AN ADVANCEMENT TO DIVERSE IRIS DETECTION AT CODE – LEVEL

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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 code level and it performs significantly better than previous pixel-level, feature-level and score-level approaches. 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.

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.

Based on an extensive literature survey, we classify iris recognition systems into three categories depending on the method by which the features from the texture are extracted for matching purposes. These three categories are (a) appearance based, (b) texture based and, (c) feature based extraction.

Scope of the project

Regardless of the challenges, the popularity of iris scanning—and its cousin, facial recognition technology—is growing. This is particularly true in physical security applications, like those used at some airports and government installations

To process large numbers of individuals, a biometrics solution must be fast and non-intrusive. Products like Sarnoff's Iris on the Move (IOM) (video) allows the scanning of up to 30 people per minute from a distance of several feet. The scanned individuals do not even have to stop. Compare this with an expected throughput of 10 to 15 people per minute with high-end hand or fingerprint scanners.

No-contact scanning is the future of biometrics. Iris scanning is positioned to take a central role.

Need for the project

Iris recognition is an automated method of biometric identification that uses mathematical pattern-recognition techniques on video images of the iris of an individual's eyes, whose complex random patterns are unique and can be seen from some distance.

Not to be confused with another, less prevalent, ocular-based technology, retina scanning, and iris recognition uses camera technology with subtle infrared illumination to acquire images of the detail-rich, intricate structures of the iris. Digital templates encoded from these patterns by mathematical and statistical algorithms allow unambiguous positive identification of an individual. Databases of enrolled templates are searched by matcher engines at speeds measured in the millions of templates per second per (single-core) CPU, and with infinitesimally small False Match rates.

Many millions of persons in several countries around the world have been enrolled in iris recognition systems, for convenience purposes such as passport-free automated border-crossings, and some national ID systems based on this technology are being deployed. A key advantage of iris recognition, besides its speed of matching and its extreme resistance to False Matches is the stability of the iris as an internal, protected, yet externally visible organ of the eye.

Objective:

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".

Existing System:

1) These matching errors can be exploited as security loopholes. If a person on a watch list can change the left-right or up-down labelling of their iris image(s), then the false non match result will allow them to evade detection.
2) Due to specific shape of the tear duct and its surroundings, it can be also helpful in upright / upside-down (U/D) classification. However, in this case, the tear duct does not give an obvious and unambiguous anatomical clue for U/D orientation.
3) Rotated and flipped images may occur in a scenario in which a person can alter an original image after acquisition but before it is given to the biometric system.
4) This can be thought of as a natural result of eyelid "droop" being to cover more of the upper part of the iris and less of the lower part of the iris.
5) That is, all features and classifiers were trained using upside-down images created by rotating them 180 degrees. However, upside-down images can also be created by flipping, or mirroring, the upright version along the horizontal axis, or by the sensor being upside-down at the time of acquisition.

Disadvantages:

- In this approach the iris images will occupy more memory space the in the database.
- In early things the eye has to match exactly with the database as if we stored the image. Even a small distraction also will not be allowed.

- One can take different parts of a face and analyze the presence of the person.

Proposed system:

1) Iris code Bit Pairs decompression by exploiting Daugman Compression algorithm.
2) Gabor filters, which influence the distributions of the Bits to identify the bitwise Hamming distance of phase.
3) Decompressed iris images obtained from two public iris Image databases are evaluated by visual comparison, two objective image quality assessment metrics, and eight iris recognition methods.
4) Implements and their analyses specifically focused on the intra-relationship of bit pairs in Iris-Codes and local intensity variation-based method proposed by "Spoof" method.
5) Our post-processing techniques are Normalization, Segmentation using phase-based, texture analysis methods.

Advantages:

- Using this technique, the user will have the unique identification for his personal details.
- We can have more efficiency and security to the applications and also there will less memory usage while storing in the data base.
- Instead of storing the iris image, the iris code is going to store in the database.
- code level information mapping achieves the best trade-off between distinctiveness and robustness in single- and multi-source heterogeneous applications

