International Journal of Engineering Research and General Science Volume 3, Issue 3, May-June, 2015
ISSN 2091-2730

An Improved Feature level Fusion in Multimodel Biometric System Using Iris and Ear

[1]Nupriya Goyal, [2]Dr. Rohit Bajaj
[1]PG Scholar, C.S.E. Department, [2]Associate Professor, C.S.E. Department
Chandigarh Engineering College Landran, Distt. Mohali, Punjab, India
babugoyal99@gmail.com (8427201487), cecm.cse.rohitbajaj@gmail.com

Abstract- Multi modal biometric system is one of the major areas of study identified with large applications in recognition system. Single modal biometric systems have to challenge with a variety of problems such as noisy data, Intra-class variations, non-universality, spoof attacks, and unacceptable error rates. Some of these limitations can be solved with multi modal biometric systems. The major purpose of the study is to review and analyze the prime works in multimodal biometric system and its efficiency in recognition rate. The proposed framework of the multimodal biometric system using face and ear is given. This paper also discusses data set of Iris, Ear and understands the various techniques for feature extraction and reduction which are used in project work.

Keywords- Iris Recognition, Ear Recognition, Feature Extraction, Biometric recognition, Multimodel recognition, ICA, GA

1. Introduction

Biometrics is always developing innovation which has been generally utilized as a part of numerous official and business distinguishing proof applications. Biometrics first came to spotlight in 1879 when Alphonse Bertillon (1853–1914), a French Criminologist, presented his anthropometrical signalman or Bertillon age system for recognizing sentenced offenders [1].
The most utilized recognizable proof movement as a part of criminology and in like manner common applications is the particular case that has as its point individual ID. The recognizable proof of an individual that has perpetrated a wrongdoing has been set aside a few minutes by utilizing logical and otherworldly components. The requirement for dependable client confirmation systems has expanded in the wake of increased worries about security and fast headways in systems administration, correspondence and versatility. Biometrics, depicted as the investigation of re meditation individual, in view of her physiological or behavioral attributes. Biometric frameworks have now been sent in dissimilar business, regular citizen and legal applications as a method for building personality. These frameworks depend on the proof of fingerprints, hand geometry, iris, retina, face, hand vein, facial thermo gram, mark, voice, and so forth to either accept or focus a personality [3]. Most biometric frameworks sent in certifiable applications are uni-modular.

1.1 WHAT IS BIOMETRIC FUSION?

A biometric framework is programmed means by which physical attributes are utilized to perceive an individual, or check an individual's singularity. An arrangement of such frameworks have been actualize and utilized gainfully through the years, checking ones in view of fingerprints, irises, facial pictures, hand and storyteller acknowledgment, among others. The enthralling fruitions of biometric frameworks oblige address various issues, tallying precision, fitness, durability, materialness, and comprehensiveness. A solitary strategy for trade with a hefty portion of the issues goes up against biometric frameworks is to amass more information from every center, and breaker the information, or the results of handling that information. A biometric combination can be positive generally as the utilization of a few sorts of biometric information or strategy for giving out to enhance the show of biometric frameworks [13].
The speculation at the back combination is not fragmented to biometrics: Biometric based choices are a specific instance of classification in the field of arithmetical example acknowledgment, and biometric combination comparably can be watchful an uncommon instances of join numerous classifiers in example credit. Combination system is utilized as a part of such differed fields as web indexes, investigation of settlement symbolism, and investigation of medicinal test results. Biometric combination is not another thought: for a considerable length of time, a mixture of part of combination has been essential piece of the vanquishing execution of biometric frameworks, basically vast scale finger impression frameworks

1.2 MULTI-BIOMETRIC SYSTEMS

A multi-biometric framework is one in which various classes of information are created and utilized for a scope of reason, checking yet not inadequate to combination [13]:

- **SELECTION**: In which the best or the greater part valuable information is hold for utilization, while the other information is surreptitiously or superfluous. Combination is frequently in view of value measurements.

