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Iris Recognition System Based On Haar Wavelet

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ABSTRACT
Iris Recognition is one of the important biometric identification systems that recognize people based on their eyes and iris. The iris identification algorithm is planned through histogram equalization and wavelet approaches in this paper. In this paper, iris recognition system using Haar wavelet packet is presented. In this paper the iris recognition approach is implemented through many steps, these steps are determined on image capturing, grayscale image,Normalization, Feature extraction and Matching.
Keywords: Haar Wavelet,Feature Extraction,Hamming Distance,Normalization

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I. INTRODUCTION

Iris recognition eliminate the outdated system like one need to bring to one's mind an awareness of PIN, password or token. Identification through Iris become an apparent issue in good mannered societies. A person is having approval user before entering secret area, before carry out transactions. It works by taking into one's possession of the feature which have a digital image for iris recognition. The chance of any two human is minimized when the distictive nature is decidely unique. However the role of research in this area has raised the popularity of this system. Person Iris images provides a unique feature to get high dimensional information .It described how among other types of biometric verification the iris verification has the lowest false acceptance rate. Since each particular person has a distinctive nature and vigorous iris pattern, so the identification of particular person is account to be good information among the various features of biometrics. The highly unordered presence of the iris makes its use as a biometric well identified.

II. RELATED WORK

A large number of task has been completed by so many researchers in the field of iris identification system in this section. Daugman [5] put forward its first working method used in the area of the iris biometrics. It invented a system which are more reliable and fast to identify a person ,approximately within a second.

provide an identification system that calculates confidence levels for any identification decision, on an objective and rigorous basis. A still further object of the invention is to provide an identification system that provides identification without action from the subject and without making physical contact with the subject. A yet further object of the invention is to provide an identification system that allows discrimination between genuine living subjects and imposters employing

non-living duplicate identification means.These and other objects are achieved in the present invention by a method for uniquely identifying a particular human being that comprises the following steps.First, the system acquires through a videocamera a digitized image of an eye of the human to be identified. Then, it isolates the iris if it is present within the imageand defines a circular pupillary boundary between the iris and pupil portions of the image, and it defines an other circular boundary between the iris and scleraportions of the image, using arcs that are not necessarily concentric with the pupillary boundary. The system of the invention establishes a polar coordinate system on the isolated iris image, the origin of the coordinate system being the center of the circular pupillary boundary. It then defines a plurality of annular analysis bands within the iris image, these analysis bands excluding certain preselected portions of the iris image likely to be occluded by the eyelids, eyelashes, or specular reflection from an illuminator.

Further, Wildes et al.[] discussed about iris recognition .Conceptually, issues in the design and implementation of a system for automated iris recognition can be subdivided into three parts. The first set of issues surrounds image acquisition. The second set is concerned with localizing the iris per se from a captured image. The third part is concerned with matching an extracted iris pattern with candidate data base entries. This section of the paper discusses these issues in some detail. Throughout the discussion, the iris-recognition systems of Daugman[1]–[2] and Wildes et al. [4] will be used to provide illustrations.Extant iris-recognition systems have been able to answer the challenges of image resolution and focus using standard optics. The Daugman system captures images with the iris diameter typically between 100 and 200 pixels from a distance of 15–46 cm using a 330-mm lens. Similarly, the Wildes et al. system images the iris with approximately 256 pixels across the diameter from 20 cm using an 80-mm lens. Due to the need to keep the illumination level relatively low for operator comfort, the optical aperture cannot be too small (e.g., -stop 11). Therefore, both systems have fairly small depths of field, approximately 1 cm. Video rate capture is exploited by both systems. Typically, this is sufficient to guard against blur due to eye movements provided that the operator is attempting to maintain a steady gaze. Empirically, the overall spatial resolution and focus that results from these designs appear to be sufficient to supdepicted having images of their eye captured for the purpose of identification.

III. METHODOLOGY

Many iris recognition algorithms are based on ground work of Daugman [1][2] which is based on gabor wavelets, Boles[3] algorithm is based on zerocrossing of wavelet

transform and Lim [6] algorithm is based on 2D Haar wavelet transform.The standard discrete wavelet transform (DWT) is a very powerful tool used successfully to solve various

problems in signal and image processing. The DWTbreaks an image down into four sub-sampled, or images.The results consist of one image that has been high pass in the horizontal and vertical directions(HH), one that has been low passed in the vertical and high passed in the horizontal(LH), one that has been high passed in the vertical and low passed in the horizontal(HL) and last that has been low pass filtered in both directions(LL) Where, H

and L mean the high pass and low pass filter, respectively. While HH means that the high pass filter is applied to signals of both directions, represent diagonal features of

the image, HL correspond to horizontal structures, LH results vertical information and LL is used for further processing.

