

# Multimodal Biometrics using Image Fusion Techniques

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**ABSTRACT :** The world is becoming increasingly more insecure so the technology world evolves challenges to implement secure personal identification protocols with biometric. Biometrics is majorly used to authenticate true identity of an individual. To overcome the false acceptance rate and rejection rate the multimodal biometrics is used. Multimodal biometrics relies on more than one form of biometric data. The Main aim of this paper is to propose Wavelet based Image fusion that combines information from Palm, Face, Iris, and Signature Images and performs recognition. Multi-Modal Biometric images are large in size and fusing the images reduces the size of the images while obtaining the features for the biometric recognition. The process of image fusion fuses the good information from each of the given images together to form a resultant image whose quality is superior to any of the input images.

**KEYWORDS:** Image fusion, acceptance rate, rejection rate, recognition.

## I. INTRODUCTION

As the technology world evolves challenges to implement secure personal identification Protocols with biometric technology are increasing and the need for accurate human identification is higher than ever in just about every market across the world. In wavelet analysis, the DWT decomposes a signal into a set of mutually orthogonal wavelet basis functions. Image fusion is a technique of combining of relevant information from two or more images into a single image. A major motivation for this paper using biometrics is the ability to authenticate the true identity of an individual. It has been shown that some people have difficulty with fingerprint for enrollment or verification due to the inherent characteristics of their finger. Sometimes the problem is associated with noisy data from biometric sensors and environmental conditions. All these lead to an increase in false acceptance and false rejection rates. To overcome these problems, multi-modal biometrics relies on more than one form of biometric data.

## II. RELATED WORK

### MULTIMODAL BIOMETRIC SYSTEMS – A SURVEY

Physical examples include fingerprint, hand geometry, face and iris recognition. These are usually very accurate, and are the most common amongst biometric readers. Less accurate but still useful, behavioral characteristics, is based upon the measurement of a person's actions. Like voice and signature verification are examples of these. Biometrics is generally safer and more secure than keys or passwords.

### SIMPLE IMAGE SCRAMBLING ALGORITHM BASED ON RANDOM GENERATION

The importance of digital image security increased especially after the networking, internet development and modern communication media. Many decryption algorithms studied to develop process of encryption and decryption. In this approach new technique has been suggested to encrypt a gray level image by using transportation technique and scrambling the image pixel.

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

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Vol. 6, Issue 4, April 2017

## STUDY OF DIFFERENT IMAGE FUSION ALGORITHM

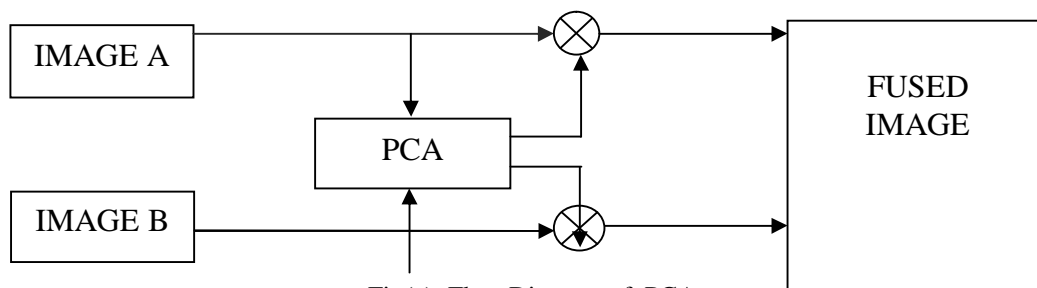
Image fusion is a technique that integrate complimentary details from multiple input images such that the new image give more information and more suitable for the purpose of human visual perception. This topic presents a review on some of the image fusion techniques (simple average, simple minimum, simple maximum, PCA, DWT). Comparison of all the techniques concludes the better approach for its future research.

