# Human Iris Eye Segmentation by Extended and Regional Transform

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## ABSTRACT

Iris recognition is regarded as the most reliable and accurate biometric identification system available is a form of biometric technology that authenticates individuals by using the unique iris patterns between the pupil and the sclera. Iris recognition systems capture an image of an individual's eye; the iris in the image is then segmented for feature extraction process. The performance of iris recognition systems highly depends on segmentation. In this paper, Extended and Regional (min/ max) Transform applied to Human eye's iris segmentation with four group of eye's iris (Stream, flower Jewel, Shaker iris structure), and evaluation the accuracy of results. Experimental results showed that the described extended technique was better than that when using regional technique depending on misclassification rate (MCR) measurement.

**Keywords**: Extended and Regional (min/ max) Transform, Iris of eye, Digital Image Processing, segmentation, Biometrics, Image Quality, Matlab, MCR.

## 1. INTRODUCTION

Biometrics science is the measuring technology of data analyzing biological. Ii's used for identify uniquely of individuals by characteristics of physical/ behavior personal, and for allow access to employees for areas of certain and general ID (identification or identity) purposes. A system of biometrics depended on basic steps: [1]

a. Data of Acquiring.
b. Data of Analysis.
c. Encryption.

In United States, there are lawful issues to consider utilizing arrangement of biometrics as a part of the livelihood setting. Some of these contemplations incorporate the first and fourth and fifth corrections, common claims, for example, carelessness and break of agreement, and tort claims, for example, attack of protection [2]. This is in no way, shape or form a complete rundown of the considerable number of cases that may be attested by somebody who affirms harms that came about because of the utilization of biometrics [3]. It is additionally essential to comprehend that there is very little case law yet with respect to the utilization of biometrics. [4] .so Biometrics is the science and innovation of measuring and examining organic information. It is utilized to particularly recognize people by their physical attributes or individual conduct characteristics.

Morphological Segmentation is an image that combines morphological operations, such as extended minima and maxima or morphological gradient, with watershed

flooding algorithms to segment color and grayscale images of any type (8, 16 and 32-bit) in 2D and 3D. [5]

In [6] a novel watershed-based method for segmentation of cervical and breast cell images. And formulate the segmentation of clustered nuclei as an optimization problem. A hypothesis concerning the nuclei, which involves a priori knowledge with respect to the shape of nuclei, is tested to solve the optimization problem with H-minima transform is introduced to obtain the optimal segmentation result from the distance map. In [7] proposed a new image segmentation algorithm based on concave curve expansion to correctly and accurately extract markers from the original images. Marker-controlled watershed is then used to segment the clustered nuclei. In [8] the fuzzy c-means (FCM) technique applied to eye's iris segmentation and with multiple and evaluation the accuracy of results and the color of iris has a clear impact in the process of segmentation. Blue color of iris shows a clearer segmentation of other colors.

## 2. HUMAN'S IRIS

The iris (or irises) is a dainty, round structure in the eye, in charge of controlling the distance across and size of the understudy and the measure of light coming to the retina. The iris' shade is frequently alluded to as eye shading. [9]

The iris is the blue zone. Alternate structures noticeable are the understudy focus and the white sclera encompassing the iris. The overlying cornea is imagined, yet not unmistakable, as it is straightforward. Likewise envisioned are the red-hued veins inside of the sclera. These are effortlessly obvious on any individual's eyes [10]. Figure (1) shows the stream iris, flower iris, Jewel Iris, and Shaker iris structures.


FIGURE 1. Illustrates the stream, flower, Jewel and Shaker iris structure

## 3. DIGITAL IMAGE

The digital image can be representation as two-dimensional pictures on the PC by zero and one (1, 0). It comprises of an advanced picture of each of the pixels on the PC which is a representation of two-dimensional pictures on the PC by zero and one computerized picture [12] .There are other ways to represent images such that it can be represented as a function f (x, y), and displays digital images through the files GIF, Bmp, JPEG, and PNG. [13]

### 3.1 DIGITAL IMAGE PROCESSING

Digital image processing, as a computer-based technology, carries out automatic processing, manipulation and interpretation of such visual information, and it plays an increasingly important role in many aspects of our daily life. These applications

are not limited to those that have entry and exit of the image, but extend to those that have entry and exit of image characteristics and attributes we get from the picture. In the following clarification of the application of image processing which respectively. [11]

a. Image Enhancement.
b. Image Restoration.
c. Image compression.
d. Morphological processing.
e. Segmentation. Interested in dividing the picture to the elements.
f. Representation and Description. Representation as boundary or Regional.