- **VALIDATION:** In which an amount of the information is utilized to check the genuineness of the other information.
- **FUSION**: which is based on join information at an assortment of levels?

1.3 CATEGORIES OF FUSION

The sorts of information or systems for allotment utilized constitute the classifications of combination:

- **Multi-sample*:*** Combination of numerous specimens get from the same source, for example, various pictures of a solitary unique finger impression, pictures of the same face, or recording of a speaker.
- **Multi-instance:** Combination of complex occasion of the same kind of biometric, for example, fingerprints from numerous fingers, or symbolism of both irises.
- **Multi-modal:** Combination of numerous sorts of biometrics, for example, a gathering of a subject's fingerprints, confronts irises, and voice [14].
- **Metadata:** Combination of biometric inputs with other in place, for example, occasions of test quality, or demographic in place, for example, sex, stature, or age. Demographic in place is now and then portrayed as delicate biometrics.

1.4 ADVANTAGES OF MULTIBIOMETRIC SYSTEMS

1. A dry finger keep her from gainfully select into a unique mark framework, then the usability of one more biometric quality, say iris, can help in the expansion of the individual in the biometric framework. A beyond any doubt level of suppleness is attained to when a client selects into the framework utilizing a few distinct practices while just a subset of this conduct is solicitation amid check in light of the regular universe of the application under consideration and the practicality of the client [15].
2. It gets to be more and harder for an impostor to farce various biometric attributes of a legitimately enlisted individual. In the event that every subsystem demonstrates the probability that a demanding quality is a 'satire', then suitable combination plan can be locked in to finish up if the client, indeed, is a fake.
3. Multi-biometric frameworks additionally effectively address the issue of loud information. At the point when the biometric sign secure from a solitary trait is contaminated with commotion, the usability of other conduct may support in the unfaltering determination of qualities.
4. A multi-biometric framework might likewise be view as a misstep tolerant framework which keeps on controlling notwithstanding when certain biometric sources get to be variable because of sensor or programming breakdown, or computed client course.

1.5 FEATURE LEVEL

When features are similar then average feature can be measured. When features are non- homogeneous than we can integrate them to form single feature. Concatenation is difficult due to following reasons:

(i) The unknown relation between feature vectors.
(ii) Integration leads to large vector space.

In the feature level fusion, signals coming from different biometric traits are first processed and feature vectors are extracted separately from the each biometric trait. After that these feature vectors are combined to form a composite feature vector which is further used for classification. In case of feature level fusion some reduction technique must be used in order to select only useful features. Some of the researchers have applied fusion at feature level. Since features contain richer information of biometric trait than matching score or decision of matcher, fusion at feature level is expected to provide better recognition results but it has also observed that when features of different modalities are compatible with each other then fusion at feature level achieves more accuracy Figure 1 shows feature level fusion.

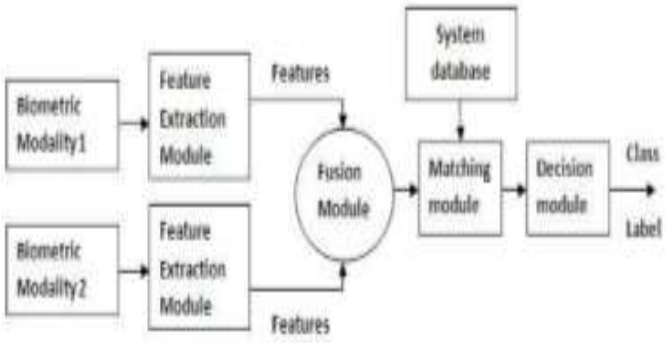


Figure 1: Fusion at Feature level

1.6 PREVIOUS WORK ON AUTHENTICATION

From the most recent couple of years, the system security and PC has been perceived as a specialized issue, particularly when the framework managing client confirmation amid the start up of gave offices. The confirmation for client commonly as a watchword, is a key security transform that either permits client to get to framework or denies access to a framework [4].

