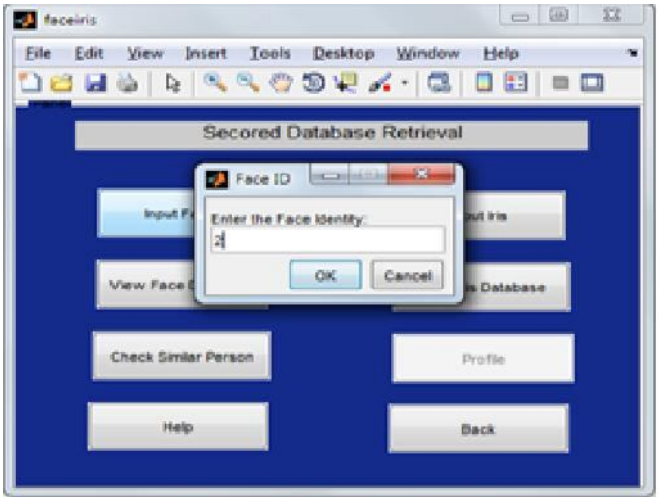

Figure 7: Entering Face Identity

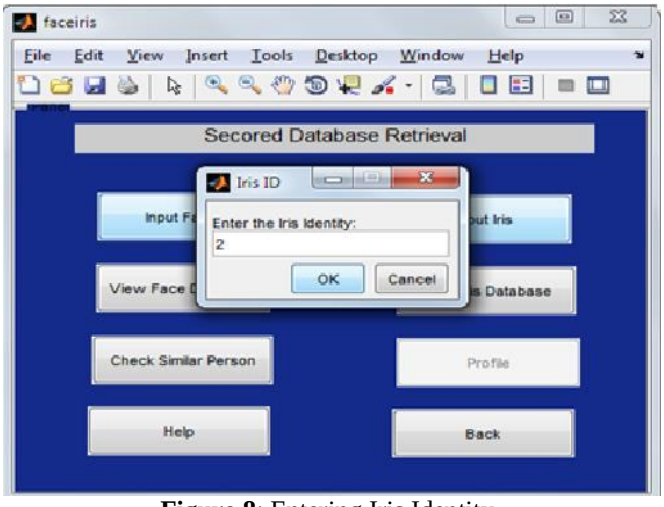

Figure 8: Entering Iris Identity

@ 2012, IJNS All Rights Reserved

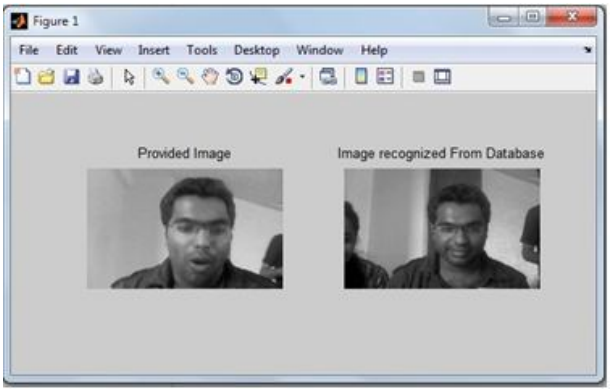

Figure 9: Output for Face Identity 1

Figure 10: Output for Iris Identity 2

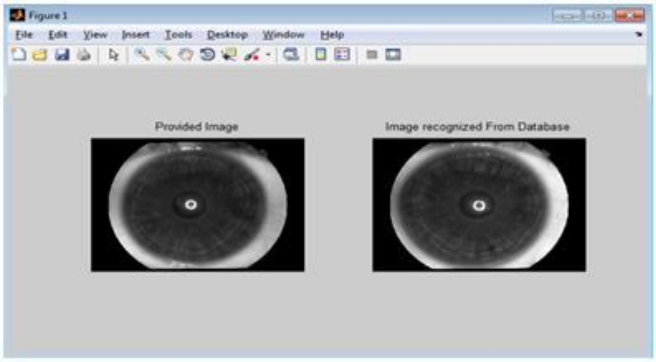

Figure 11: Output for Iris Identity 1

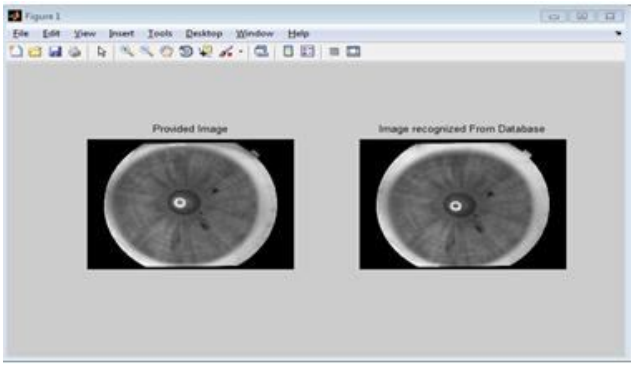

Figure 12: Output for Iris Identity 2

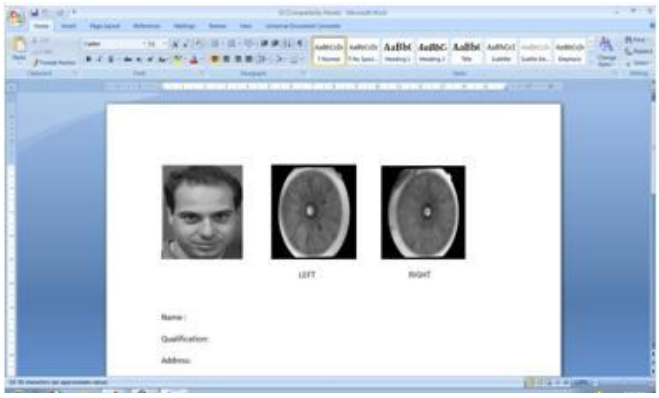

Figure 13: Database output for Identity 2

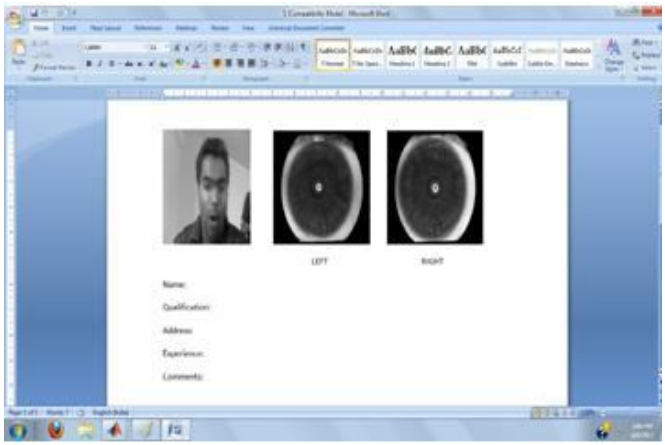

Figure 14: Database output for Identity 1

6. CONCLUSION

The above software is developed using Matlab 2011a and it serves as a low cost high end data security system. The program has three level authentications to ensure security and database retrieval. This includes password protection, face recognition and iris recognition. However two level authentication i.e. password and face or iris can be used to ensure data integrity. It gives 80% accuracy, and has been tested with live images

ACKNOWLEDGEMENT

We are very thankful to the Electronics and telecommunications department of AET's Atharva College of engineering for providing us with the necessary facilities to complete our research in the field CBIR. We also thank our family, friends for supporting us throughout our research.

REFERENCES

1. Dr. H. B. Kekre and Kamal Shah. **Performance Comparison of Kekre's Transform with PCA and other Conventional Orthogonal Transform for Face Recognition**, Second International Conference on Emerging Trends in Engineering and Technology, ICETET-09.

@ 2012, IJNS All Rights Reserved

2. Dr. H.B.Kekre, Sudeep D. Thepade, Archana Athawale, Anant Shah, Prathamesh Verlekar and Suraj Shirke. **Kekre Transform over Row Mean, Column Mean and Both Using Image Tiling for Image Retrieval**, International Journal of Computer and Electrical Engineering, Vol.2, No.6, December, 2010 1793-8163