### 3.2 IMAGE SEGMENTATION

Image Segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images [14]. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image (edge detection). Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic(s). [15]

## 4. REGIONAL MAXIMA AND EXTRACTION

Reconstruction turns out to provide a very efficient method to extract regional maxima and minima from grayscale images. Furthermore, the technique extends to the determination of maximal structures, which call *h*-domes and *h*-basins. Let us first briefly review the notion of regional maximum:

Regional maximum definition a regional maximum *M* of a grayscale image *I* is a connected components of pixels with a given value *h* (plateau at altitude *h*), such that every pixel in the neighborhood of *M* has a strictly lower value.

Regional maxima should not be mistaken with local maxima. Recall that a pixel p of *I* is a local maximum for grid *G* if and only if its value *I(p)* is greater or equal to that of any of its neighbors.

All the pixels belonging to a regional maximum are local maxima, but the converse is not true: for example, a pixel *p* belonging to the inside of a plateau is a local maximum, but the plateau may have neighboring pixels of higher altitude and thus not be a regional maximum.

An alternative definition can also be proposed for the notion of regional maximum at altitude h of grayscale image I is a connected component by *C* of $T_h(I)$ such that $C \cap T_{h+1}(I) = \varnothing$. That $T_h(I)$ is threshold of *I* at level *h*.

Determining the regional maxima of a grayscale image is relatively easy and several algorithms have been proposed in literature, some of which are reviewed in [16]. One of the most efficient methods makes use of grayscale reconstruction and is based on

the (binary) image M(I) of the regional maxima of I is given by $M(I) = 1\text{-}pt_n(I\text{-}1)$, this proposition is illustrated by Figure (2).

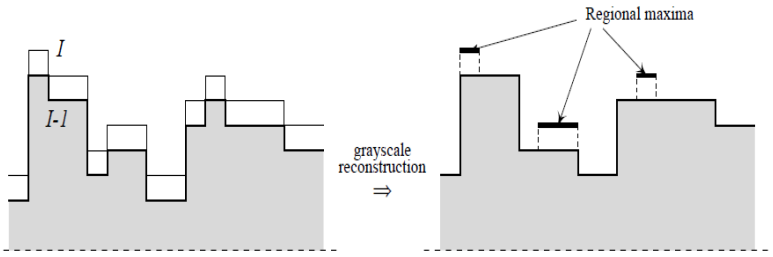



FIGURE 2.Extracting the regional maxima of I by reconstruction I-1 [16]

## 5. IMPLEMENTATION AND RESULTS

### 5.1 IMPLEMENTATION

This study aims to prove the identity of the people iris recognition depending on the image processing techniques and a number of statistical standards for digital images and techniques of pattern recognition neural networks with reverse proliferation and using the program Matlab 2012a to prove the identity of the people through the iris recognition.

Connectivity, specified as a one of the scalar values in table (1). By default, image extended /min uses 8-connected neighborhoods for 2-D images and 26-connected neighborhoods.

Connectivity can be defined in a more general way for any dimension by using for conn a 3-by-3-by- ...-by-3 matrix of 0s and 1s, Table (1). The 1-valued elements define neighborhood locations relative to the center element of conn. Note that conn must be symmetric around its center element, shows as Figure (3).

TABLE 1.
Type of Connectivity dimensional

| Value | Meaning |
|---|---|
| | **Two-dimensional connectivities** |
| 4 | 4-connected neighborhood |
| 8 | 8-connected neighborhood |
| | **Three-dimensional connectivities** |
| 6 | 6-connected neighborhood |
| 18 | 18-connected neighborhood |
| 26 | 26-connected neighborhood |