A wide mixed bag of uses requires dependable confirmation plans to affirm the character of an individual asking for their administration. Customary verification systems utilizing passwords and ID cards are ordinarily used to confine access to an assortment of frameworks. However in these frameworks security can be effortlessly broken. The development of biometrics advances is supplanting the customary routines as it has tended to the issues that torment these frameworks. Since biometric identifiers are one of a kind to people, they are more solid in checking personality than token and information based routines.

Likewise uni-modal biometric frameworks are not compelling so much, they can be pulverized easily, and so Multimodal biometric frameworks started to be that incorporate diverse biometric frameworks for check in making an individual recognizable proof [5]. This framework exploits the abilities of every individual biometric. These frameworks can anticipate that more exactness due will the way that they utilize various biometric modalities where every methodology presents autonomous proof to settle on a more educated choice [6].

1.7 PROPOSED METHODOLOGY

The accompanying steps will demonstrate the working of proposed framework highlight are concentrate by new calculation and highlight vectors are gotten .The highlight vectors are combined utilizing a proposed method & acquire another highlight vector which can be put away in database. In the wake of putting away all information, matcher can be utilized to match the new information with existing database & gives the outcomes.

Algorithm Level Design

- Data Procurement
- Feature Extraction -Improvement
- Fusion
- Matching & are talked about in this work.

1. Data Procurement

Iris and Ear: Ear pictures are gathered from IIT Delhi Ear Database (Version1.0) and iris pictures from IIT Delhi Iris Database (Form 1.0). The proposed framework is tried with 50 subject's various specimens (more or less 2 every each).

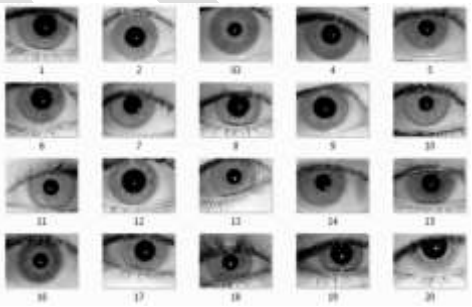


Figure 2: Iris IIT database samples

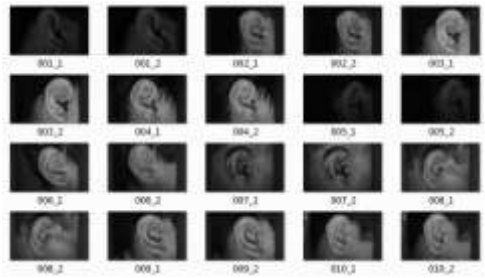


Figure 3: Ear IIT database

2. Feature Extraction method is same for both Ear and IRIS

The highlight extraction of both the biometric has been done through the ICA algorithm.

Independent component analysis (ICA) is a measurable system that speaks to a multidimensional source vector as a direct blend of non-Gaussian irregular free variables called free segments [11]. It expects to catch the free sources keeping in mind the end goal to examine the basic haphazardness of the watched signs.

I. Given the information picture Im n, pixels of the picture are orchestrated by connecting m columns of n sections into an example vector of (m * n) segments.

II. Given the information set Dl of L cases, the preparation set would have L columns and m n sections. For managed adapting, there is one extra mark section marking the case, making the length of the example vector as m/ n + 1.

All in all terms ICA grabs the free segments of the pictures. This procedure is done in diverse cycles and every emphasis has distinctive arrangement of parts and every segment can be dealt with as highlight. Despite the fact that when the highlight extraction part is finished, we don't get every one of those segments which are obliged to the methodology in the framework additionally those parts which are not needed. Subsequently to go before the removed segment we have to upgrade the list of capabilities which could be possible either by any advancement calculation o0r by straightforward threshold method.

