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A Mathematical Study on IRIS Code for Security Connotation

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Abstract: The experimental results shows that biometric templates, including iris and users attributes, produced by different recognition methods can be matched through the central rays in their convex polyhedral cones and that templates protected by a method extended from Iris-templates can be broken into. These experimental results indicate that, without a thorough security analysis, convex polyhedral cone templates cannot be assumed secure. In this paper, the presence of a contact lens, particularly a textured cosmetic lens, poses a challenge to iris recognition as it obfuscates the natural iris patterns. Many types and colors of lenses are available from a number of different manufacturers. To analyze the effect of these parameters on iris recognition. The proposed approach outperforms other lens detection algorithms on the improved iris recognition performance.Detection of the presence of a contact lens is the first step to improving the usability and reliability of iris recognition for contact lens wearers. The extraordinary market success of Iris-templates relies heavily on its computational advantages, including extremely high matching speed for large-scale identification and automatic threshold adjustment based on image quality many methods modified from Iris-templates were proposed for iris and user attributes based recognition.

Keywords: Iriscode, Convex polyhedral cones, Iris template, Biometrics, Iris recognition system.

I. INTRODUCTION

A method for applying pattern recognition techniques to recognize the identity of a person based on their iris is proposed. Also discussed is a transform of the iris image from two to one dimensional space and overcoming limited data with the generation of synthetic images.A recent emphasis on security has resulted in increased research attention being offered to the field of individual identification based on "biometrics". A biometric feature is an inherent physical or behavioral trait that is unique among individuals. In addition to these, the human iris can also be considered a valid biometric feature for personal identification. The iris is the colored ring on the human eye between the pupil and the white sclera. Each human iris has a unique "Iris Code" of subtle features that varies greatly from person to person. Iris features remain constant over an individual's lifetime and are not subject to changes produced by the effects of aging as other biometric features may be. For these reasons, the human iris is an ideal feature for highly accurate and efficient identification systems. The uniqueness of iris texture lies in the fact that the processes generating those textures are completely chaotic but stable. Hence in order to use the iris as a biometric, the feature extraction should be able to capture and encode this randomness present in the iris texture.

II. LITERATURE SURVEY

According to author S. S. Arora, M. Vatsa, R. Singh, and A. K. Jain, following are the demerits in title "On Iris camera interoperability"

Iris camera classification based preprocessing framework to address iris interoperability. The camera classification output is used to perform selective iris image enhancement.It is to be noted that these results are of direct matching and the camera classification and enhancement algorithms have not been applied here.

According to author R. Connaughton, A. Sgroi, K. Bowyer, and P. Flynn, following are the demerits in title "A multialgorithm analysis of three Iris biometric sensors"

Interoperability between iris sensors is an important topic in large-scale and long-term applications of iris biometric systems. It cannot obtain data about how the segmentations are performed.It cannot report the exact reason why a particular image failed.

According to author N. Kohli, D. Yadav, M. Vatsa, and R. Singh, following are the demerits in title "Revisiting Iris recognition with color cosmetic contact lenses"

To evaluate the hypothesis that "detecting and rejecting the iris samples with color cosmetic contact lens can improve the performance of iris recognition algorithms", another experiment is performed in which the output of lens classification algorithm is provided as input to the iris recognition system.Iris patterns are unique, they may be affected by external factors such as illumination, camera-eye angle, and sensor interoperability .

According to author M. Negin, T. Chmielewski, M. Salganicoff, U. von Seelen, P. enetainer, and G. Zhang, following are the demerits in title "An Iris biometric system for public and personal use"

Since there are no publicly available large scale and even medium size databases, neither of the newly designed algorithms has undergone extensive testing. The designers claim exclusively high recognition performance when the algorithms are tested on a small amount of data. In a large scale setting, systems are yet to be tested. Since the issues of security and privacy slow down the speed of collecting and publishing iris data, an optional solution to the problem of algorithm testing is to synthetically generate a large scale database of iris images.

