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Innovative method for Iris melanoma detection

Sneha Jayant Patil[1], Rajaram. D. Patil[2]
[1]ME (Electronics) Student, Dept. of Electronics Engg. PVPIT, Budhgaon, Sangli, Maharashtra, India
[2]Associate Professor, Dept. of Electronics Engg. PVPIT, Budhgaon, Sangli, Maharashtra, India

Abstract: ***Iris Melanoma is one of the type of eye tumor. Iris is colored part of eye that surrounds pupil. The Melanoma is tumor which grows and develops in tissues in middle layer of eyeball. Symptoms of Melanoma are dark spots in iris section of eye , change in size as well as shape of pupil, changes in vision. To detect these dark spots the proposed system is developed. This system consist of different techniques from image processing. This paper aims to develop a computerized automatically detection of the presence of abnormalities(dark spots) in iris. Different image processing methods are used in order to analyze and segment tumor into iris, and mark abnormal part on normal eye image.***
Keywords: Iris Melanoma, Image Fusion, Artificial Neural Network

I. INTRODUCTION

Iris is a flat, colored, ring shaped membrane behind the cornea of eye. The iris has a thin, circular structure in the eye. The iris has the significance to reflect the changes in human body with the varying health condition. Iris analysis studies the relationship between human health and changes in the anatomy of the iris. Iris diagnosis emphasizes the detecting and analyzing of local variations in the characteristics of irises.

A. Structure of eye

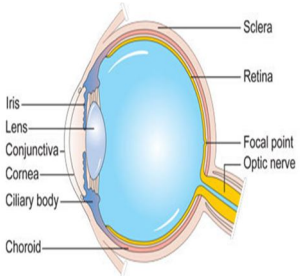

fig.(1)Eye structure

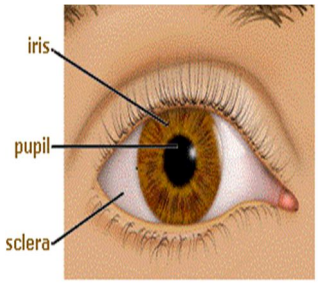

fig.(2): Front view of human eye

The human iris is an annular part between pupil and cornea (figure 1). Iris is regarded as an inner organ of human body. However it may be easily observed from exterior. The white portion in eye(figure 2) is called as sclera and smallest dark circle is known as pupil. The colored portion between pupil & sclera is known as iris.

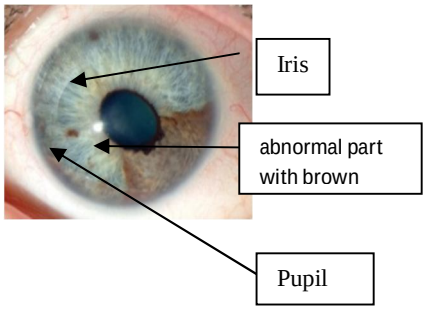

fig.(3) Iris containing abnormal part

Fig(3) shows actual symptoms of Iris Melanoma. As we see in fig.(3) dark , tan spots on iris section gives hint for this tumor[1] [2]. Our proposed system is going to detect not only area of that dark spot but also diameter . According these features of lesion

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proposed system going to classified that eye is tumorous or not. Our proposed system containing many image processing techniques like image segmentation, image fusion. The structure of this paper is as follows: As first section consist of introduction to eye structure as well as iris tumor and proposed system. The second section gives detailed idea about proposed system ie. methodology in which we provide flow chart and some figures that helps to explain system stages and methods which are used. In the subsections of second part we explain each step in proposed system .Third section is experimental result which shows system performance and efficiency. The last part is of conclusion about developed system.

II. METHODOLGY OF DEVELOPED SYSTEM

The developed system methodology in this section consist of four stages : Segmentation , Image fusion, Feature extraction, classification. This paper gives idea about detection system. Fig.(4) gives idea about Proposed work system. Input images ie. normal eye[3] and test image will be collected from available database. Test image is nothing but abnormal eye containing dark spots on iris part. Then preprocessing will be done on both eye images. From abnormal eye input image abnormal part will be segmented. After that, segmented part & normal eye will be fused using image fusion technique. Feature extraction of fused image and normal eye will be take place. Classifier classify that abnormal part according to its features.

A. Input

There are two inputs for this proposed system. first one is test image which consist of abnormal dark spots on iris section and second one is normal iris image. We are going to perform image processing operations on these two input images. The database related to iris melanoma available on Google. Those images are taken for further process.