### 1. IMAGE FUSION USING PCA

PCA finds the principal components of data. It is easy to find principal components rather than x-y axis. Principal components are direction of most variance where most data are spread out. Principal components are linear combinations of optimally weighted observed variables. In PCA, the number of components extracted is equal to the number of observed variables being analyzed. However, in most PCA analysis, only the first few components have the largest possible variance, so only these first few components are retained, interpreted & used for subsequent analysis. The input images are arranged in two column vectors and their empirical means are subtracted. The resulting vector has a dimension of  $n \times 2$ , where  $n$  is length of the each image vector.

Compute the eigenvector and eigenvalues for this resulting vector are computed and the eigenvectors corresponding to the larger eigenvalue obtained.

$$\rho_1 = (1) ; \rho_2 = V(2) V$$



Fig(a): Flow Diagram of PCA

### 2. IMAGE FUSION USING DCT

Discrete cosine transform (DCT) is a transform extensively used in digital image processing. DCT is used to compress the image and perform DCT in images. The DCT splits the images into different frequencies that is low frequencies. The first step the image to be decompose is transformed into frequency domain by applying DCT along columns or column – wise. The digital images are displaying on screen immediately after they are captured. They are two represents types for digital images that is Spatial domain and frequency domain mostly spatial domain techniques are complex and time consuming which are hard to perform on each time application like JPEG.

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It is divided in blocks  $n*n$  and perform on each block.

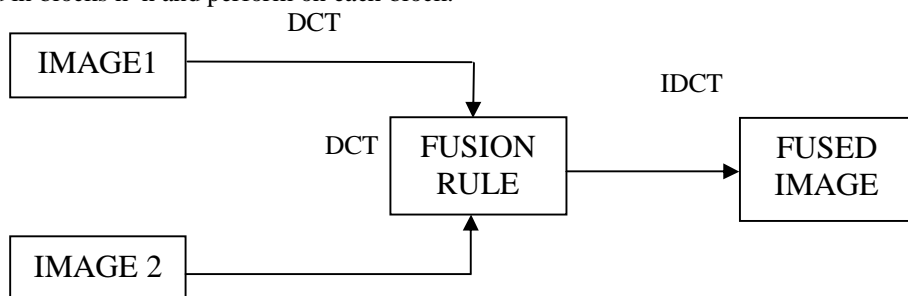


Fig (b): Flow Diagram of DCT

### III. PROPOSED METHODOLOGY

In propose scheme, wavelet transformation splits the image into high frequency and low-frequency components for four biometric images. The proposed biometric data fusion algorithm uses the palm print, face, iris, and signature images of an individual, to generate a single composite multimodal biometric image and then fused multi-modal biometric image is scrambled and store in database. In recognition process, the image obtained after descrambling is extracted by using the same wavelet bases then Recognition by using Normalized 2-D cross-correlation.

#### 1. WAVELET TRANSFORM

Wavelet transforms are multi-resolution image decomposition tool that provide a variety of channels representing the image feature by different frequency sub bands at multi-scale. It is a famous technique in analyzing signals. DWT decomposes an image into different sub images. Deionising algorithm using DWT requires the decomposition of noised image to get wavelet coefficients. DWT decomposes an image into four sub bands such as LL, LH, HL, HH frequency bands. Wavelet transform is used to transform the image form time domain to frequency domain. So that Time and frequency both information are analyzed.

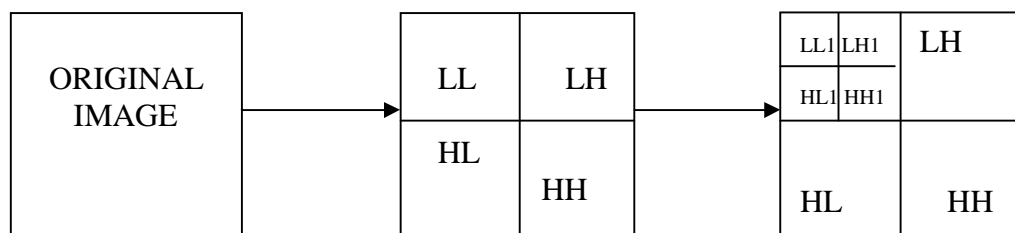


Fig (c): Decompose of an image

**Step 1:** Implement Discrete Wavelet Transform on both the input image to create wavelet lower decomposition.

**Step 2:** Fuse each decomposition level by using different fusion rule.

**Step 3:** Carry Inverse Discrete Wavelet Transform on fused decomposed level, which means to reconstruct the image, while the image reconstructed is the fused image F.

