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Bio-Metric Iris Recognition System in Cloud Computings

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ABSTRACT

The role of security in every aspect is increasing day by day leading to the development in technology for better authentication. In this world of authentications, Biometric plays a vital role in which every individual avails a unique identification which is mostly limited to fingerprints. When technology keeps on developing in its pace, iris recognition will be the crucial and pre-eminent biometric technology to be used for the upcoming generations since the iris differs from every individual. This paper outlines the research made on the iris recognition technology, which makes it more attractive for using it as an authenticating system to identify individual. A brief about image localization, normalization and iris enhancement is also discussed. The steps involved in general process of iris recognition are also highlighted. The limitations of previous algorithms and their outputs are also discussed. In this study, existing difficulties in iris biometric, possible solutions on them are covered. The techniques and algorithms that are employed for enhancing the recognition during segmenting the iris and extracting the iris features are considered here.

Keywords: Iris recognition, cloud storage, Iris database, Iris alignment, Authentication, biometric-based security, cloud service access, session key.

1. Introduction

The unique features of humans like signature, photograph, finger prints, palm prints, iris patterns and voice of a personal are sources of biometric systems. These features individually or combination of those features has been identified and is exploited identity verification system. Each system has its own strength and weaknesses. It forms a powerful link between an individual and his identity as they can not be easily shared, lost, or duplicated and more proof against social engineering attacks (e.g., phishing).

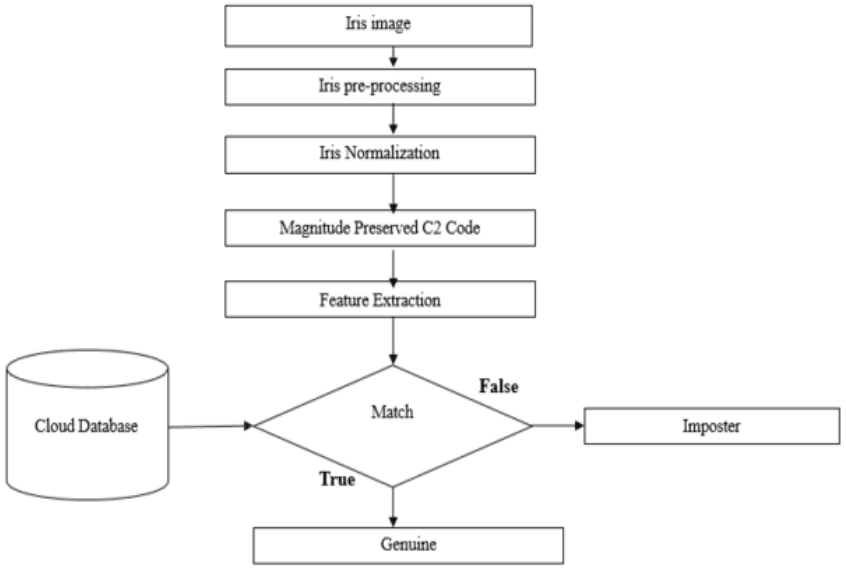
2. Literature Review

- In paper [1] Ilankumaran, S. and Deisy, C., proposes a singular C2 code derived using orientation and magnitude information extracted from finger vein and iris images to spice up the authenticating system. the images of finger vein and iris of the eye of same person are arrested. After capturing both finger vein and iris images, the pre- processing model satisfy the localisation. The C2 code removes feature selection operator decreasing the tactic complexity because it combines the orientation and magnitude data from finger vein and iris image inputs. Magnitude and Orientation information obtained from output are used to obtain the magnitude preserved C2 code, called a competitive code which preserves the magnitude information of the filtered image and is used for feature vectors extraction and this process is repeated for each sample and stored in cloud database which helps within the proposed identification system.
- In paper [2] Padma, P., & Srinivasan, S presented an IWT (Integer Wavelet Transform) based efficient iris recognition system. For iris region localisation and segmentation Circular Hough Transform (CHT) and Relative Total Variation (RTV) model is utilized together. By using four level IWT the segmented iris region is localised.by applying four level Integer Wavelet Transform 256 sub-bands are generated on the input Image, out of 192 lower sub-bands are considered Features like Energy are Extracted from each of 192 sub-bands, hence producing a 192-bit code. individual iris code is computed by comparing energy of each sub-band with a pre-computed individual personalized building value. For photo documentation, test iris photo is seek registered iris template iris code by calculating normalized hamming distance between them.
- In paper [3] Yi, K., Deng, Q., Yuan, B., Qu, X., Gao, J., & Fernandes, T Iris is a circular part surrounding the pupil in the human eye controlling the eye from the light entering. Iris recognition technique used to recognize human's unique arrangements. Iris features are very recognizable and unique for each human. In this mechanism, an image of the eye is taken using a high-resolution digital camera to be analyzed by the infrared or visible waves. Then features like striations, pits and furrows are extracted and stored in cloud database. In the verification phase, a special algorithm is used to check whether the image matches the stored one or not.a robust non-interactive one-time biometric key which is used to generate one-time cloud login request message. This key has two strong building blocks; it is biometrically based on the extraction of features from the entities' irises, and cryptographically based on the strong key- based message authentication code MAC-SHA-512 and Rivest Cipher 4.