Figure 4: Original Image Edge of the Image

Genetic Algorithm for optimization

- ✓ Initialize GA parameters i.e., population size, determination, change and hybrid.
- ✓ Create fitness function.
  - $f = (1 - e) \cdot (m - F_s / F_t)$ (changed fitness function)
  - Where Fs= feature, Ft=total number of feature, e= characterization error rate (enhancement parameter).
- ✓ Call GA functions with the fitness function.
- ✓ If the yield is 1 then the feature is chosen else dismissed.
- ✓ Write the lessened features to excel file.

Hamming Distance

At the point when there is no x and y coordinate over a quality and still it is obliged to discover the likenesses between both the focuses, Hamming separation is an advantage. In Mat lab 2010 Hamming (x, y) and it would give you 1 or 0. On the off chance that the worth is 0 then both the focuses are indistinguishable if not, both the qualities are diverse

1.8 SYSTEM FRAMEWORK

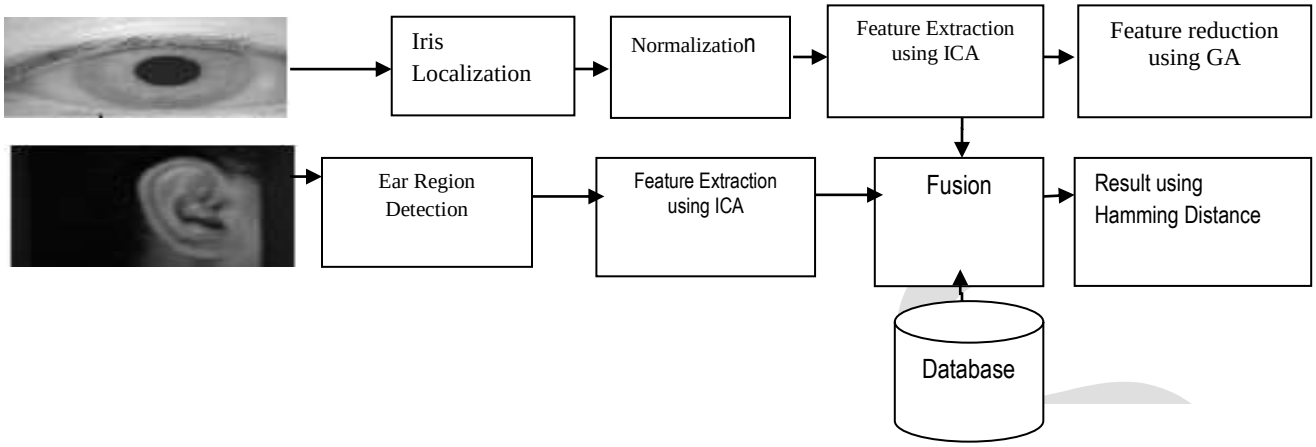


Figure.5 Flow chart of proposed work

Firstly the picture of iris is transferred and it will be standardized by changing over the picture from rgb (red, green, blue) to dim scale through which its measurement will be diminished and after that we apply the highlight extraction calculation i.e. Free Part examination for highlight extraction technique and we will get the highlights vector and afterward we apply hereditary calculation for the highlight streamlining and after that we will spare it in the database of MATLAB. The same methodology will be petitioned the ear database. First and foremost we transfer picture from ear database and the histogram is made for that transferred picture and afterward the edge discovery of the current transferred picture happens. After edge recognition we apply the highlight extraction methodology utilizing Free Part Examination and afterward we spare both the highlight vector in database. At that point we apply fusion level methodology and the preparation of iris and ear is finished with the aforementioned procedure. At that point we spare the melded information set in MATLAB database and we stack that database to the testing area and we will assess the execution parameters like False Acknowledgement rate, False Dismissal rate and precision.

