Haar Wavelet and Texton Representation Fusion Based Iris Recognition

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***Abstract*— Iris recognition is a method of identifying people based on the unique patterns within the ring-shaped region surrounding the pupil of the eye. The iris usually has a brown, blue, gray, red or greenish color, with complex patterns that are visible on close inspection. Since it makes use of a biological characteristic, it is considered a form of biometric verification. At present, the iris recognition techniques allow very high recognition performances in controlled settings and with cooperating users. This makes iris a true competitor to other biometric traits like fingerprints. Also, most of the existing approaches for iris recognition are designed for images acquired in Near Infrared or Hyper-spectral regions, which are not much affected by changes in surrounding light conditions. Current research is focusing on designing new techniques which aim to ensure high accuracy even on images that are captured in visible light and in adverse conditions. Iris classification aims to recognize and identify iris among many that are stored in database. Image registration for database includes- image pre-processing and feature extraction based on the texture. Feature extraction is done using fusion of haar wavelet transform and texton representation. The query image is processed using the same technique and iris identification (matching process) is done.**

Keywords:- Iris recognition, Biometric identification, Feature vector, Haar wavelet transform, Texton representation.

I. INTRODUCTION

Iris is the region surrounding the circular pupil. It is formed 6 months after the birth and becomes stable after 6 years. It then remains the same throughout. Irises are unique for every individual. Hence verification based on iris can be a secure biometric identification technique.

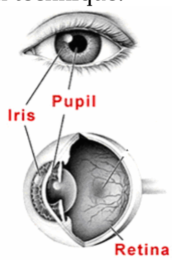

Fig 1 : Iris of the eye

Most of the existing techniques for iris biometric identification take advantage of images collected in near infrared (NIR) illumination, which offers better visibility of iris texture, especially for heavily pigmented irises. But, such setup is very difficult to implement in portable devices, such as phones and tablets. Current research is based on iris recognition of images captured in visible light spectrum. We have proposed a technique which is the fusion of haar wavelet transform and texton representation for identification of irises captured in visible light [2].

II. HAAR WAVELET TRANSFORM

The Haar wavelet transform discovered by Alfred Haar in 1910, is both powerful and simple. In the Haar wavelet transformation method, low-pass filtering is done by finding the average of two adjacent pixel values, whereas the difference of two adjacent pixel values is found out to perform high-pass filtering. The Haar wavelet transform applies a pair of low-pass and high-pass filters to image decomposition. First they are applied in image columns and then in image rows one by one. As a result, the output of first level Haar wavelet transform consists of four sub-bands [1]. The four sub-bands are LL1, HL1, LH1, and HH1. Upto four levels of decomposition are done to get the detailed image. The WT separates an image into a lower resolution approximation image component (LL) as well as horizontal component (HL), vertical component (LH) and diagonal (HH) component. This process is repeated to compute multi-scale wavelet decomposition of the image.

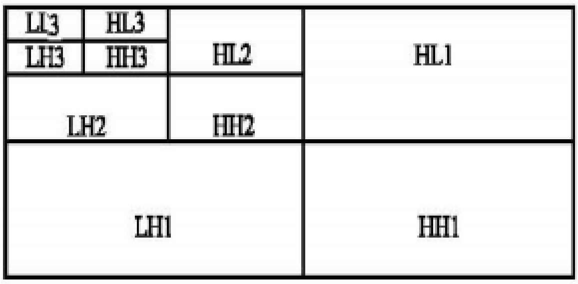

Fig 2: Haar wavelet transform

III. TEXTON REPRESENTATION

Texton-based texture classifiers classify textures based on their texton frequency histogram. The construction of texton-based texture classifiers consists of computation of a texton frequency histogram and training of the classifier based on the texture frequency histograms [3].

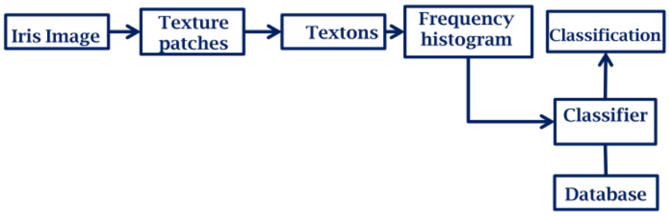

Fig 3: Texton representation block diagram

In texton-based texture classifiers, texture is viewed upon as a probabilistic generator of textons. The underlying probability distribution is estimated by means of a texton frequency histogram that measures the relative frequency of textons from the texture image. A texton frequency histogram is constructed from a texture image by scanning over the texture image and extracting small texture patches. The small texture patches are then converted to the image representation that is used in the codebook. Codebook is a collection of texton image representations which can be later matched. Each texton which is extracted from the image is compared to the textons in the codebook in order to identify the most similar texton from the codebook, and the texton frequency histogram bin corresponding to that particular texton is incremented. After normalization, the texton frequency histogram forms a feature vector that shows the texture of the image.