#### 2. FUSING IMAGES

The output images from the wavelet transform are fused together in the next process. The four input images are combined into a single fused image.

#### 3. IMAGE FUSION

Formation from a set of images of the same scene into a single image and the resultant fused image will be more informative and complete than any of the input images. Input images could be multi sensor, multimodal,

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multifocal or multi temporal. There are some important requirements for the image fusion process is the fused image should preserve all relevant information from the input images.

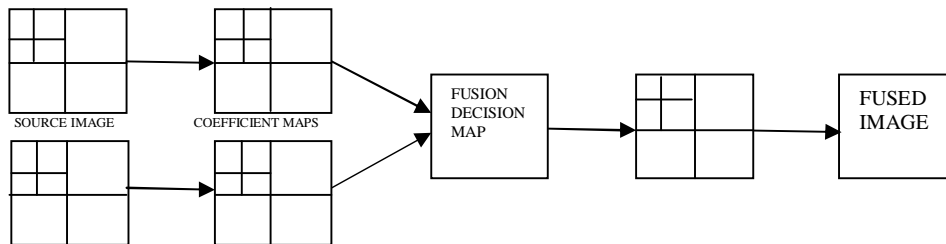


Fig (d): Image Fusion

## IV. SCRAMBLING IMAGE

This algorithm will create, encrypt image with a secret key in encrypt process and create decrypt image in decrypting process. Two algorithms are suggested one for the encrypt original image, second is for decrypt image. The original image will read row by row. The encrypted image will build randomly and the decrypt image will rebuild row by row. In encrypt processing two random number generates for each pixel one for the row the range of this number starts from 1 to the total number of rows and the following equation to generate the number from a two b.  $a=1$  and  $b=$  total number of rows.

### ADVANTAGES OF SCRAMBLED IMAGE:

The decrypt image is clear without any noise. Gives the authority to the user to keep his images protected which are meant for private purpose. High security and low complexity of for estimating such a sequence to unscramble the image will be practically impossible to break the code.

To make the algorithm more clear, we will apply an algorithm for this segment of the image the pixel of the original image will scramble to build the encrypt image.

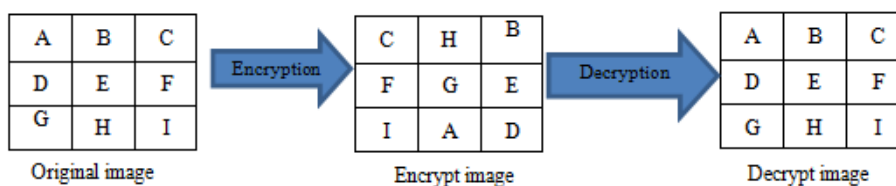


Fig (e): Encryption Decryption process

## V. SECURITY

The scrambled image with random number is saved in database using the key password. Password is used for security purposes.

## VI. RECONSTRUCTING IMAGES

To reconstruct image select the image and descramble them using user name and password and apply wavelet transform and inverse wavelet transform and using the 2D correlation the reconstructed image are matched with the original image and result is displayed.

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## VII. PROPOSED ALGORITHM

The algorithm of image fusion using DWT has following common steps applicable to proposed methods of fusion.

STEP 1: Accept the two input images.

STEP 2: Resize both the images to 512 x 512.

STEP 3: Convert to Gray scale image.

STEP 4: Convert to double precision format.

STEP 5: Take Discrete Wavelet Transform of both the images.