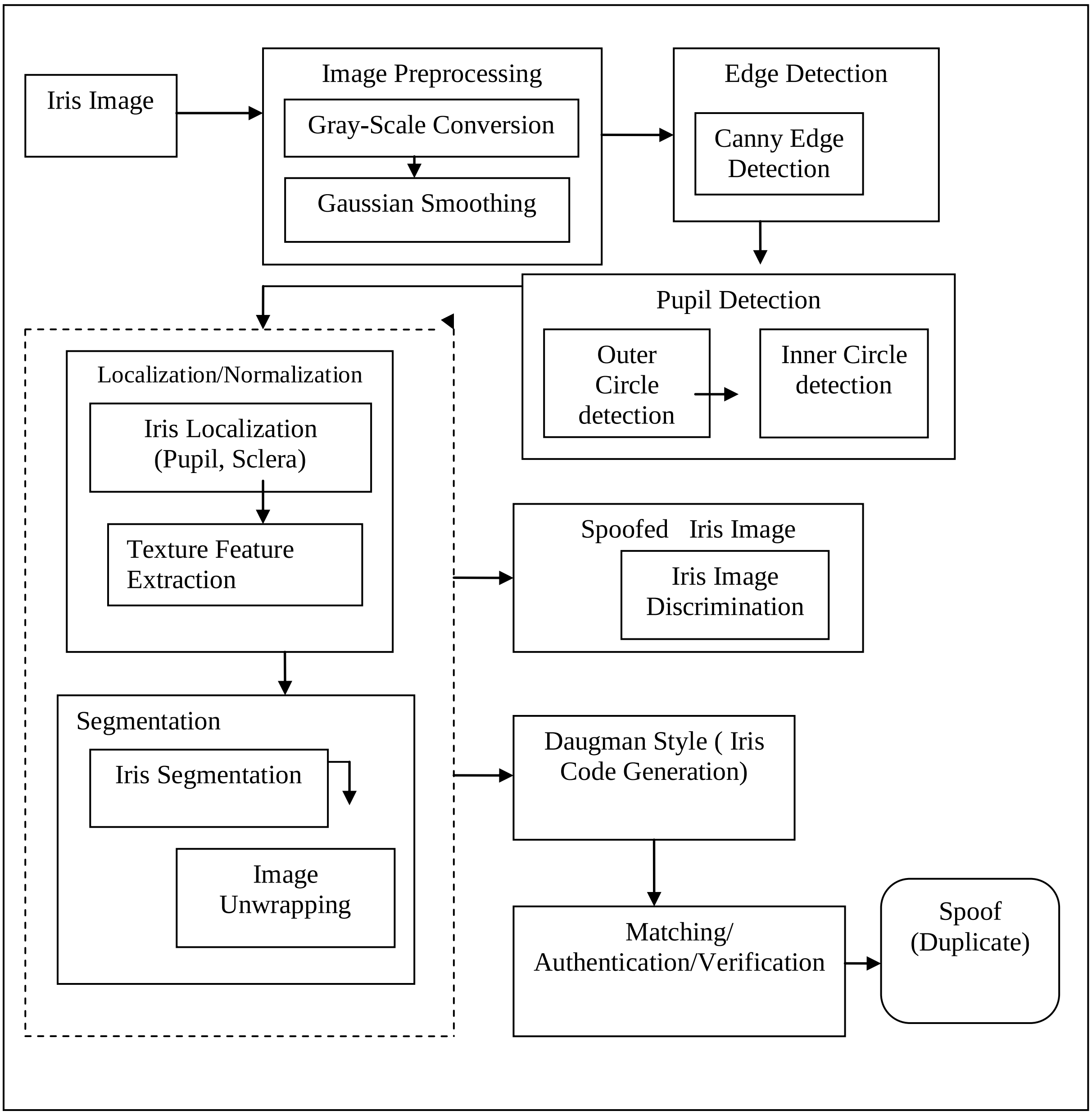
According to author J. W. Thompson, H. Santos-Villalobos, P. J. Flynn, and K. W. Bowyer, following are the demerits in title "Effects of Iris surface curvature on Iris recognition"

Of all the physiological traits of the human body that help in personal identification, the iris is probably the most robust and accurate. Although numerous iris recognition algorithms have been proposed, the underlying processes that define the texture of irises have not been extensively studied. We demonstrate that iris textures in general are significantly different from other irregular textural patterns.

Module description:

1) **Image Conversion:** Gray scale images are distinct from one-bit black-and-white images, which in the context of computer imaging are images with only the two colors, black, and white (also called *bi-level* or *binary images*). Grayscale images have many shades of gray in between. Grayscale images are also called monochromatic, denoting the absence of any chromatic variation.

2) **Edge Detection: It** is a fundamental tool in image processing and computer vision, particularly in the areas of feature detection and feature extraction, which aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities.



3) **Pupil Detection:** The acquired iris image has to be preprocessed to detect the iris, which is an annular portion between the pupil (inner boundary) and the sclera (outer boundary). The first step in iris localization is to detect pupil which is the black circular part surrounded by iris tissues. The center of pupil can be used to detect the outer radius of iris patterns. The important steps involved are:

1. Pupil detection(Inner Circle)
2. Outer iris localization

Circular Hough Transformation for pupil detection can be used. The basic idea of this technique is to find curves that can be parameterized like straight lines, polynomials, circles, etc., in a suitable parameter space.

4) **Normalization: It** must remove blurred images before feature extraction. Localizing iris from an image delineates the annular portion from the rest of the image. The concept of rubber sheet modal suggested by Daugman takes into consideration the possibility of pupil dilation and appearing of different size in different images. For this purpose, the coordinate system is changed by unwrapping the iris and mapping all the points within the boundary of the iris into their polar equivalent. The mapped image has 80 × 360 pixels. It means that the step size is same at every angle. This normalization slightly reduces the elastic distortions of the iris.

5**) Feature extraction: It** Corners in the normalized iris image can be used to extract features for distinguishing two iris images. The steps involved in corner detection algorithm are as follows

S1: The normalized iris image is used to detect corners using covariance matrix

S2: The detected corners between the database and query image are used to find cross correlation coefficient

S3: If the number of correlation coefficients between the detected corners of the two images is greater than a threshold value then the candidate is accepted by the system

6) **Matching:** Two irises are determined to be of the same class by a comparison of the featurevectors, using a Daugman like X-OR operation. Finally matching would be done of the iris. The matching would be done with the trained images. So that, if the images are matched and present in our database it shows the details of that person. Details such as his personal details, health details. If he is not matched with the database, then his details will be collected for further investigation, if it is needed.

III. CONCLUSION

In this work, we have explored a method of creating iris textures for a given person embedded in their natural iris texture (or someone else's if desired) using just the iris code of the person. If these textures are used in an iris recognition system, they will give a response similar to the original iris texture. There are some papers that discuss the creation of artificial iris textures using cues from anatomy, or by modeling iris textures using various mathematical models from a pure synthesis point of view. To the best of our knowledge, no work currently exists that starts modeling the iris from the iris code which is generally considered to be unidentifiable data. In our work, we create the iris texture starting from just the iris bit code of the individual and we embed the necessary texture to create a iris code. Our results show natural looking iris images that give a similar recognition (verification) performance as a genuine iris of the same person. As mentioned in the offset of this section, the advantage of this is that we can now create alternate iris textures that will give a very similar iris code when compared to the original iris. As future work, we will explore countermeasures for detecting such attempts.

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