IV. METHODOLOGY

Main Steps of Iris Recognition There are four steps to iris recognition, iris acquisition, iris localization and normalization, iris feature extraction and matching verification [4].

Image preprocessing

Image preprocessing includes Image acquisition, Iris Localization and Normalization. The first processing step consists in capturing the image of the eye and locating the inner and outer boundaries of the iris. Iris normalization is done in order to rectify the orientation of the image.

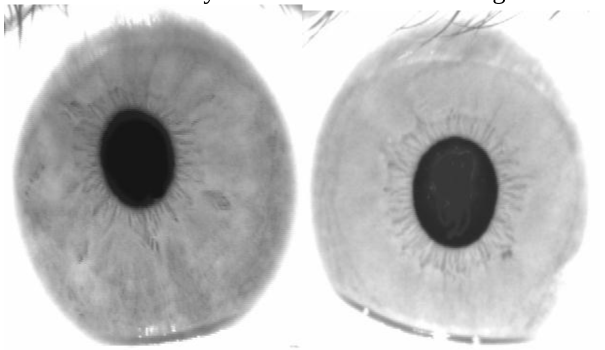

Fig 4: Sample iris images after preprocessing

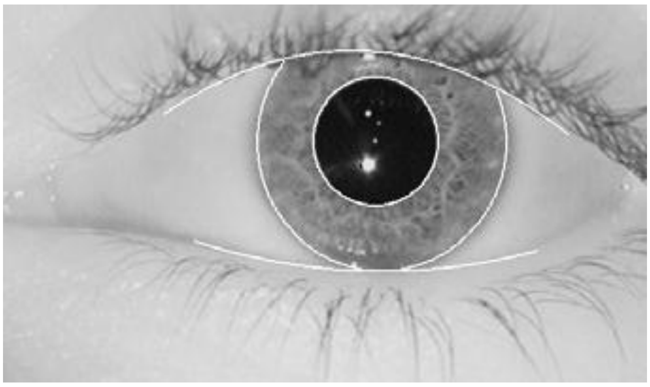

Fig 5: Iris localization and normalization

Proposed System

The preprocessed image is now feature extracted and those feature vectors are stored in the database. When a query image is given, it undergoes same preprocessing and same method of feature extraction. These feature vectors of query image are then compared with the existing feature vectors in the database. The feature vector with which the query feature vector has less difference is selected. Thus the person is identified based on the matching of feature vectors.

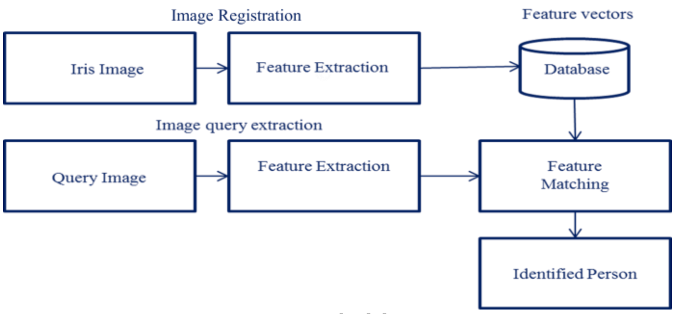

Fig 6: Methodology

V. CONCLUSION

Haar wavelet transform and Texton representation for Iris recognition output good result when applied individually on images that are taken in UV light spectrum. But when they are applied individually on visible light they do not output the expected results as with UV light spectrum. So we use fusion of both these methods to obtain a better result in visible light.

VI. FUTURE SCOPE

Further analysis will be focused on the Iris recognition of the image of eye with contact lenses, image that are clicked on low megapixel camera, poor contrast images. Even images clicked on smart phones can be used for recognition which in turn gives chance for developing applications based on iris lock.

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VIII. REFERENCES

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