STEP 6: Let for first image four bands be HHa, HLa, LHa, LLa and for second image be HHb, HLb, LHb, LLb image fusion using Maximum Pixel replacement

STEP 7: Take the pixel having the maximum value of the two bands i.e. HHa and HHb, and put in HHn.

STEP 8: Take the pixel having the maximum value of the two bands i.e. HLa and HLb, and put in HLn.

STEP 9: Take the pixel having the maximum value of the two bands i.e. LHa and LHb, and put in LHn.

STEP 10: Take the pixel having the maximum value of the two bands i.e. LLa and LLb, and put in LLn.

STEP 11: Thus we will get HHn,HLn,LHn and LLn as new coefficients.

STEP 12: Take Inverse Discrete Wavelet Transform.

STEP 13: Obtain the fused Image and Display.

STEP 14: Select the fused image

STEP 15: Set a User name and Password key.

STEP 16: For security purpose the using the password key scramble the images

STEP 17: Save in the database.

STEP 18: Get the fused image by giving password.

STEP 19: The images using IDWT technique gets reconstructed.

STEP 20: The image reconstruction occurs.

STEP 21: Image is matching with correlation 2D technique.

STEP 22: The original image is matched with reconstructed image.

STEP 23: If the image is matched then matched result is displayed

STEP 24: Else the not matched is displayed.

## VIII. EXPERIMENTAL RESULTS

### IMAGE FUSING

Get the input images. Read the required image that needs to be fused. The input images palm, iris, face, signature are read one by one. The color images are converted into grey images. DWT is performed on the images and the images are decomposing with maximum pixel replacement.

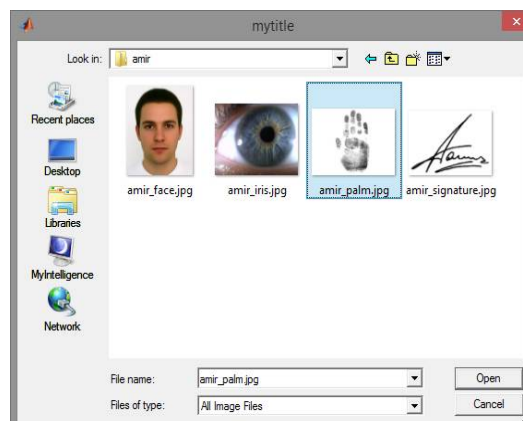


Fig (g): Reading the Input Images

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After reading the images the images are fused together as shown in figure h. The four input images are fused together as a single image with more informative information than the original image. Then the images are scrambled for the security purposes.

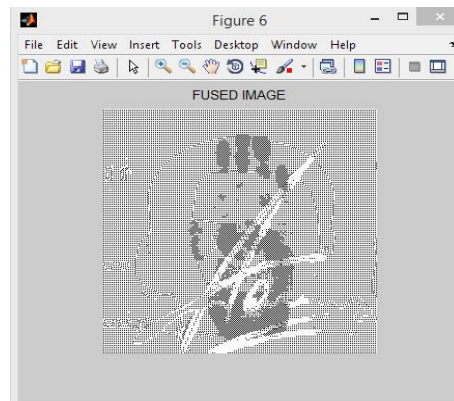


Fig (h): Fused Image

The images are scrambled and the user name and password is created so that no other person can use the information. This password and user name gives the very good security.

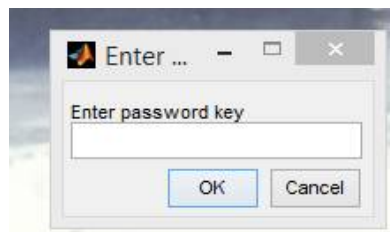


Fig (i): Password Key

The images using IDWT technique gets reconstructed. And the original image is matched with reconstructed image. After the password is given the images reconstruct and the reconstructed image is compared with the original image and matched using 2D normalized cross correlation.