3. Dr. H. B. Kekre, V. A Bharadi, V I Singh, V Kaul and B Nmeade. **Hybrid multimodal biometric recognition usng Kekre's Wavelets, 1D Transforms and Kekre's Vector Quantizastion Algorithms based feature Extraction of Face and Iris**, IJCA proceedings on International conference and workshop on emrging Trends in Technology(ICWET) (3)29-34 ,2011

4. A. K. Jain, P Flynn and A. Ross. ***Handbook of Biometrics***, Springer 2008.

5. R.C.Gonzalez and R.E. Woods. ***Digital Image Processing***, Second Ed., Prentice-Hall, 2002, Pp. 90

6. R. Wildes. **Iris Recognition; An Emerging Biometric Technology,** Proceedings of IEEE Vol 85, No.9, pp.1348-1363,1997.

7. Dr. H. B. Kekr and V. A Bharadi. **Multimodal Biometric**, *ICWET 2010*, 26-27, Feb 2010.

8. O.R.L. (ORL), www.Uk.Reserach.Att.Com/Facedatabase.html

AUTHORS PROFILE

Ms. Venu Shah, BE (EXTC), ME (EXTC) from Mumbai University and has ten years of teaching experience and is working as Senior lecturer in Electronics and telecommunication department at Atharva College of Engineering. She has 6 papers in National /International Conferences / Journals to her credit. The areas of interest are Wireless Communication, Computer Networks and Image Processing.

Mr. Kushal Parmar, BE (EXTC) from Mumbai University. The areas of interest are Image processing, Computer Networks and Embedded Systems.

Ms. Payal Salot, BE (EXTC) from Mumbai University. The areas of interest are Image processing and Embedded Systems.

Ms. Manasi Chavan, BE (EXTC) from Mumbai University. The areas of interest are Image processing and Embedded Systems.

Mr. Jai Desai, BE (EXTC) from Mumbai University. The areas of interest are Image processing and Embedded Systems.

@ 2012, IJNS All Rights Reserved