Jafar [7] uses Haar wavelet, decomposes up to fifth level then creates a feature vector by combining [LH5 HL5 HH5] for feature extraction. Similarly [8] uses Haar wavelet, decomposes up to fourth level then creates a feature vector by using HH4.

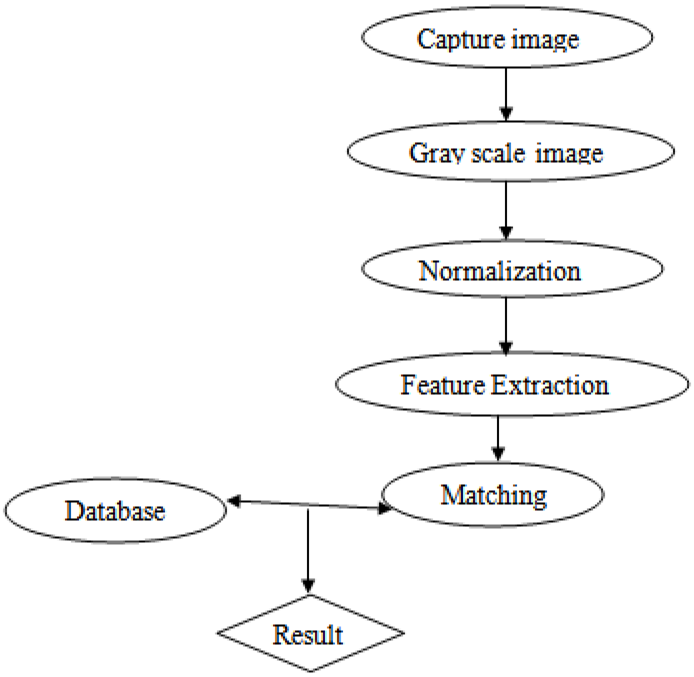
Poursaberi [9] uses daubechies db2 wavelet, decomposes up to fourth level then creates a feature vector by combining [LH4 HL4] for feature extraction. Similarly [10] uses daubechies db2 wavelet, decomposes up to third level then creates a feature vector by using [LH3 HL3]. Moukhtar [11] creates a feature vector using three different wavelets daubechies db2, db4 and Haar. Ajay Kumar[12], decompose the image five times using Haar wavelet, the feature vector consist only HH components. Daouk[13] In this approach, the enhanced

images are decomposed into 5 levels by the Haar wavelets [9]. Next the vertical, horizontal and diagonal coefficients of fourth and fifth level were employed. The coefficients of first three levels were almost the same as those of the fourth level were ignored. The fifth level decomposition offered the most discriminative information and therefore all the coefficients from this decomposition were employed. Daouk[13] In this approach, the enhanced images are decomposed into 5 levels by the Haar wavelets. Next the vertical, horizontal and diagonal coefficients of fourth and fifth level were employed. The coefficients of first three levels were almost the same as those of the fourth level were ignored. The fifth level decomposition offered the most discriminative information and therefore all the coefficients from this decomposition were employed. In this work we use different mother wavelet: Haar, Daubechies, Coiflet, Symlet and Biorthogonal. We have decomposed the normalized image using fifth level .In order to create the feature vector we tried different combinations of HH5, HL5, and LH

The last module of an iris recognition system is used for matching two iris templates. Its purpose is to measure how similar/different templates are and to decide whether they belong to the same individual or not. An appropriate match metric can be based on direct point-wise comparisons between the phase codes. The test of matching is implemented by the simple Boolean Exclusive-OR operator (XOR) applied to the encode feature vector of any two iris patterns. The XOR operator detects disagreement between any corresponding pair of

bits. This system quantifies this matter by computing the percentage of mismatched bits between a pair of iris representations, i.e., the normalized Hamming distance. Let A and B be two iris representations to be comparedand N be total number of bits, this quantity can be calculated as