1.9 RESULTS WITH IMPLEMENTATION

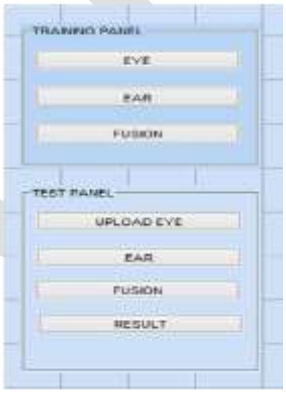


Figure 6: Training and Testing Panel

The above figures demonstrates the preparation and testing board in which acknowledgment of the combination of iris and ear happens utilizing MATLAB Graphical client interface

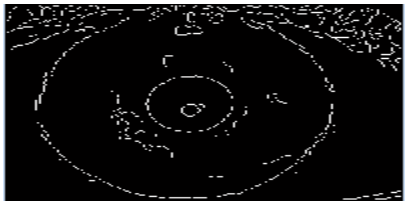


Figure 7: Edge Detection of IRIS

The above figure demonstrates the careful edge recognition of iris at which the picture splendor changes forcefully. We can likewise utilize other edge identification sorts like sober, pewit and so on.

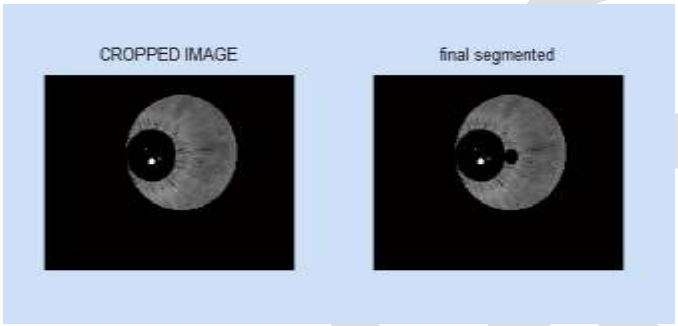


Figure 8: Segmented image and cropped image

The above figure demonstrates the last fragmented picture in the wake of applying the Hough roundabout Change HCT is system to discover the limit of the understudy i.e. internal circles and external circles of the retina.

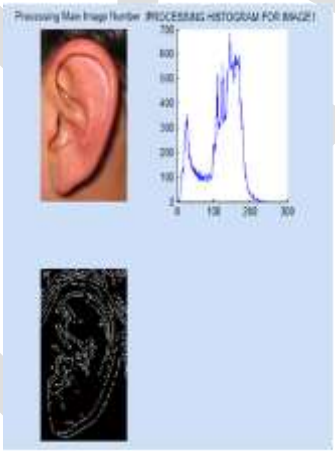


Figure 9: Ear panel Database

The above figure demonstrates the board of the ear in which we transfer the ear picture from the database and afterward the histograms is demonstrated of the current transferred picture and after that edge recognition of the picture is done and after edge discovery Autonomous part examination is petitioned highlight extraction.

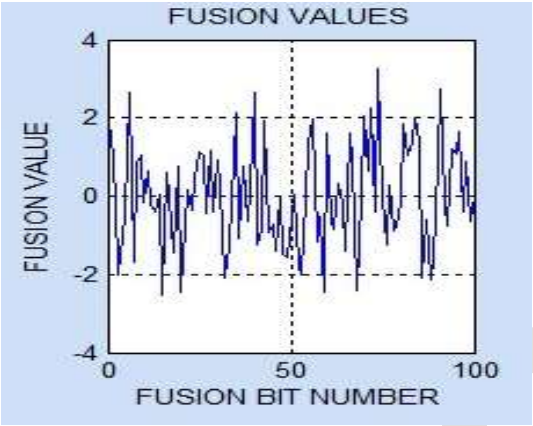
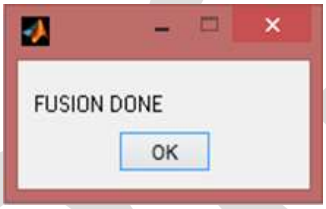
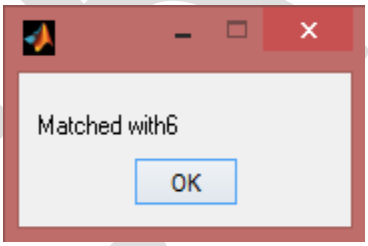


Figure 10: Fusion graph

The above figure demonstrates the combination of the iris and ear which demonstrates the chart between combination quality and combination bit number and the following message box indicates that fusion is done.



