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Automatic Detection of Diabetic Retinopathy in Retinal Image

K. Rajesh*, K.Tamilarasi[1], C.Shobana[2] and P. Seena Joice[3]

* Department of ECE, SSM Institute of Engineering and Technology, Dindigul, Tamilnadu, India,krajeshk1980.gm@gmail.com

[1, 2, 3] UG scholars, Department of ECE, SSM Institute of Engineering and Technology, Dindigul, Tamilnadu, India

ABSTRACT

Objective- In these days, medical image analysis is a very popular research area where digital images are analyzed for the diagnosis and screening of various medical problems. Diabetic Retinopathy (DR) is an eye disease caused by increased blood insulin and may result in blindness. An automated early detection system for DR can save a patient's vision. Early diagnosis is beneficial in preventing visual impairment and blindness through regular screening and treatment.

Methods-This project presents a method to detect and classify exudates in colored images of the retinal. Several image processing techniques have been developed for early detection of DR based on features. Such as blood vessels, exudes, hemorrhages and micro aneurysms, including image enhancement, skin locus segmentation.

Results-This project presents a review of the latest work on DR feature detection using image processing techniques. Based on their results, Image processing techniques are evaluated.The exudates are classified as true or false exudates with the help of grading system were able to distinguish between four different types of grading level with an average accuracy of 94.17%.

Conclusion- In this paper the finding of optic disk is made by means of skin locustechniques, blood vessel segmentation and exudates detection by means of intensity computation and feature extraction.

KEYWORDS- Skin locus segmentation, Diabetic Retinopathy, graphical User Interface (GUI).

***Corresponding author:**

K.Rajesh

Assistant professor,

Department of ECE,

SSM Institute of Engineering and Technology

Dindigul, Tamilnadu, India,

Email: krajeshk1980.gm@gmail.com

INTRODUCTION

Diabetic retinopathy, also known as diabetic in eye disease, is a medical condition which damage occurs to the retina due to diabetes and is a leading cause of blindness. It affects up to 80 percent of people who have had diabetes for 20 years or more. At least 90% of new cases could be reduced if there were proper treatment and monitoring of the eyes. The longer a person has diabetes, the higher his or her chances of developing diabetic retinopathy. Each year in the United States, diabetic retinopathy accounts for 12% of all new cases of blindness. It is also the leading cause of blindness for people aged 20 to 64 years. Retinopathy is any damage to the retina of the eyes, which may cause vision impairment. Retinopathy often refers to retinal vascular disease, or damage to the retina caused by abnormal blood flow.

Age-related macular degeneration is technically included under the umbrella term retinopathy but is often discussed as a separate entity. Retinopathy, or retinal vascular disease, can be broadly categorized into proliferative and non-proliferative types. Frequently, retinopathy is an ocular manifestation of systemic disease as seen in diabetes or hypertension. Diabetes is the most common cause of retinopathy in the U.S. as of 2008. Diabetic retinopathy is the leading cause of blindness in working-aged people. It accounts for about 5% of blindness worldwide and is designated a priority eye disease by the World Health Organization. This paper focuses on the detection of exudates, one of the symptoms of the presence of DR. As the exudates and optic disks appear in retinal images as white / yellow structures, it is necessary to remove the replication of the region of exudates, i.e. optic disks. The optic disk is detected by Region of Interest (RoI) and removed by the techniques of K-means Clustering. The exudates are identified with the variation in the gray level and the detected exudates are classified using the exudates and statistical characteristics trained using DR grading done as No exudates, low, and medium and severe based on the exudatesregion.

SYSTEMDEVELOPMENT:

Diabetic Retinopathy damages the blood vessel by causing changes in the eye. Image will undergo a standard image processing method that includes image acquisition, pre-processing, extraction of features such as LBP, GLCM and regional properties followed by accurate disease identification. We will use the model Skin locus and color histogram to classify the retinal images into the Normalcategory.

The proposed system's overall classification rate will provide better efficiency and accuracy in identifying the disease against existing systems. Patients can receive their report after obtaining results.

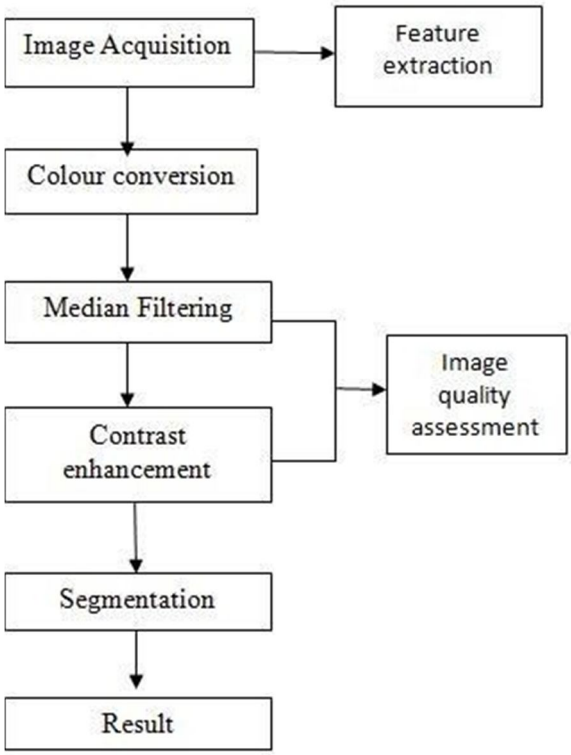

Figure 1: Block diagram of proposed system

2.1 Input image:

The RGB color model is an additive color model that adds red, green and blue light to reproduce a wide range of colors in different ways. The model's name derives from the initials of the three primary additives, red, green and blue.