- In paper [4] Raghava, N. S. worked on, a simple high instability technique is presented also this process is more convenient to use. This super-resolution algorithm is applied to the pixels of iris images to select the best frame from the iris image.In a pre-processing step it enhances some features of iris image which are required for further processing. It only enhances the quality of the image, it does not increase the information content of an image. To enhance the image this method uses the considerable redundancy presents in images. This method allocates the average value of neighbouring pixels to the distorted pixel. The tool which is used for this purpose is MATLAB realize the many brightness transformations. Remove noise using Central filters Some of the similar properties are color, brightness, contrast, texture, gray level, etc. The segmented iris image is prepared by using a normalization algorithm.

3. Methodologies

In this paper, [2] the problem mainly depends on Security Because image Acquisition, pre-processing, Normalization, iris segmentation, feature extraction, template generation are the basic methods which were carried in all the techniques anyhow each technique is completely different from other because each technique follows somewhat variation like using Hadoop technique or may using HD cameras or may using Gabor filters. And also the rise of another technique is happened due to less accuracy.so each and every processes should must give their 100%.



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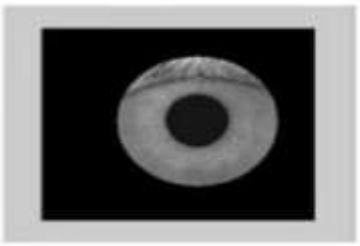
Pre-processing of iris image:

The acquired finger vein and iris images are noisy with rotational and translational variations resulting from unconstrained imaging. These acquired images are first subjected to pre-processing steps, which automatically extract the region-of-interest (ROI) images so as to attenuate the translational and rotational variations. The ROI decomposition for the finger vein is followed by reducing the translational or direction error. The iris is an internal part of the eye; however, the raw images of eye present other irrelevant parts like eye lid, pupil and a part of face. There are problems in varying distance of eye to camera and non-uniform brightness while capturing iris image. Localization of iris is that the commencement which eliminates unwanted parts of eye and fixing the iris boundary. The second step is to unwrap localized iris to a set rectangular mask so as to scale back deformation because of pupil variation and approximation of scale invariance and image enhancement modifying contrast and providing correction in lighting.

Iris localization:

Iris localization is to unrelated the annular region of iris from the outer boundary, namely sclera and inner boundary and pupil. These borders are roughly a circle but not a concentric circle.



The borders are localized by means of adjusting a threshold since the internal pupil is much darker than the sclera. Integra-differential operators are used to detect the centre and diameter of the iris and the pupil. This operator joined with Hough transform finds edges of the iris and boundary.

Normalization:

Iris normalization is the process of unwrapping the annular iris counter clockwise to a rectangular texture block with a fixed size. This is done to avoid the elastic deformation caused by various size of eye image of the same person due to non-uniform illumination, and changes in size of iris for different individuals with different sizes. The real iris image has low-contrast and non-uniform illumination because of position of light source which may affect the texture analysis.

Feature extraction:

Wavelet Transform is used to compute characteristics of iris at diverse scale. Feature extraction are done in two steps. In step one wavelet decay is done followed by energy computation in step two. A four-level integer wavelet is used in this paper to retrieve features from unrolled images. In 2D domain Gabor filters are highly used for texture analysis of images like finger print, palm print, finger vein and iris. These images are having large number of ridges and curvatures. Gabor filter is resolved into two components known as even symmetric and odd symmetric Gabor filter which are used to get ridge and edge detection, respectively. Out of two components of Gabor filter, the even symmetric coefficient gives the magnitude information of feature vector and odd symmetric coefficient gives orientation information of the image.

Matching:

The variance between the given binary codes of input iris image and stored iris templates is calculated using normalized hamming distance technique. With the assistance of normalized hamming distance, number of bits mismatched between the 2 templates is calculated. If the normalized hamming range calculated amongst two code vectors is smaller than the pick threshold, than the 2 irises are considered to be of the matched person instead not.