ARCHITECTURAL DESIGN

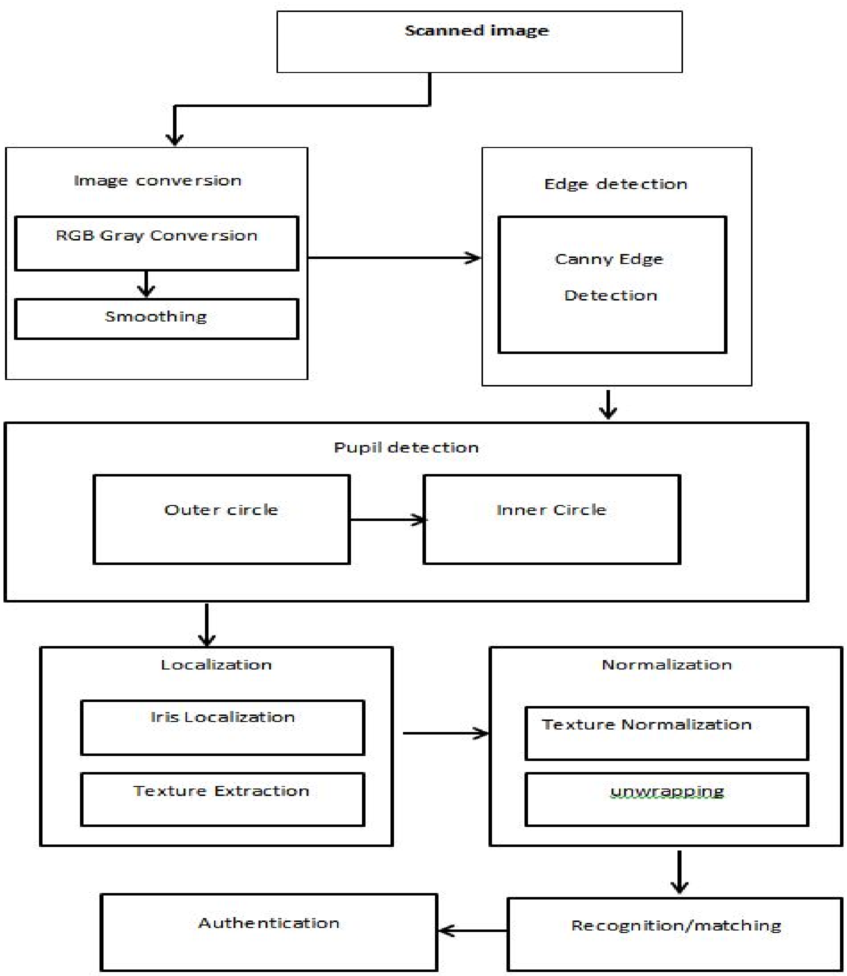


Figure 1. Architectural design

USECASE DIAGRAM:

A use case illustrates a unit of functionality provided by the system. The main purpose of the use-case diagram is to help development teams visualize the functional requirements of a system, including the relationship of "actors" (human beings who will interact with the system) to essential processes, as well as the relationships among different use cases. The use case has two actors: user and server. User gives the image as input and server performs the operation.