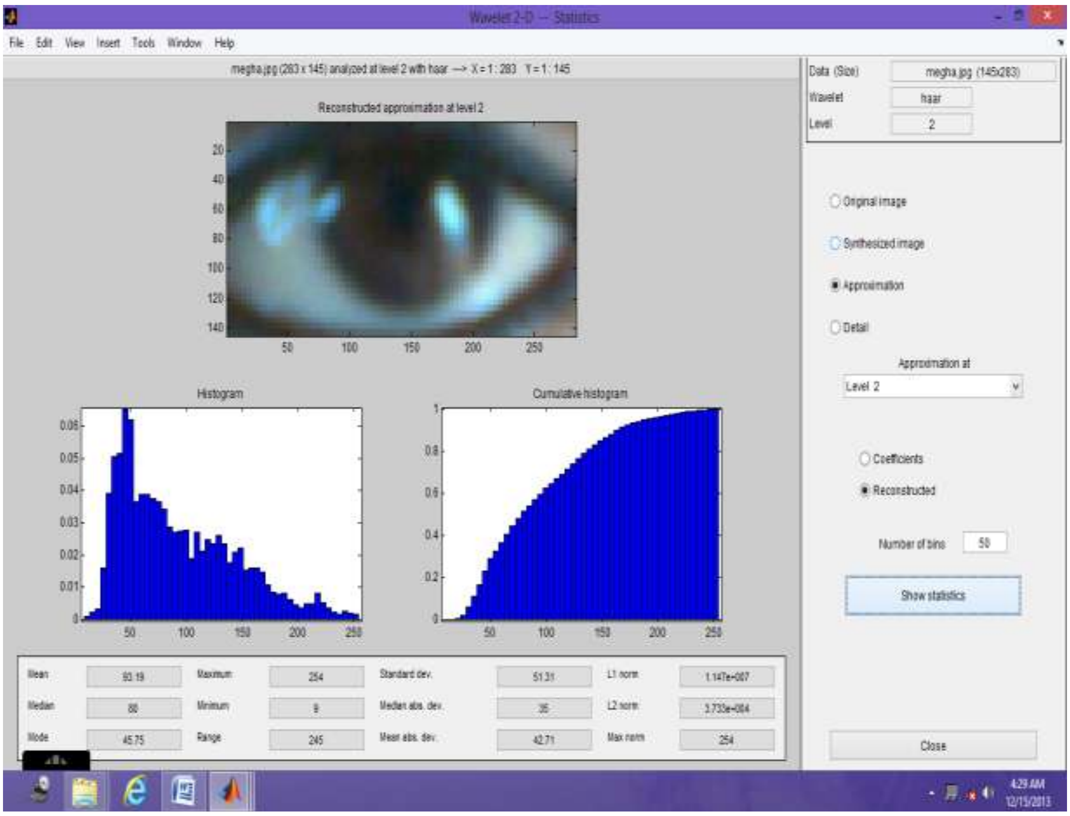
$$HD = 1/N \sum_{j=1}^{N} A_j © B_j$$



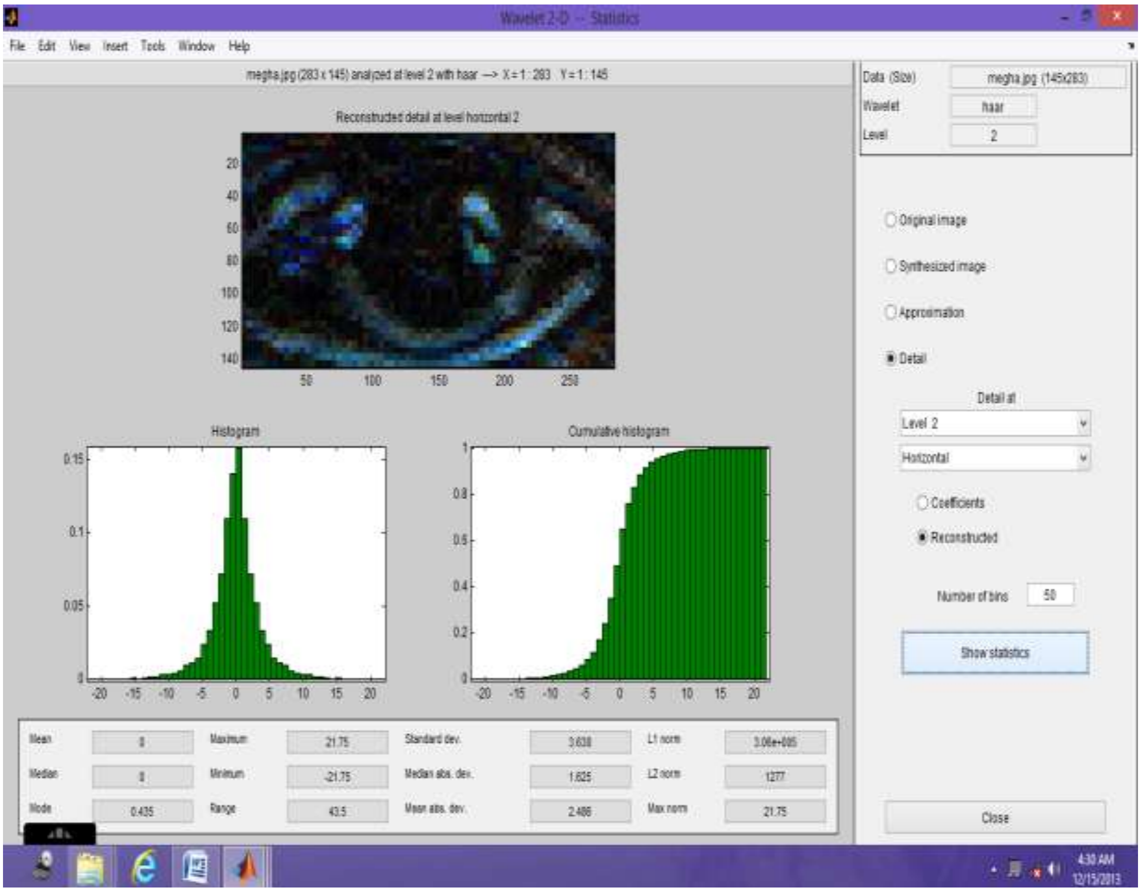
Steps of Iris Recognition System

Algorithm

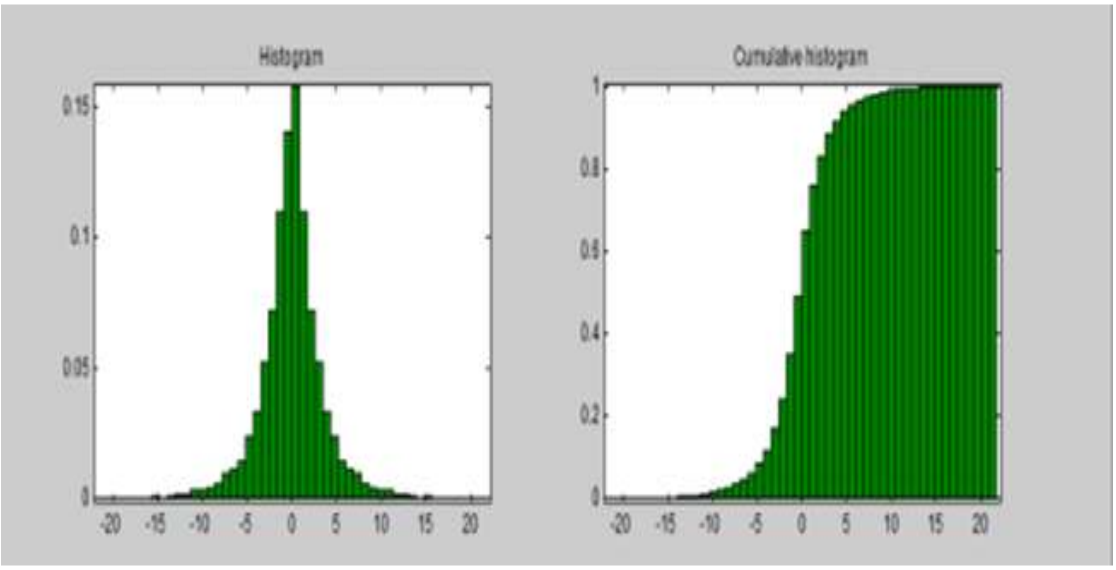
Step 1: Preprocessing & Iris capturing: this process includes revises processing in which the image must be adequate to be adaptive to the next step. Then the iris it truncated and resizingfrom the original image.