The overview of complete Iris recognition system from capturing iris image to storing the template into database

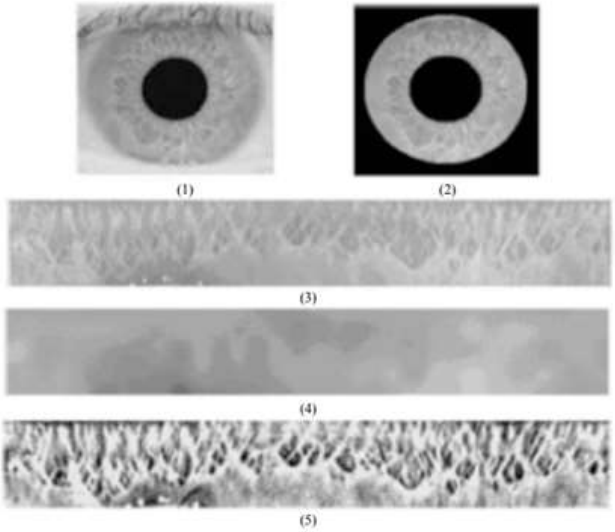


Fig. 2. (a) iris image (b) result after localization (c) result after normalization (d) estimation of local intensity (e) image after enhancement

Results:

The table below represents the resultant data, of each Authentication method where the biometric-iris recognition is compared with each other authentication technique by taking the characteristics like uniqueness performance acceptability and many more. Among all the biometric identifiers technique the iris recognition technique gives the high value in all characteristics except Acceptability.

Table 2: Comparison of Different Characteristics of Biometric Techniques (H: High, M: Medium, L: Low) [31] [36].

Biometric Identifier	Universality	Uniqueness	Permanence	Collectability	Performance	Acceptability	Circumvention
Face	H	L	M	H	L	H	L
Fingerprint	M	H	H	M	H	H	M
Iris	H	H	H	M	H	L	H
Retina	H	H	M	L	H	L	H
Hand	M	M	M	H	M	M	M
Palm Vein	M	H	H	M	H	M	H
Voice	M	L	L	M	L	H	L
Signature	L	L	L	H	L	H	L
keystroke	L	M	L	H	L	M	M

5. Discussions:

Table 1: Comparison of Physiological and Behavioral Biometric techniques used for Cloud Computing Authentication [31].

Method	Function mechanism	Advantages	Disadvantages
Face	Using 2-dimensional facial features such as Eye brows and eye areas	- Highly and simply accepted by users. - Good accuracy/low error rate	- Need additional hardware - As social part of people treatments, face expressions are being changed. So it is not much accurate
Finger-print	Based on optical, thermal, silicon or ultrasonic principles	- Good accuracy/low error rate - Used for over 10 years - No need for high power or cost	- Need additional hardware - Dirty or damaged fingers can affect the image of testing the accuracy
Iris	Using infrared or visible waves to process the image of unique arrangements in iris	- Very reliable with low error rate - Gives high results of accuracy	- High cost special equipment for scanning - Some people have phobia to expose eyes to light - Require long time for authenticating
Retina	Imaging of blood vessels in the eye using infrared illumination	- Very reliable with low error rate - Gives high results of accuracy	- High cost special equipment for scanning - Most people suffering from severe eye illness - Some people have phobia to expose eyes to light - Require long time for authenticating
Hand	Based fingers length and thickness, distance between finger joints and hand's overall bone structure	- Simplicity and low-cost, non-contact, high user acceptance properties	- Need additional large hardware for scanning - Hand geometry features are not very unique
Palm Vein	Rely on the interior vast network of blood vessels underneath the person's skin	- Gives high results of accuracy - Not easy to be changed or falsified.	- Need large expensive hardware for scanning - Detection equipment tool exposes transmission of many germs from different users
Voice	Rely on speaker's voice frequency, nasal tone, cadence, inflection	- Highly accepted and easy to use	- Doesn't work well with illness - Resaults are not very high accuracy

The functional mechanism behind the Iris Recognition is it using infrared and visible waves to process the image of unique arrangements in iris

And also, it has a specific advantage which was not given by any technique that is it is very reliable with low error rate. And gives high accuracy in results.

The major disadvantages of using iris recognition technique are that some people have phobia to expose eyes to light and the equipment cost for scanning is very high

Conclusion

In the presented paper, an IWT based well organized iris recognition system was developed and evaluated. The presented paper used Circular Hough Transform and Total Variation Model for iris localization and segmentation. IWT was used to decay the segmented image in sub band photos that are used to derive characteristics. The matching criterion for comparing template with test image is normalized Hamming distance. The results obtained from proposed IWT based method was compared with DWT based iris recognition method. The proposed IWT based iris recognition method is better than DWT based method as it enhances recognition efficient with decreasing the computational time. Logistic Regression gives good result when compared to others. So Logistic Regression model can be effectively used for activity recognition using the data provided by accelerometer and gyroscope of a smartphone.

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