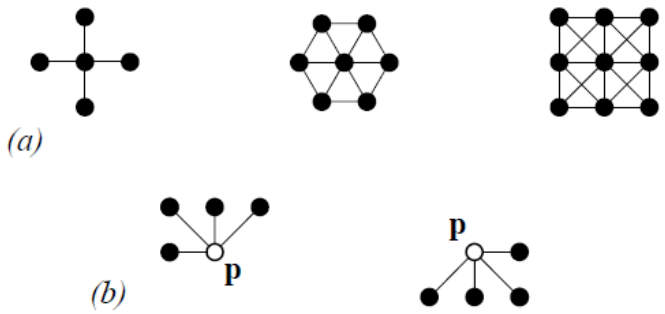
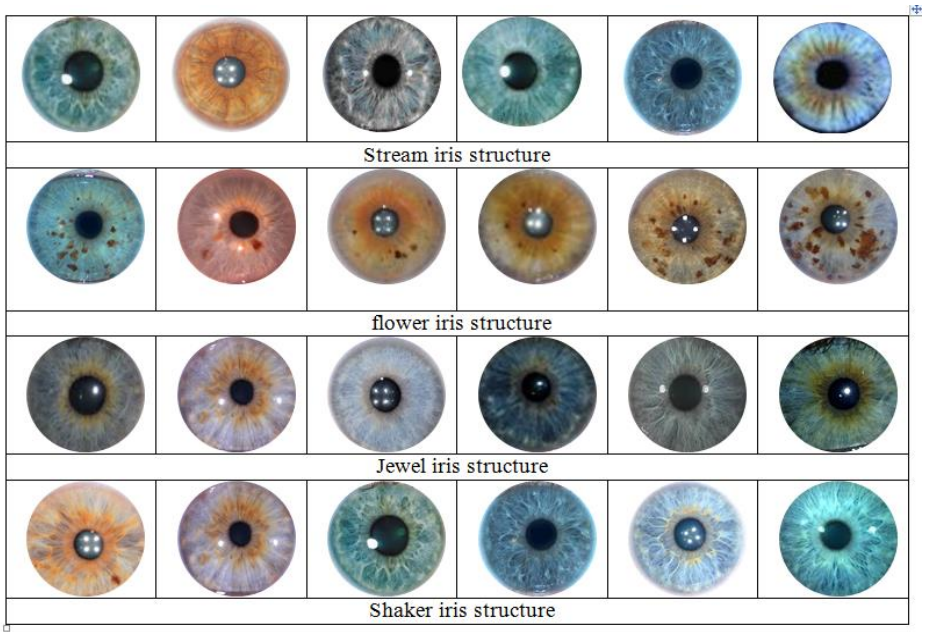



FIGURE 3. Example of Connectivity dimensional [16]The Table (2) shows the database for the study samples (images) that represent the irises.

TABLE 2.
Database for the study (images)




The Figure (4) shows the diagram of study and Figure (5) shows the Matlab segment Tool GUI *R2013a* using in this study with sample image of iris.