B. Preprocessing

In this section Preprocessing means image resizing. This step is done during segmentation, image fusion as well as Process Tumor. The image which are consider during this proposed system are converted into [512 512] and [128 128] .

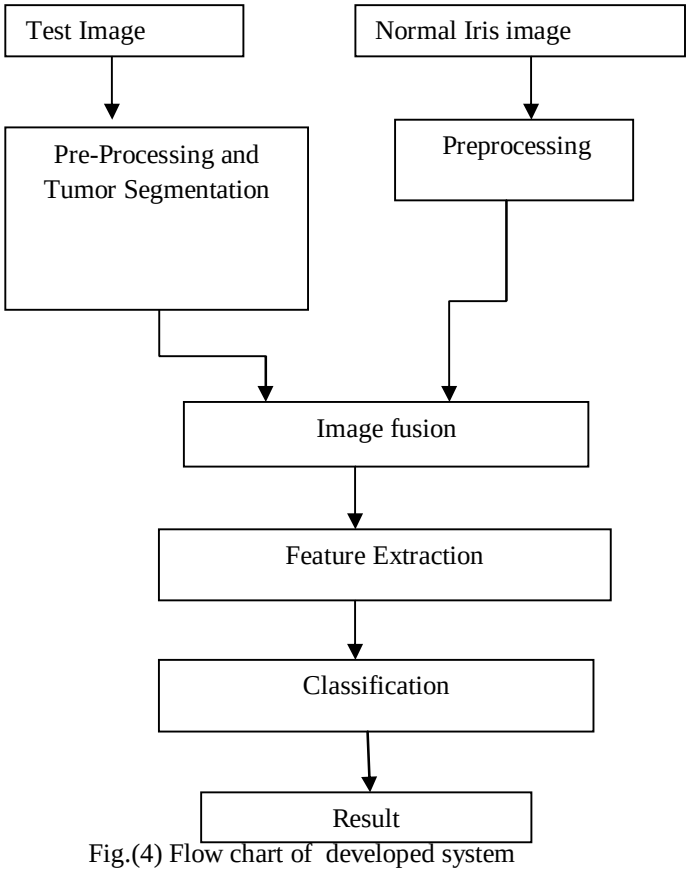

Fig.(4) Flow chart of developed system

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C. Tumor segmentation

To detect abnormal part we perform segmentation on test image. For segmentation we use active contour segmentation method. Here we first create an initial segmentation that defines seed point selection and then segment image . Firstly we choose seed point. One of the points from abnormal dark spot is selected as seed point. After that according to color level it will detect shape of dark spot. This is the process of tumor segmentation.

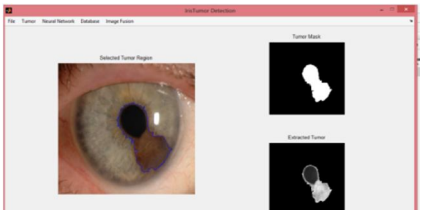

Fig.(5). Segmentation of dark spot

D. Image Fusion

Image fusion is nothing but number of images produces single image. This fused image always gives us more information in compact format. Process of combining multiple images into single composite image. Actual working of this technique is given in Fig.(6).

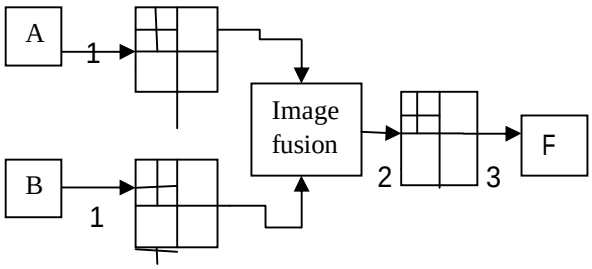

Fig.(6). Concept of Image fusion

Fig.(6) consist of two input images. Label 1 shows that these images undergo for decomposition. The decomposition is nothing but image components divide into LPF Sub-band and HPF Sub-band. According to fusion rule components image we get fused image. label 3 indicated that after applying inverse fusion rule we get output of fusion process[6].

This developed system consist of this technique to get more idea about affected area of iris due to dark spot and features of dark spot. In this part we get actual idea about affected iris area in normal eye. Hence fused image is used to see which kind of area is affected by obtained dark spot. Here we are going to use segmented tumor and another image which is iridology chart [12] that is considered as normal iris as input for fusion process. The images are going to decomposed using biorthogonal wavelet . We perform two level decomposition. After that image fusion will be done. The output of fused image is shown in Fig.(6).

