Image Processing of Eye for Iris Using Canny Edge Detection Technique

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***Abstract* – Iris is one the important Biometric Identification technique and also Iris is one of unique identifier of Human then it is stable throughout a life of the person's. In this work a new method to recognition of the eye have been proposed. Edge detection is one of the important modules of any image processing technique. In this work we have proposed the canny edge detection technique based on Region of Interest (ROI) and also Edge Length (EL) to recognize the Human eye. The performance of the proposed system has been verified and validated with existing problem. This technique is a novel technique to identify the Iris and also the proposed technique shows significant results and compared with the other conventional technique. Using this technique we can able to predict the Cholesterol inside the eye through image processing.**

Keywords – Iris, Canny Edge detection, ROI, Edge Length, Eye image and Cholesterol.

I. INTRODUCTION

Popularity of the iris biometric grew considerably over the past three years. The problems of processing, encoding Iris texture, and designing iris-based recognition systems have attracted the attention of a large number of research teams [1]. On the other side, the iris biometric has been gaining public acceptance. Modern cameras used for iris acquisition are less intrusive compared to earlier iris scanning devices. Iridology is the science of analyzing the delicate structures of the iris of the eye [2,3]. The iris reveals body constitution, inherent weaknesses, and levels of health and transitions that take place in a person's body according to the way one lives [4]. There is an old saying that the eyes are the window of the soul. They can also be a window to one's health. Like fingerprints or faces, no two irises (the colored part of the eye) are exactly alike [5,6,7]. The iris structure is so unique it is now being used for security identification at ATM machines and airports. And for centuries, it has also been used to analyze people's health – past, present and future. The study of the iris for medical purposes is called iridology [8]. The iris contains detailed fibers and pigmentation that reflects our physical and psychological makeup. When an organ or body system is in poor health, the nerve running from that body part will start to recede [9]. When it does, it draws with it various degrees of the layers of fibers which make up the color of the iris of the eyes, leaving darkened marks called lesions [10, 11, 12]. Iris is one the important Biometric Identification technique and also Iris is one of unique identifier of Human then it is stable throughout a life of the person's. In this work a new method to recognition of the eye have been proposed. Edge detection is one of the important modules of any image processing technique. In this work we have proposed the edge detection technique based on Region of Interest (ROI) and also Edge Length (EL) to recognize the Human eye. The performance of the proposed system has been verified and validated with existing problems. This technique is a novel technique to identify the Iris and also the proposed technique shows significant results and compared with the other conventional techniques.

II. PROPOSED WORK SEQUENCE

The Block diagram of the proposed system of Iris Edge Detection and ROI prediction is shown in Figure 1. The different process sequence is involved in this process is also given in below. The Original image is obtained from the image centre and then it will be incorporated by using edge detection algorithm. Both

the results have been compared and analyzed and also proved this technique also helpful for the Iris prediction. Eye description is shown in Figure 1 and then Right eye original image is shown in Figure 2, Left eye original image is shown in Figure 3 and similarly red eye original image is shown in Figure 4. The proposed method flow diagram is shown in Figure 5 in a sequence manner.