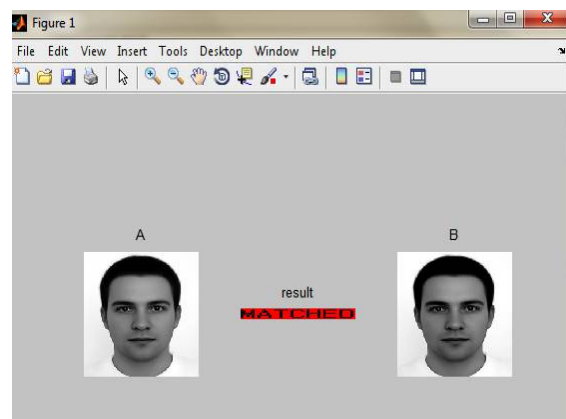


Fig (j): Matching of reconstructed image

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## IX. CONCLUSION

This project presented an effective method for Multimodal Image Fusion using Discrete Wavelet Transform. The algorithm worked fine for most circumstances thereby withstanding Image Feature and Saving Space. The system was also successful in overcoming several drawbacks posed by the earlier systems. In future, this proposed method can be used in real time applications.

Further the algorithm was tested in real time environment by developing simple Biometric images. Here, the system showed its real time effectiveness by fusing images.

## REFERENCES

- [1] Sepasian, M., Balachandran, W., & Mares, C. (2008, October 22-24). Image Enhancement for Fingerprint Minutiae-Based Algorithms Using CLAHE, Standard Deviation Analysis and Sliding Neighborhood. Proceedings of the World Congress on Engineering and Computer Science: WCECS 2008, pp. 1-6, San Francisco, USA, ISBN: 987-988-98671-0-2.
- [2] Mishra, A. (2010, June). Multimodal Biometrics it is: Need for Future System. International Journals of Computer Application, 3(4), pp. 28-33, ISSN: 0975-8887, DOI: 10.5120/720-1012.
- [3] Gottschlich, C., (2012, April). Curved Gabor Filters for Fingerprint Image Enhancement. IEEE Transactions on Image Processing, 21(4), pp. 2220-2227, DOI: 10.1109/TIP.2011.2170696.
- [4] Gudavalli, M., Babu, A. V., Raju, S. V., & Kumar, D. S. (2012, March 26-29). Multimodal Biometrics–Sources, Architecture and Fusion Techniques: An Overview, IEEE: International Symposium on Biometrics and Security Technologies, pp. 27-34, Taipei, ISBN: 978-0-7695-4696-4/12, DOI: 10.1109/ISBAST.2012.24.
- [5] Qifan Wang, ZhenhongJia, Xizhong Qin, Jie Yang and Yingjie Hu, "A New Technique for Multispectral and Panchromatic Image Fusion" Elsevier, 2011, pp. 182-186
- [6] Hongbo Wu and Yanqiu Xing, " Pixel-based Image Fusion Using Wavelet Transform for SPOT and ETM+ Image" IEEE Transaction, 2010 pp. 936-940
- [7] MirajkarPradnya P. and Ruikar Sachin D. " Wavelet based Image Fusion Techniques" IEEE International Conference on Intelligent Systems and Signal Processing (ISSP), 2013 pp. 77-81
- [8] Hui Li, Manjunath, B.S., Mitra, S.K. , "Multi-sensor image fusion using wavelet transform," Graph. Models Image Process., San Diego, CA, pp. 235-245, 1995.
- [9] V.P.S Naidu, "Discrete cosine transform-based image fusion," Defense science journal, vol. 60, no. 1, pp. 48-54, Jan 2010.
- [10] VPS Naidu, "Discrete Cosine Transform based Image Fusion techniques," Journal of Communication, Navigation and Signal Processing (January 2012) Vol. I, No. I, pp. 35-45.
- [11] Li. Shujun, X. Zheng "Cryptanalysis of a chaotic image encryption method," Circuits and Systems, IEEE International Symposium on , Vol.2 ) , pp.708-711, may. 2002.
- [12] V.V.Divya, S.K.Sudha and V.R.Resmy , " Simple and Secure Image Encryption" International Journal of Computer Science Issues, Vol. 9, pp. 186-289, November .2012.