Fig.(6).Fusion Output

E. Process Tumor

Here we are going to consider extracted tumor. In this section we get background image, adjusted image intensities segmented image and clear boundary connected objects. It is nothing but preprocessing of Abnormal iris image. Fig.(7) shows actual output of this step .

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Fig.(7).Process Tumor

F. Tumor selection

Here we set criteria for tumor selection according to area and maximum radius of circle of nodule.

1) Tumor selection –Area: Here we set area limit as [5 5000]. In this step we get no. of nodules present in area [5 5000].

2) *Tumor selection – Circle:* This step is used to calculate radius of detected nodule. Here circle is fit to nodule according maximum radius where find out. That part is consider as radius of nodule. As per medical term if nodule size(radius) >2.5 mm then it will be considered as tumor. If detected nodule have radius greater than 2.5 then it will be consider as tumor. The output of this step is shown in Fig.(8).

G. Features Extraction

Here features like radius , area, mean intensity, ECD are going to extract from selected nodule. Here values of theses feature are displayed on screen. These features values are considered for detection of tumor ie. test image is tumorous or not.

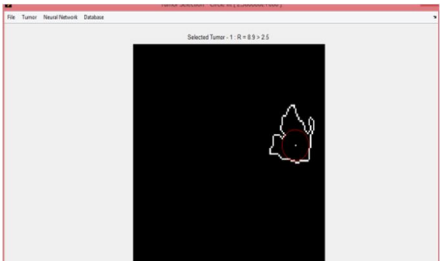

Fig.(8) Radius of Detected Nodule

H. Neural Network

The artificial neural network consist of three layers ie.

1) Input Layer
2) Output Layer
3) Hidden Layer

The block diagram of neural network is shown in fig.(9).

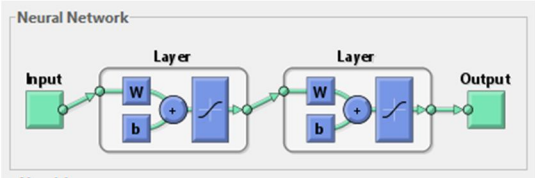

Fig.(9) Block Diagram

1) Input Layer: The number of input nodes is equal to number features which is considered for classification. The proposed system consists of 05 input nodes.

2) *Output Layer:* The output layer consists of a number of nodes .There are two output nodes.

3) *Hidden Layer:* Initially, it is consist of a specific number of nodes. The trial-and error mechanism had been followed to determine the number of hidden nodes. Here we used 50 hidden nodes.

III. RESULT

The proposed system helps to find out selected nodule size and according to that size test image is classified into cancerous or non-cancerous. Here we used images with JPG formats. We resized image in [512 512]. Here firstly we take 35 images for training purpose . Here Fig.(10). gives performance of system.

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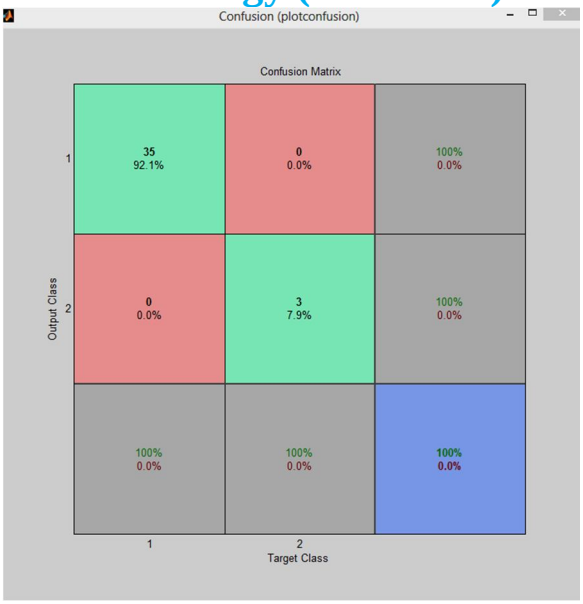

Fig.(10).Confusion Matrix

IV. CONCLUSION

This proposed method gives novel approach for early detection of iris melanoma using image fusion and segmentation method. Here firstly developed system read images like tumorous image and normal (iridology chart) iris image, then tumor part will be segmented and will fused to normal iris image and after that according to segmented tumor's radius it will be classified into tumorous or non-tumorous eye using artificial neural network. The fused image output gives information related to affect of tumor on other internal organ. Hence it become early detection system for tumor. The developed system has been tested abnormal iris images which are obtained from internet resource and experimental result were successful which proves that our proposed system can be implemented into real time application.