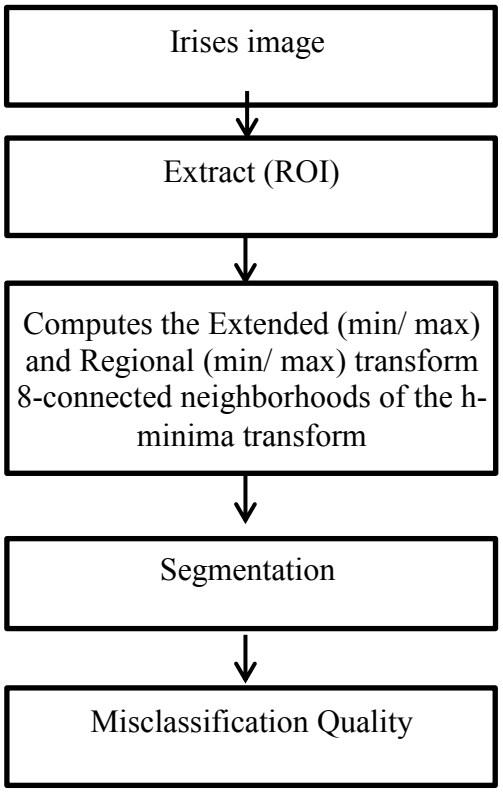



FIGURE 4. Diagram of study

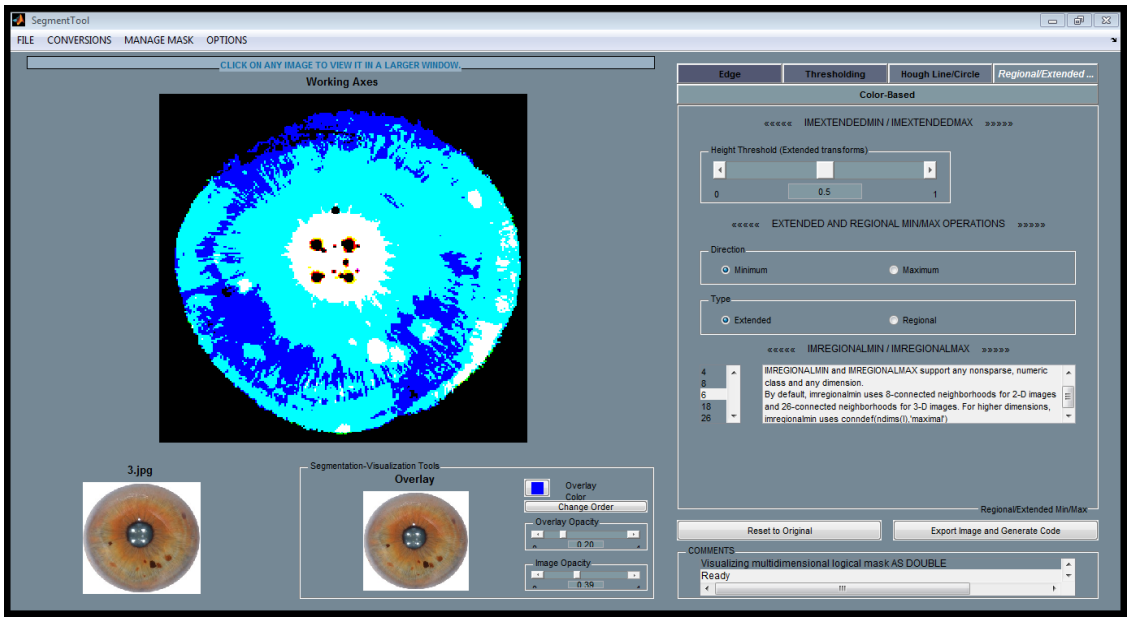
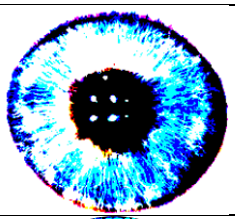
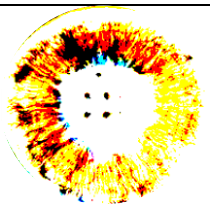
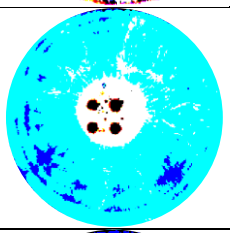
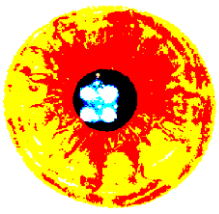
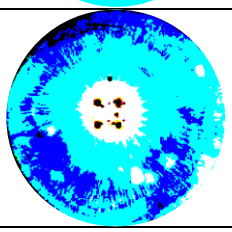
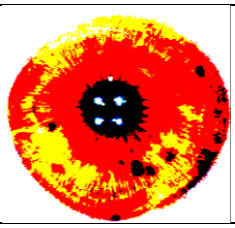


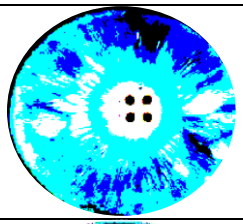
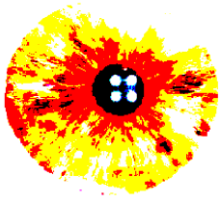
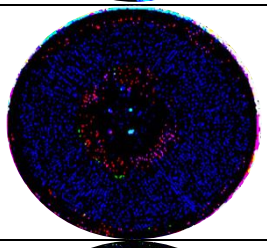
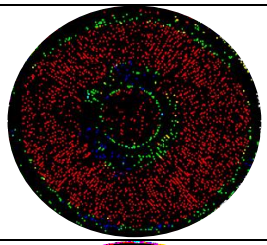
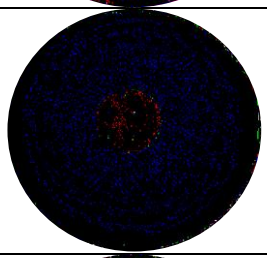
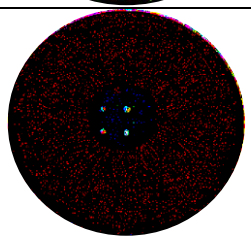
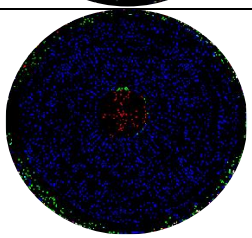
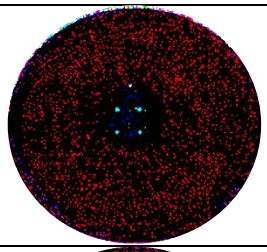
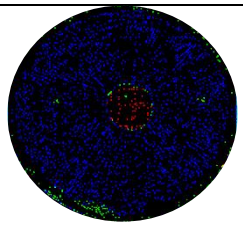
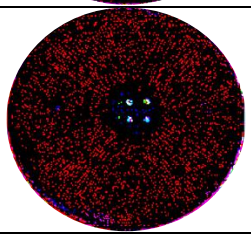

FIGURE 5. Matlab segment tool GUI R2013a was applied on dataset

## 5.2 RESULTS

Table (4) shown the rustles to segmentation by using Extended and Regional (min/ max) transform applied to human eye's iris example (Stream, Flower Jewel, Shaker iris) structuring in Table (3).