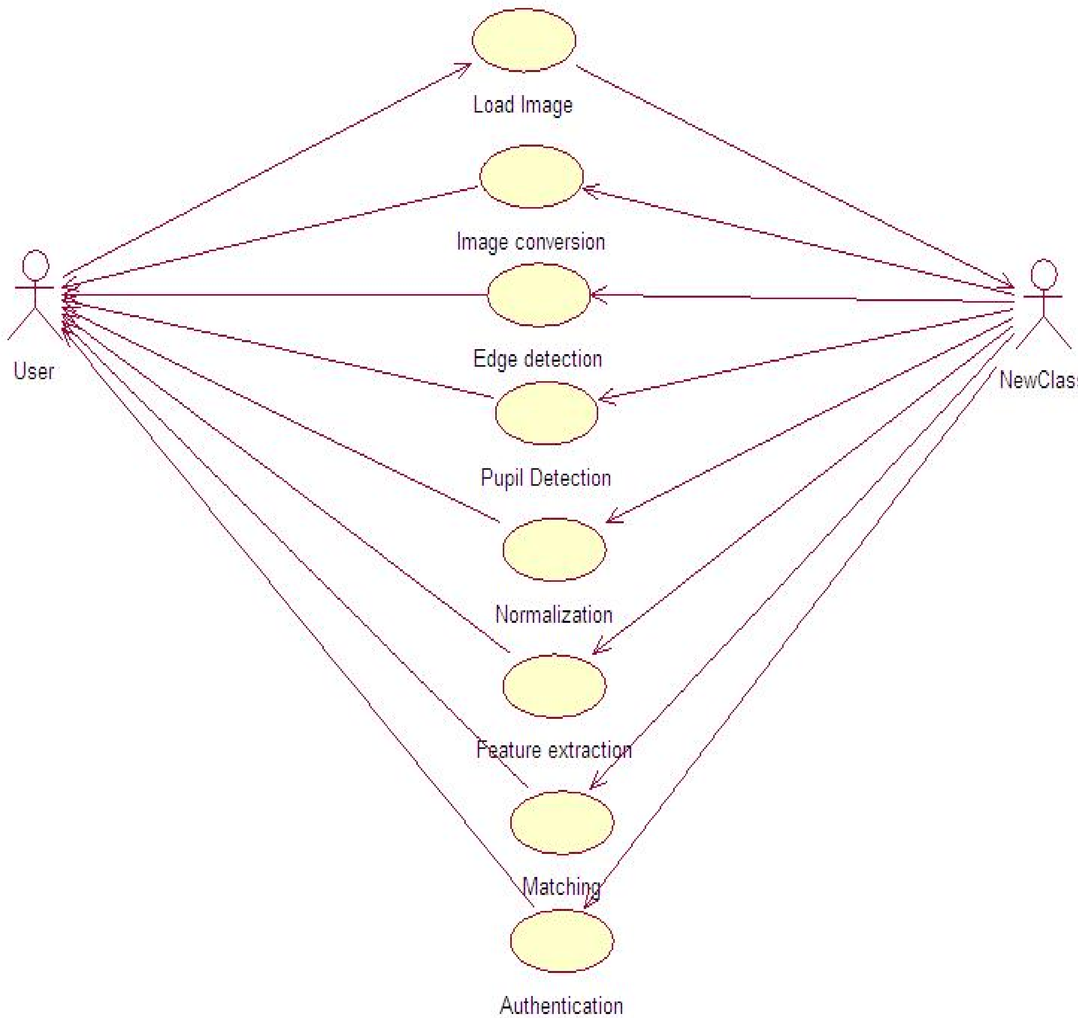


Figure 2: use case diagram

COLLABORATION DIAGRAM:

Collaboration diagrams are a technique for defining external object behavior. They include the same information as Sequence Diagrams (or message trace diagrams) but are better able to show asynchronous message passing. Collaboration diagrams show how objects collaborate by representing objects by icons and their message passing as labeled arrows.