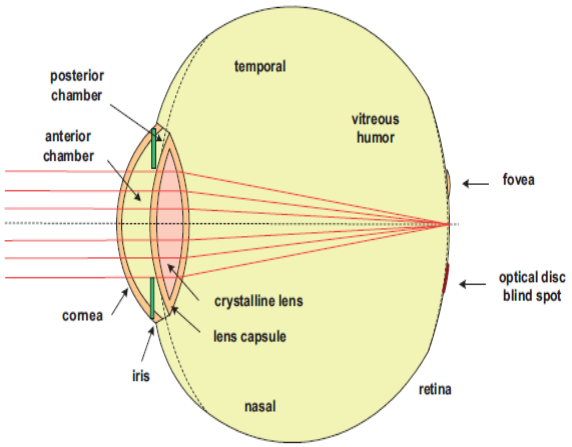


Fig. 1: Eye Description

Fig.2 : Right Eye

Fig. 3: Left Eye

Fig. 4: Red Eye

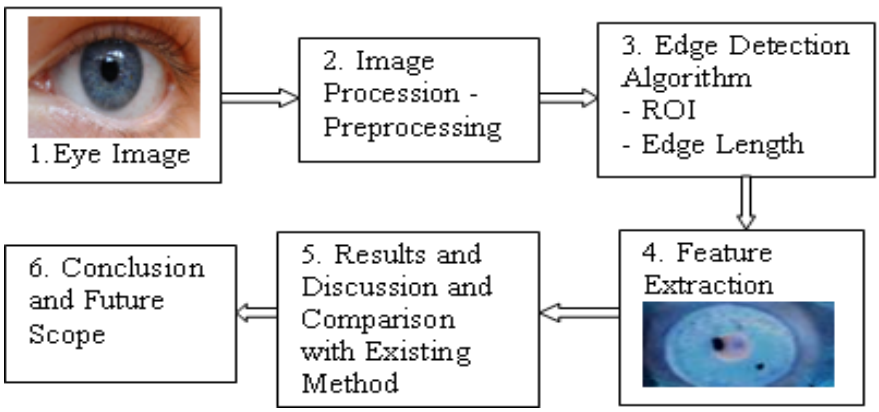


Fig.5 : Flow diagram of proposed method

III. EDGE DETECTION ALGORITHM

Segmentation is the process of partitioning a biomedical or digital image into its constituent objects or regions. These types of objects are having some common Characters like colour, density, texture, intensity and size, etc. In the segmentation first step is to predict the edge of the image and parts of the image. Once the edge will be detected from the using edge detection technique then the segmentation will take place. There will be a lot of segmentation techniques will be available. That is Canny edge detection techniques, Genetic Algorithm approach, Random walker method approach, Sobel operator approach, Prewitt operator approach and Roberts operator approach, etc. In this work we have applied only Prewitt operator, Sobel operator and Prewitt operator approach. These techniques will follow the edge based technique.

3.1 Canny Edge Detection Algorithm

The Canny algorithm can be used an optimal edge detector based on a set of criteria which include finding

the most edges by minimizing the error rate, marking edges as closely as possible to the actual edges to maximize localization, and marking edges only once when a single edge exists for minimal response. According to Canny, the optimal filter that meets all three criteria above can be efficiently approximated using the first derivative of a Gaussian function.

$$\mathbf{GF(i,j)} = \frac{\mathbf{1}}{\mathbf{2\pi\sigma^2}} e^{\frac{i^2+j^2}{2\pi\sigma^2}} \quad (1)$$

$$\frac{\partial \mathbf{GF(i,j)}}{\partial \mathbf{i}} \alpha i e^{\frac{i^2+j^2}{2\sigma^2}} \quad \frac{\partial \mathbf{GF(i,j)}}{\partial \mathbf{j}} \alpha j e^{\frac{i^2+j^2}{2\sigma^2}} \quad (2)$$

All the images are having some speckle and other noises. So there is a need of noise filtering using any techniques. In this work median filter is used to reduce the noise. If the scan box is approximately centered with neck, the median filter is shown below.

$$C_i^j = Median\ (Pixel = P) \quad (3)$$

Where, the speckle noise reduction can be done using the below expression

$$SN_1^n = Pixel\ B_1^{n-1} \quad (4)$$

A. Pre-processing of Initial Position of Edge parameters detection

Step 1: Calculate the average magnitude

$$\mathbf{M(1,2)} = \frac{\mathbf{1}}{M} \sum_{(1,2)}^{\mathbf{n}} \sqrt{\mathbf{Mx(1,2)^2 + My(1,2)^2}} \quad (5)$$

Step 2: Calculate the density of the edge length. The density of the edge length is calculated from

$$\mathbf{L(1,2)} = \frac{C(1,2)}{\max \mathbf{C(1,2)}} \quad (6)$$

Where C(i,j) is the number of connected pixels at each position of pixel.

Step 3: Calculate the Initial position of map from summation of density of edge Length and average magnitude.

$$\mathbf{P(1,2)} = \frac{\mathbf{1}}{\mathbf{2}\left(M(1,2) + L(1,2)\right)} \quad (7)$$

Step 4: Calculate the thresholding of the initial position map. If

$$P(1,2) > T_{\max} \quad (8)$$

Then P(1, 2) is the initial position of the edge following. And then we obtained the initial position by setting T_{max} to 90% of the maximum value.