TABLE 4.
The results of applied Extended and Regional (min/ max) Transform on dataset

| Technique | Sample | min | Max |
|---|---|---|---|
| Extended Transform | Stream |  |  |
| | Flower |  |  |
| | Jewel |  |  |

| | | | |
|---|---|---|---|
| | Shaker |  |  |
| **Regional Transform** | Stream |  |  |
| | Flower |  |  |
| | Jewel |  |  |
| | Shaker |  |  |

Performances of the classifiers were evaluated using the misclassification rate (MCR). The MCR is defined as the ratio between the number of non-stem pixels misclassified as stem pixels and the total number of non-stem pixels in the image. [15]. To measure the segmentation accuracy, we also apply the quantitative evaluation of performance by defining the misclassification ratio (MCR), which is given by: [15]

$$\text{MCR} = \frac{\text{number of misclassfe d pixels}}{\text{total number of pixels}}$$

Table (5) shows the results of MCR of the segmentation using Extended and Regional (min/ max) Transform with (24) images representing the irises.

TABLE 5.
MCR value of segmentation by Extended and Regional (min/ max) Transform and value of MCR

| Image | | Extended | | Regional | |
|---|---|---|---|---|---|
| | | Min/ MCR | Max/ MCR | Min/ MCR | Max/ MCR |
| Stream | 1 | 95- 33 % | 96- 33 % | 301- 19 % | 496- 30 % |
| | 2 | 34- 29 % | 43- 28 % | 377- 18 % | 443- 27 % |
| | 3 | 78- 34 % | 83- 34 % | 378- 20 % | 483- 27 % |
| | 4 | 67- 31 % | 64- 44 % | 367- 21 % | 64- 28 % |
| | 5 | 57- 34 % | 66- 34 % | 357- 30 % | 466- 33 % |
| | 6 | 63- 36 % | 77- 45 % | 363- 29 % | 477- 31 % |
| Flower | 1 | 88- 32 % | 101- 30 % | 389- 39 % | 480- 34 % |
| | 2 | 40- 28 % | 37- 30 % | 340- 20 % | 441- 25 % |
| | 3 | 88- 32 % | 83- 33 % | 378- 42 % | 88- 24 % |
| | 4 | 32- 29 % | 68- 45 % | 363- 29 % | 466- 36 % |
| | 5 | 57- 40 % | 94- 33 % | 376- 33 % | 476- 40 % |
| | 6 | 70- 46 % | 63- 35 % | 355- 30 % | 479- 36 % |
| Jewel | 1 | 93- 30 % | 91- 38 % | 389- 20 % | 496- 30 % |
| | 2 | 36- 23 % | 33- 26 % | 329- 17 % | 443- 27 % |
| | 3 | 63- 33 % | 82- 36 % | 371- 23 % | 483- 27 % |
| | 4 | 66- 39 % | 61- 48 % | 361- 21 % | 464- 28 % |
| | 5 | 55- 37 % | 60- 30 % | 355- 29 % | 466- 33 % |
| | 6 | 59- 40 % | 70- 40 % | 364- 31 % | 477- 31 % |
| Shaker | 1 | 88- 34 % | 80- 36 % | 95- 36 % | 478- 39 % |
| | 2 | 34- 30 % | 30- 27 % | 330- 26 % | 433- 25 % |
| | 3 | 67- 31 % | 63- 34 % | 363- 29 % | 464- 37 % |
| | 4 | 41- 33 % | 45- 39 % | 372- 32 % | 445- 32 % |
| | 5 | 82- 36 % | 79- 34 % | 342- 29 % | 483- 30 % |
| | 6 | 79- 37 % | 88- 36 % | 339- 30 % | 475- 41 % |

## 6. CONCLUSION

In this paper, we proposed an enhancement iris image segmentation technique based on the Extended and Regional Transform. Our proposed method was better than that when using Regional Transform; estimate this result using segmentation quality retail measurement (MCR).

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