When fusion is done then we upload the iris image and ear image again. Then check the result of matching. When matching is done then the following message box indicates that it matched. If our data is not matched with database data then it will show the unmatched. After that it shows the value of FAR, FRR and Accuracy of our project with the message box.



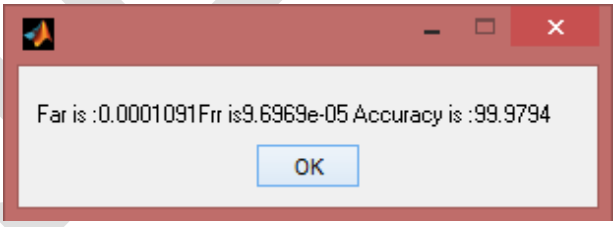


Table Performance metrics for Fusion of Iris and Ear

Metric	**Fusion of Iris and Ear**
FAR	.0001091
FRR	9.6969
Accuracy	99.97

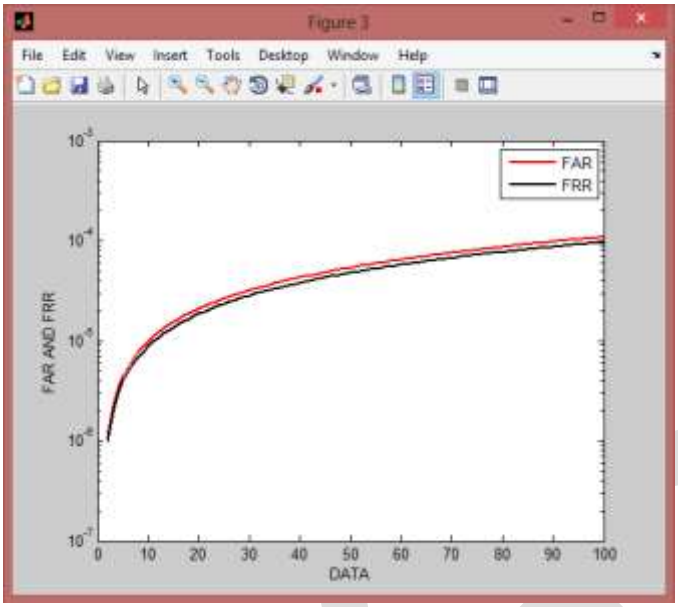


Figure11: Graph shows the FRR, FAR and Accuracy values of our work

1.10 CONCLUSION

Multimodal biometric frameworks richly address a few of the issues show in unimodal frameworks. By consolidating various wellsprings of data, these frameworks enhance coordinating execution, build populace scope, prevent caricaturing, and encourage indexing. Different combination levels and situations are conceivable in multi-model framework. Combination at the highlight level is the most well-known because of the simplicity in getting to and uniting coordinating scores. Execution addition is proclaimed when uncorrelated qualities are utilized as a part of a multimodal framework. Consolidating client particular parameters can further enhance execution of these frameworks.
In the proposed framework another system is created at highlight level for highlight extraction and combination of iris and ear expand the precision of the confirmation frameworks. In this ICA highlights are separated for iris and ICA for ear. This proposed technique diminished the FAR and in addition FRR, & has builds the framework execution on the given information set.

REFERENCES:

[1] Kulkarni S. B., Shirodkar S., Hegadi R. S., Kulkarni U. P., Iris Recognition using Fusion of Gray Level Co-occurrence Matrix and Gray Level Run Length Matrix, ICSIP 2013, Elsevier, pp. 241 - 246, 2013.