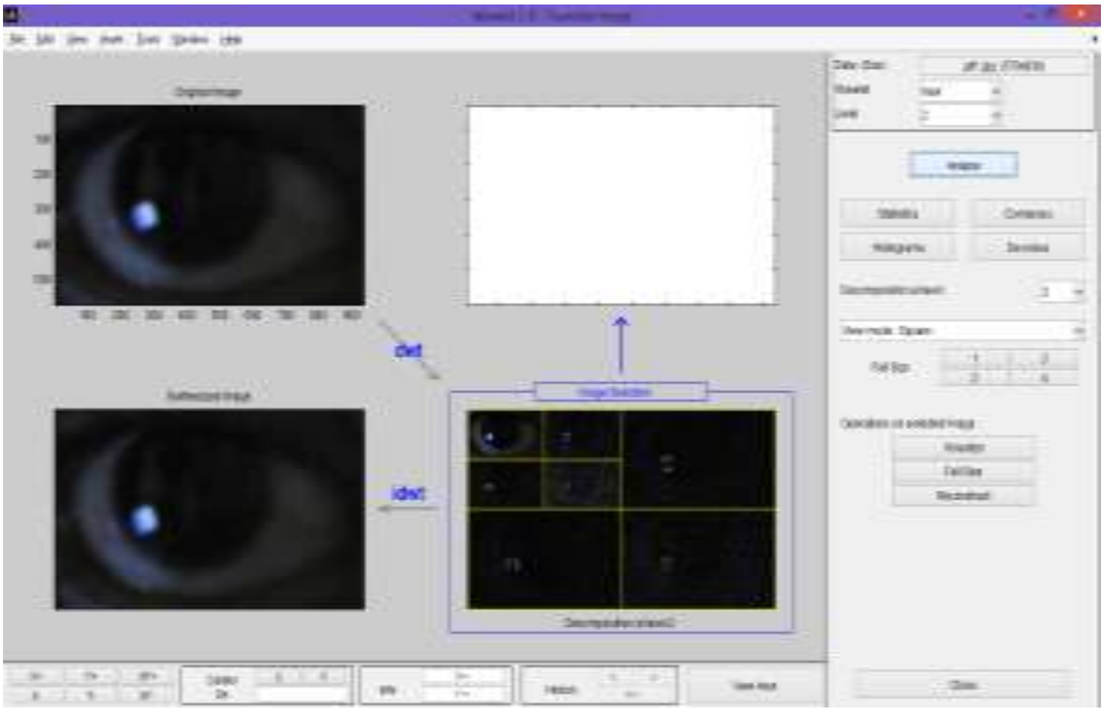
Step 2: Converting image into gray scale: this process deals with the converting of color image into gray scale image.



Step 3: Histogram equalization: this process includes redistributing of pixels in order to enhance the overall image.



Step 4: 2D Haar wavelet: this process in applied to generate the most significant features of the image in order to minimize the processing time as well as to get minimum reduction size.



Step 5: Images with less than threshold value is considered as matched image otherwise not matching

IV. RESULT

In this iris information is encoded based on energy of wavelet packets. And then matching of this iris code with the stored one is performed using hamming distance . Our proposed work significantly decreases FAR and FRR values as compared to previous work.The results suggest that the Haar wavelet yield high accuracy and efficiency. The Haar wavelet decomposed at Level 5 has 98% in terms of accuracy.

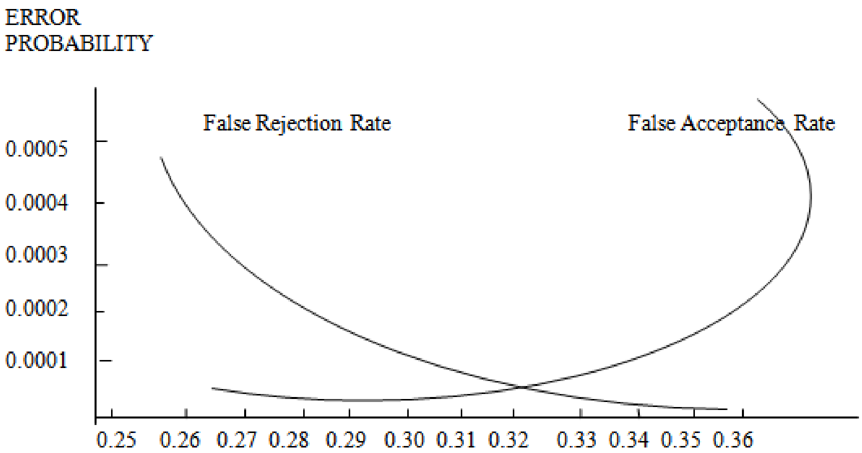


Fig-1hamming Distance

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