IV. RESULTS AND DISCUSSION

The performance of the three operator's simulation results shown in below figures form 6 to 16.

Fig.6. Original image of different eyes

Fig.7. Pre Processing of eye image

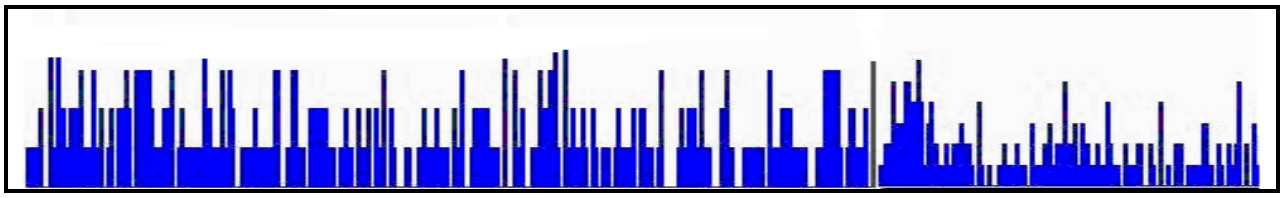


Fig.8. MATLAB Noise signal chart - Pre -Processing

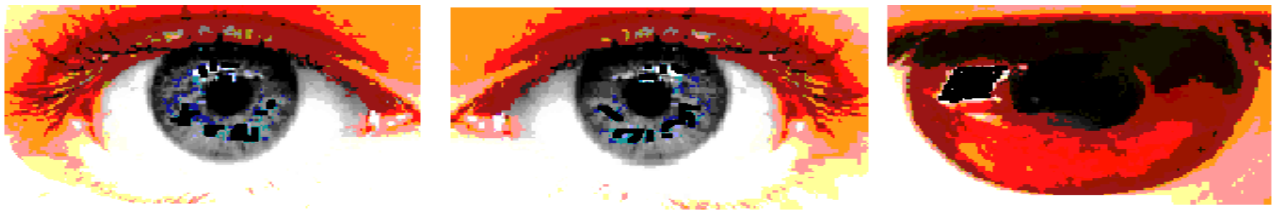


Fig.9. Initial Noise removal

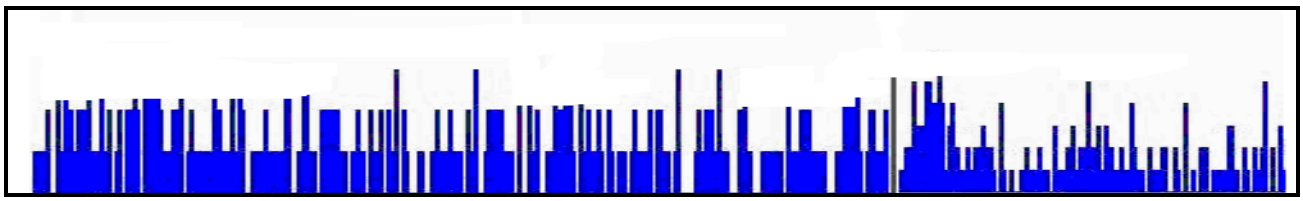


Fig.10. MATLAB output - Initial Noise removal

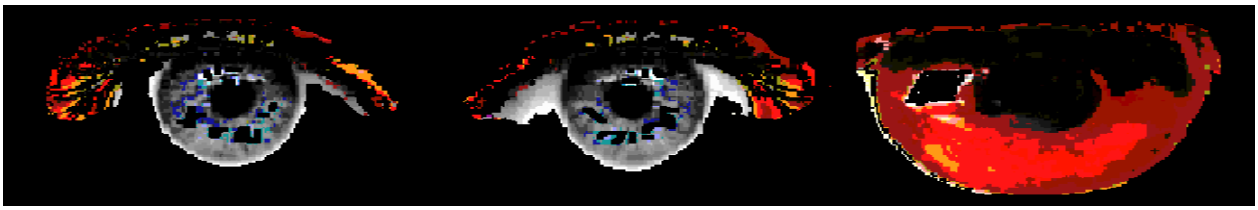


Fig.11. Fine Noise removal

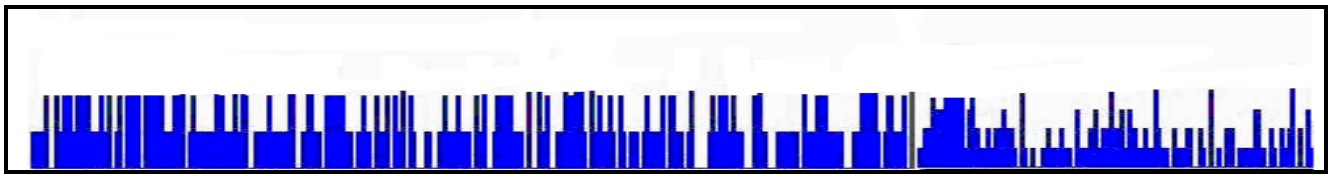


Fig.12. MATLAB output – Fine Noise removal

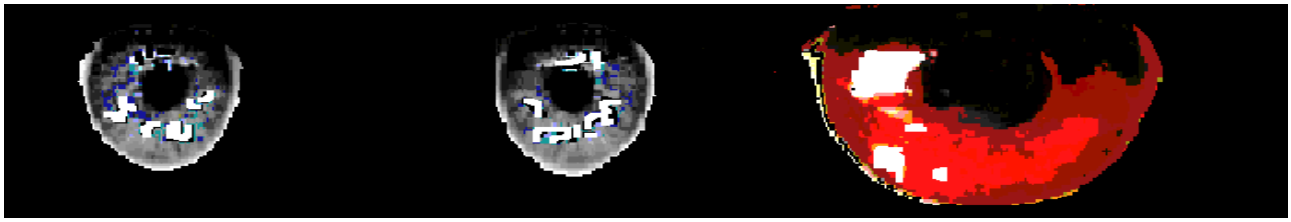


Fig.13. Final Threshold Image

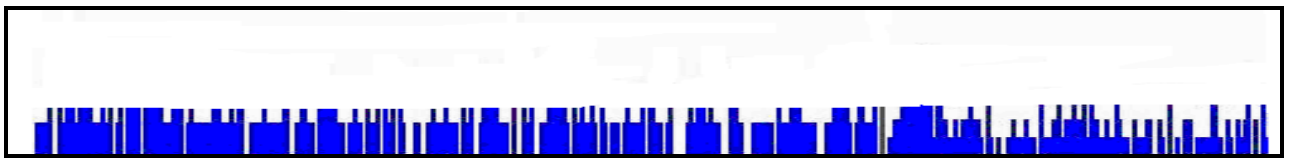
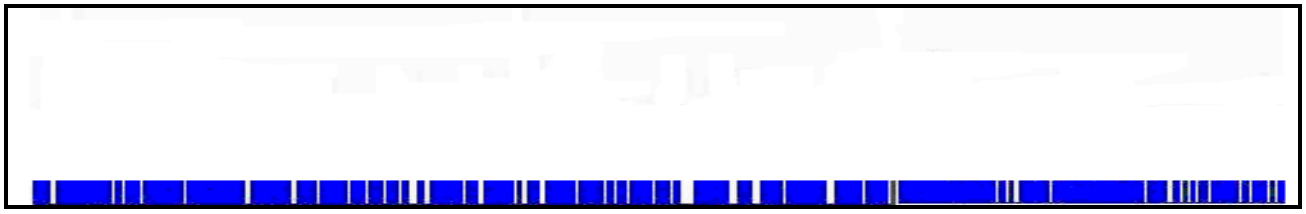


Fig.14. MATLAB output - Final Threshold Image

Fig. 15. Edge Detection Image



16. MATLAB output - Edge Detection Image

The best and optimum detector type can be evaluated by calculating the edge maps relative to each other through statistical evaluation. Upon this evaluation, an edge detection method can also be emphasised to characterize edges to represent the image for further analysis.

V. CONCLUSION

In this work performance of Canny Edge Detection technique have been investigated. Edge detection is one of the important modules of any image processing technique. In this work we have proposed the edge detection technique based on Region of Interest (ROI) and also Edge Length (EL) to recognize the Human eye. The performance of the proposed system has been verified. This technique is a novel technique to identify the Iris and also the proposed technique shows significant results and compared with the other conventional techniques and also using this technique we can able to predict the cholesterol inside the eye as one of the future extraction.

VI. REFERENCES

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