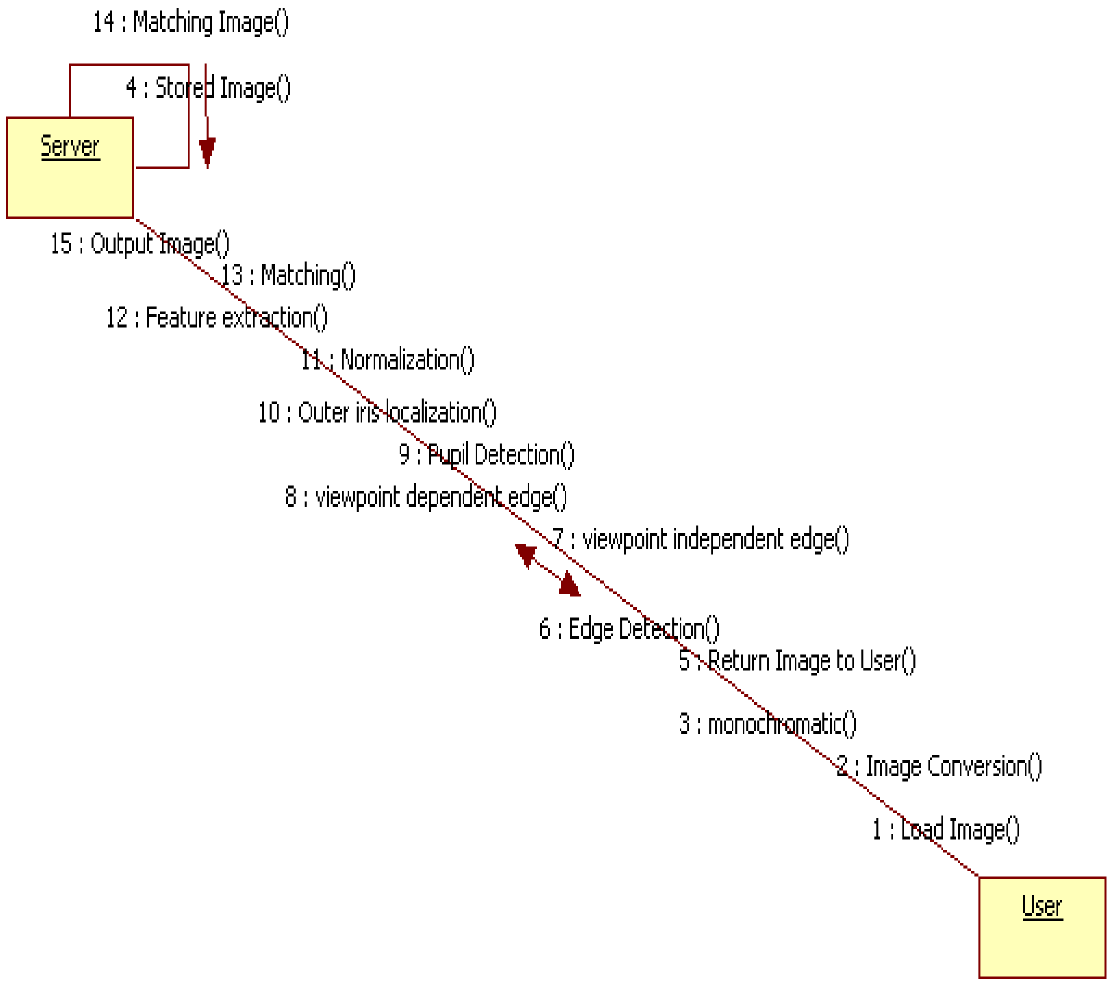


Figure 3. Collaboration diagram

CLASS DIAGRAM:

The class diagram shows how the different entities (people, things, and data) relate to each other; in other words, it shows the static structures of the system. A class diagram can be used to display logical classes. Class diagrams can also be used to show implementation classes, which are the things that programmers typically deal with. A class is depicted on the class diagram as a rectangle with three horizontal sections, as shown in above figure. The upper section shows the class's name; the middle section contains the class's attributes; and the lower section contains the class's operations (or "methods"). The diagram has five main classes which give the attributes and operations used in each class.

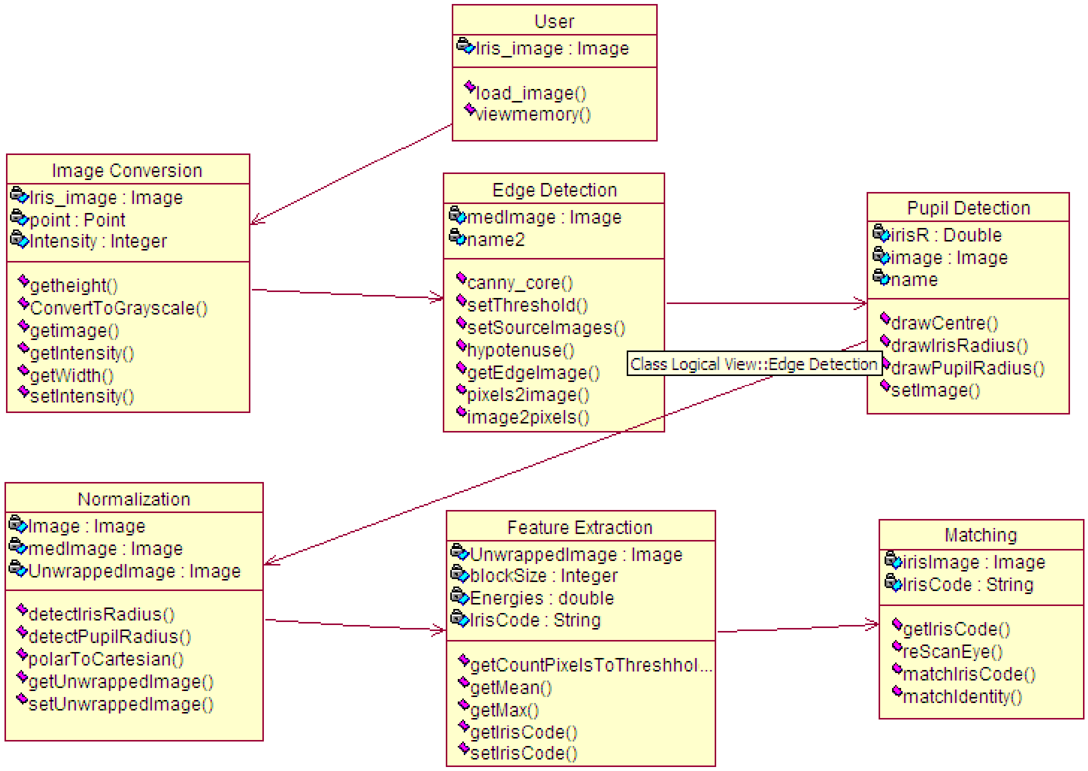


Figure 4. Class diagram

Module Description

Modules:

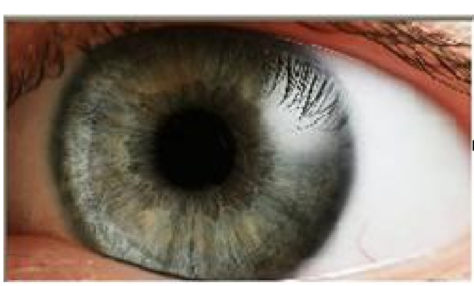
- Image conversion
- Edge detection
- Pupil detection
- Normalization
- Feature Extraction
- Matching

Module description:

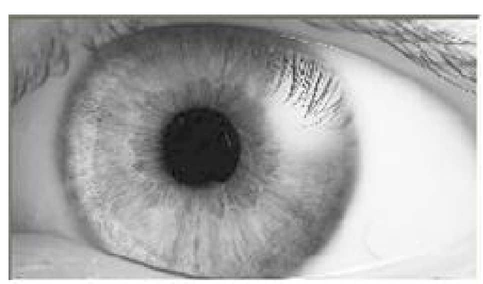
1) Image Conversion :-

Grayscale 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.

Grayscale images are often the result of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g. infrared, visible light, ultraviolet, etc.), and in such cases they are monochromatic proper when only a given frequency is captured. But also they can be synthesized from a full color image; see the section about converting to grayscale.



Original Image



Grayscale Image

2) Edge Detection :-

Edge detection 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. The edges extracted from a two-dimensional image of a three-dimensional scene can be classified as

- Viewpoint dependent
- Viewpoint independent.

A *viewpoint independent edge* typically reflects inherent properties of the three-dimensional objects, such as surface markings and surface shape.

A *viewpoint dependent edge* may change as the viewpoint changes, and typically reflects the geometry of the scene, such as objects occluding one another.

Canny Edge Detection Algorithm:

The Canny algorithm basically finds edges where the grayscale intensity of the image changes the most. These areas are found by determining gradients of the image.

Gradients at each pixel in the smoothed image

The algorithm runs in 5 separate steps:

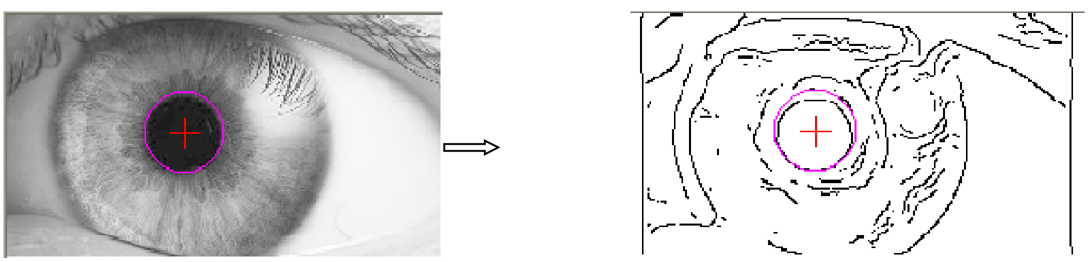
1. **Smoothing**: Blurring of the image to remove noise.

2. **Finding gradients**: The edges should be marked where the gradients of the image has large magnitudes.

3. **Non-maximum suppression**: Only local maxima should be marked as edges.

4. **Double thresholding**: Potential edges are determined by thresholding.

5. **Edge tracking by hysteresis**: Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge.

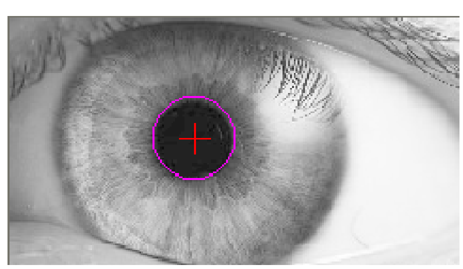


3) Pupil Detection:-

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:

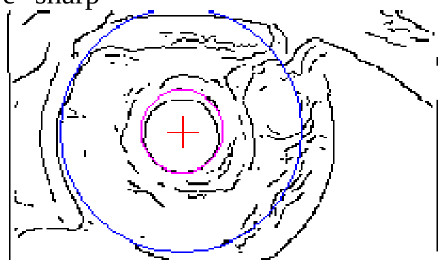
1. Pupil detection(Inner Circle)
2. Outer iris localization

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.



Detection of inner pupil boundary

External noise is removed by blurring the intensity image. But too much blurring may dilate the boundaries of the edge or may make it difficult to detect the outer iris boundary, separating the eyeball and sclera. Thus a special smoothing filter such as the median filter is used on the original intensity image. This type of filtering eliminates sparse noise while preserving image boundaries. After filtering, the contrast of image is enhanced to have sharp variation at image boundaries using histogram equalization.



4) Normalization:-

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.

CONCLUSION AND FUTURE WORK

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 an 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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