[2] Ashish Mishra, "Multimodal Biometrics it is: Need for Future Systems," International Journal of Computer Applications, vol. 3, pp. 28-33, June 2010.

[3] Mingxing He , Shi-JinnHorng , Pingzhi Fan , Ray-Shine Run , Rong-Jian Chen , Jui-Lin Lai , Muhammad Khurram Khan, Kevin Octavius Sentosa , "Performance evaluation of score level fusion in multimodal biometric systems," Pattern Recognition, vol. 43, pp. 1789-1800, May 2010.

[4] Shi-Jinn Horng, "An Improved Score Level Fusion in Multimodal Biometric Systems," International Conference on Parallel and Distributed Computing, Applications and Technologies, pp. 239 - 246, Dec 8-11, 2009.

[5] A. Ross and R. Govindarajan, "Feature Level Fusion in Biometric Systems," SPICE Conference on Biometric Technology for human identification.. II, Vol. 5779, Orlando USA, March 2005, pp. 196-204.

[6] A. Rattani, D. R. Kisku, M. Bicego, and M. Tistarelli, "Feature Level Fusion of Face and Fingerprint Biometrics," 1st IEEE International Conference on Biometrics, Theory, Applications and Systems, pp. 1 – 6, September 2007

[7] SuryantiAwang, RubiyahYusof, "Fusion of Face and Signature at the Feature Level by using Correlation Pattern Recognition", World Academy of Science, Engineering and Technology, 2011.

[8] MichałChoras, "Ear Biometrics Based on Geometrical Feature Extraction," Electronic Letters on Computer Vision and Image Analysis 5, pp. 84-95, 2005

[9] Li Yuan, Zhichun Mu, "Ear recognition based on local information fusion," Pattern Recognition Letters 33(2), pp. 182-190, 2012.

[10] Naveen Singh, Dilip Gandhi, Krishna Pal Singh, "Iris recognition system using a canny edge detection and a circular Hough transform," International Journal of Advances in Engineering & Technology, May 2011.

[11] A. Basit, M. Y. Javed, M. A. Anjum, "Efficient Iris Recognition Method for Human Identification," proceedings of world academy of science, engineering and technology, vol. 4 feb.2005.

[12] John Daugman, "How Iris Recognition Works", in Proceedings of International Conference on Image Processing, vol.1, pp. I-33-I-36, 2002.

[13]Austin Hicklin, Brad Ulery, Craig Watson,"A Brief Introduction to Biometric Fusion", International Journal of Advances in Engineering & Technology, vol (1),issue 2,16,june,2002.

[14] V. Conti1, G. Milici, P. Ribino, F. Sorbello1 and S. Vitabile,"Fusion in Multimodal Biometric Systems", International Journal of Advances in Engineering & Technology,vol 1, pp. 1162-1166, September 2002.

[15] Arun Ross," An introduction to Multibiometrics" Appeared in Proc.of the 15th Europen Signal processing conference, vol 2,September,2007.

[16] Harbi AlMahafzah and et.al," A Study of Multibiometric Systems", Journal of Research and Practice in Information Technology, Vol. 36, No. 1, February 2004.
[17]Brad Ulery,1 William Fellnerand et.al," Evaluation of Selected Biometric Fusion Techniques",
National Institute of standards and technology, vol 3, issue 2, 20 july 2006.

[18] LeninaBirgale and M. Kokare, 2010. Iris Recognition without Iris Normalization. Journal of Computer Science 6, pp. 1042-1047.

[19] Shashi Kumar D R, K B Raja, R. K Chhootaray, SabyasachiPattnaik, 2011. PCA based Iris Recognition using DWT. Int. J. Comp. Tech. Appl. , vol 2 (4), pp. 884-893

[20] P. D. Garje1, Prof. S. S. Agrawal, 2012. Multibiometric Identification System Based On Score Level Fusion. IOSR Journal of Electronics and Communication Engineering (IOSRJECE), ISSN: 2278-2834 Volume 2, Issue 6, PP 07-11