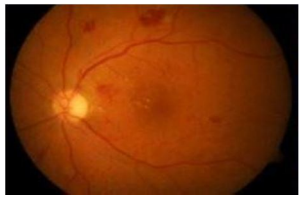

Figure 2:Acquired image

2.2 Grayimage:

A grayscale or grey scale digital image in photography and computing is an image in which the value of each pixel is a single sample, that is, it only carries information about intensity. Such images, also known as black-and-white, consist exclusively of gray shades, varying from black at the lowest intensity to white at the strongest. In photography and computing, a grayscale or grayscale digital image is an image in which the value of each pixel is a single sample, that is,

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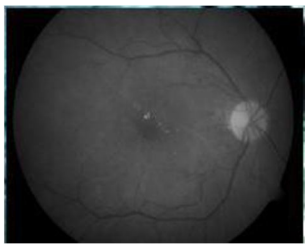


Figure3: Gray image

2.3 Featureextraction:

In machine learning, pattern recognition and in image processing, feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction.

When the input data to an algorithm is too large to be processed and it is suspected to be redundant (e.g. the same measurement in both feet and meters, or the repetitiveness of images presented as pixels), then it can be transformed into a reduced set of features (also named a feature vector). Determining a subset of the initial features is called feature selection. The selected features are expected to contain the relevant information from the input data, so that the desired task can be performed by using this reduced representation instead of the complete initial data.

2.4 Median filter:

A nonlinear digital filtering technique is the median filter, often used to remove noise from an image or signal. Such noise reduction is a typical pre - processing step to improve later processing results (e.g., image edge detection).Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise, also having applications in signal processing. The main idea of the median filter is to run through the signal entry by entry, replacing each entry with the median of neighboring entries. The pattern of neighbors is called the "window", which slides, entry by entry, over the entire signal. For 1D signal, the most obvious window is just the first few preceding and following entries, whereas for 2D (or higher-dimensional) signals such as images, more complex window patterns are possible (such as "box" or "cross" patterns). Note that if the window has an odd number of entries,thenthemedianissimpletodefine:itisjustthemiddlevalueafteralltheentriesinthe

window are sorted numerically. For an even number of entries, there is more than one possible median.

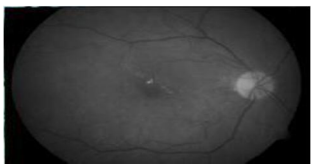


Figure4: Filtered image

2.5Adaptive histogram equalization:

Adaptive histogram equalization (AHE) is a computer image processing technique used to improve contrast in images. It differs from ordinary histogram equalization in the respect that the adaptive method computes several histograms, each corresponding to a distinct section of the image, and uses them to redistribute the lightness values of the image. It is therefore suitable for improving the local contrast and enhancing the definitions of edges in each region of an image. However, AHE has a tendency to over amplify noise in relatively homogeneous regions of an image. A variant of adaptive histogram equalization called contrast limited adaptive histogram equalization (CLAHE) prevents this by limiting the amplification.

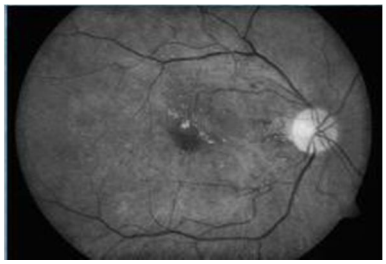


Figure 5:Output of AHE

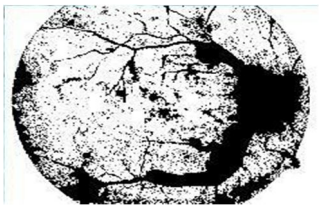
Ordinary histogram equalization uses the same transformation derived from the image histogram to transform all pixels. This works well when the distribution of pixel values is similar throughout the image. However, when the image contains regions that are significantly lighter or darker than most of the image, the contrast in those regions will not be sufficientlyenhanced.

2.6 Skin locussegmentation:

The proposed methodology uses the skin locus model algorithm, which is mainly based on the color of the retinal image. Skin locus model although different people will have different skin color, it may even depend on their gene and other aspects. But in most studies it is clearly shown that the large and major difference was in their intensity of the skin rather than their chromaticity of their skin. Different color models are compared together such as the RGB, HSV, Y,Cb,Cr etc. To make the algorithm of skin locus model. Using these color models has shown the efficiency in extracting skinny regions under certain situations. When only

chromaticityisconsideredthentherobustnessisachievedagainsttheintensity. Generally, the Skin chromaticity is based on the illumination and the camera calibration of the light source. These above two factors may vary larger in chromaticity. Illumination is usually not uniform throughout the complete face. In order to make conclusions for these problems we are implementing this method of skin locus model algorithm.