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AUTHORS

Miss. Sneha. J. Patil has received his Bachelor"s degree in Electronics and Telecommunication Engg. from Shivaji University, Kolhapur.
Currently pursuing Master"s in Electronics Engg. from Shivaji University, Kolhapur.

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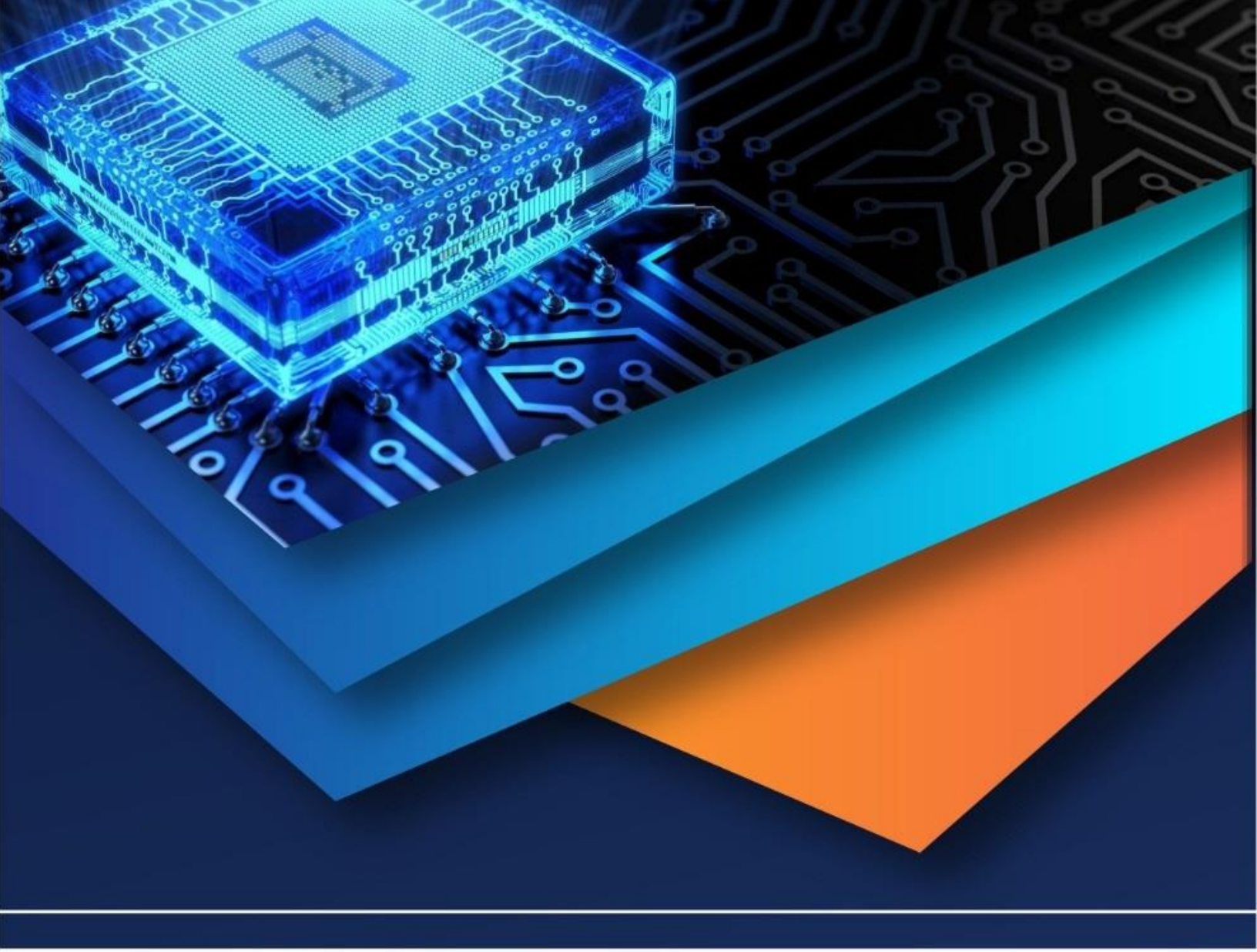
Mr. R. D. Patil (M.E. Electronics) Ph.D. (pursuing) working as an Associate Professor & P.G. Co-ordinator at PVPIT, Budhgaon. Having 26 years of teaching experience.

His area of specialization is Microprocessor, Microcontroller and VLSI Design.



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