Figure 6: Segmented Output



2.7 Result:

This is the second stage knows as moderate non proliferative retinopathy, some of the blood vessels in the retina will become black. Here 90% of the defect can be cured

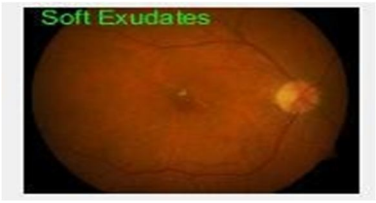


Figure7: Final Output

1. EXISTING MECHANISM VS. PROPOSEDMECHANISM:

The result of our proposed methodology is compared with two parameters known as Maximum Difference (MD) and PSNR value. We can achieve 97.12% accuracy using this proposed methodology. Our methodology Works as the best system of all available existing system by using these two parameters such Maximum Difference (MD) and PSNR value

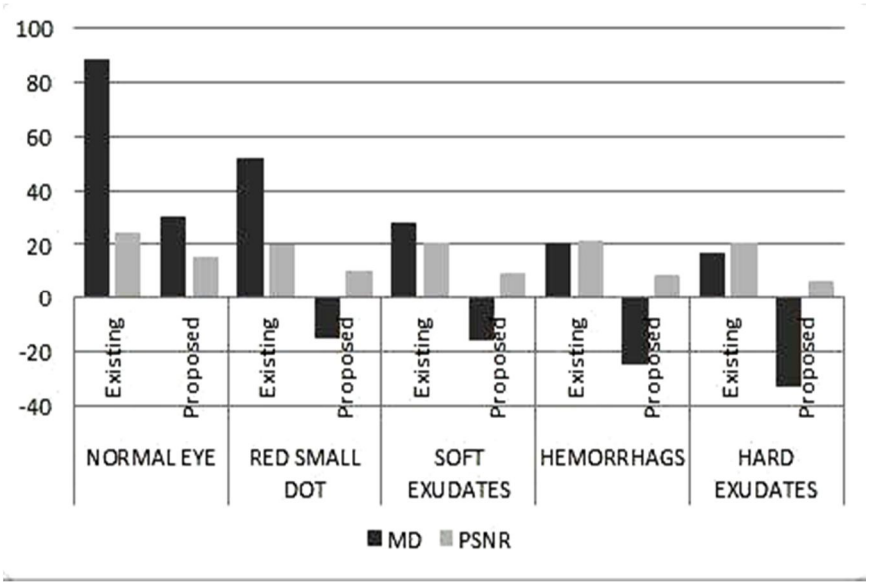


Figure 8: Existing vs. proposed

3.1 Disadvantage of existing system:

- The Prediction of retinopathy is quitedifficult
- Segmentation method may produce unwantednoise
- PSNR value ishigh
- Image assessment analysis provides poorperformance.
- Segmentation covers unwantedregion
- Only 84% accuracy can beachieved

3.2 Advantages of proposedsystem:

- Retinopathy Prediction is Helps prevent vision loss by earlydetection
- Automated Blood Vessel Extraction algorithms can save time, patients' vision and medicalcosts.
- Error Probabilitylow.
- PSNR value is very low when compared to existingsystem.
- Adaptive Histogram gives brightness and intensity to segment eye diseaseproperly.

2. SOFTWARE:

4.1 Matlab:

MATLAB is a programming language developed by Math Works. It started out as a matrix programming language where linear algebra programming was simple. It can be run both under interactive sessions and as a batch job. MATLAB (matrix laboratory) is a fourth generation high-level programming language and interactive environment for numerical computation, visualization and programming. MATLAB is developed by Math Works. It allows matrix manipulations; plotting of functions and data; implementation of algorithms; creation of user interfaces; interfacing with programs written in other languages, including C, C++, Java, and FORTRAN; analyze data; develop algorithms; and create models and applications. It has numerous built-in commands and math functions that help you in mathematical calculations, generating plots and performing numerical methods.

4.2 Digital imageprocessing:

Digital image processing deals with manipulation of digital images through a digital computer. It is a subfield of signals and systems but focus particularly on images. DIP focuses on developing a computer system that is able to perform processing on an image. The input of that system is a digital image and the system process that image using efficient algorithms, and gives an imageas

an output. The most common example is Adobe Photoshop. It is one of the widely used applications for processing digital images

CONCLUTION:

In this project, the finding of optic disc is made by means of skin locus techniques, blood vessel segmentation and exudates detection by means of intensity computation, thresholding and features extraction. The exudates are classified as true or false exudates with the help of grading system were able to distinguish between four different types of grading level with an average accuracy of 94.17%. As an extension of our work, it is suggested to optimize the features selected and the fore most features with different classifier techniques can be compared and analyzed.

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