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Diabetic Retinopathy Using Artificial Neural Network

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ABSTRACT: Diabetes mellitus commonly referred to us diabetics, is a group of metabolic disorder in which there is a high blood sugar levels over a prolonged period. If left untreated it can cause many complication, one of such complication, is diabetic retinopathy. High blood sugar levels causes damage to blood vessels in the retina, it leads to blindness. This project proposed an image processing method in which input image is proposed in the MATLAB where the blood vessels are isolated to identify the presence of micro aneurysm and exudates. preprocessing is done by median filtering to remove the noise and to preserve the edges. Bottom hat segmentation is used the image and later the image is classified using ANN(artificial neural network)

I. INTRODUCTION

While there are numerous health issues that India is battling with, diabetes is one of the most worrying. Currently,5% of the Indian population suffers from diabetes .in the year 2000, the total number of diabetics in India stood at 31.7 million and it is expected to rise by more than 100% in the year 2030 to account for 79.4 million.it currently affects an estimated 143million people worldwide and the number is growing rapidly. Diabetes mellitus, commonly referred to as diabetes, is a group of metabolic disorder in which there is a high blood sugar level over a prolonged period. if left untreated, diabetes can cause damage to blood vessels in the retina, it leads to blindness. This paper proposes an image processing method to detect diabetic retinopathy in advance. In this paper we present an efficient method to identify and classify the micro aneurysm, exudates as hard exudates and soft exudates. It isolates blood vessels, micro aneurysm and exudates to extract features that can be used by ANN (artificial neural network) it uses mean and median filter to reduce the noise.it leads to sudden vision loss due to delayed detection of retinopathy. A completely automated screening system for the detection of diabetic retinopathy can effectively reduce the burden of the specialist. Due to noise and other disturbance that occur during image acquisition and this is **overcome by various** image processing techniques. further the different features are extracted which serves as the guideline to identity and grade the severity of the disease based on the extracted features classification of the retinal image as normal or abnormal is carried out.

II. METHODOLOGY

Image processing technology are used to detect diabetic retinopathy that has mainly following steps- preprocessing segmentation, feature extraction and classification.

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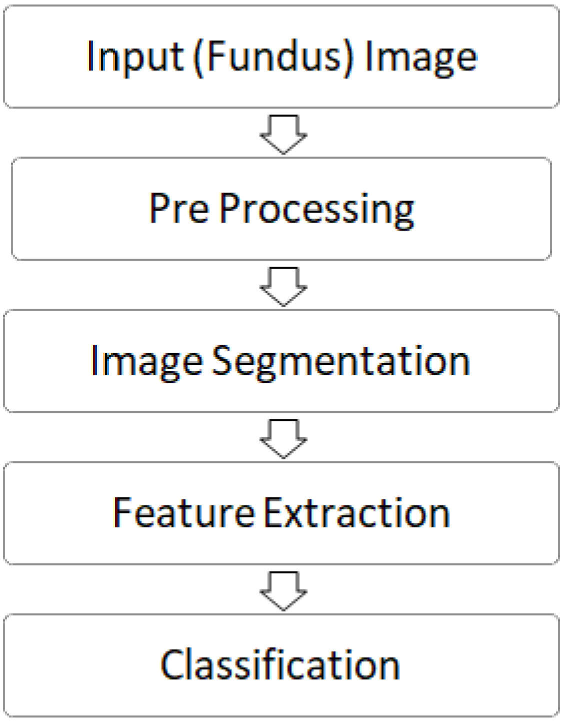

III. PREPEOCESSING

This aim of preprocessing is an improvement of the image data that suppress unwanted distortions or enhances same image features important for further processing. In this preprocessing is done by medium filter to remove the noise and to preserve the edges. median filter effectively removes the salt and pepper noise in which salt noise is high intensity noise and pepper noise is low intensitynoise. The operation of median filter o remove salt and pepper noise is discussed below.

0	**50**	**20**
15	**100**	**10**
30	**25**	**35**

In this, pixel value '0' is the pepper noise and '100' is the salt noise.

STEP 1: Arrange the pixel value in ascending order.
{0, 10, 15, 20, 25, 30, 35, 50, 100}
STEP 2: Replace all pixel value by median pixel value.

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25	25	25
25	25	25
25	25	25

Hence the output image of filtering is free from salt and pepper noise.

IV. IMAGE SEGMENTATION

Image segmentation is a process of partitioning of digital image into multiple segments. The goal of segmentation is to simplify or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is the process of assigning label to every pixel in a image such that pixels which the some label share certain characteristic. In this paper bottom hat segmentation is used to segment the image. Has RGB image is transformed into CMY component, from which green component is extracted to isolate magenta component. After extraction of the magenta component, blood vessels are segmented to identify the presence of microaneurysm and optical disc and exudates.

V. FEATURE EXTRACTION

Extracting the exactly affecting part is crucial task in case of diabetic retinopathy. Certain parameters are taken in to account for feature extraction as size, shape, composition, location of the image. As per the results obtained from the feature extraction the classification of the diabetic
Retinopathy is done.

VI. CLASSIFICAION

Artificial neural networks (ANNs) are statistical learning algorithms that are inspired by propertiesof the biological neural networks. They are used for a wide variety of tasks, from relatively simple classification problems to speech recognition and computer vision.

ANNs are loosely based on biological neural networks in a sense that they are implemented as a system of interconnected processing elements, sometimes called nodes, which are functionally analogous to biological neurons. The connections between different nodes have numerical values, called weights, and by altering these values in a systematic way, the network is eventually able to approximate the desired function. Each node in the network takes many inputs from other nodes and calculates a single output based on the inputs and the connection weights. This output is generally fed into another neuron, repeating the process. When equipped with the information given in the last sentence, one can easily envision the internal hierarchical structure of the artificial neural network, where neurons are organized into different layers, as depicted below. The input layer receives the inputs and the output layer producesan output. The layers that lye in between these two are called hidden layers.

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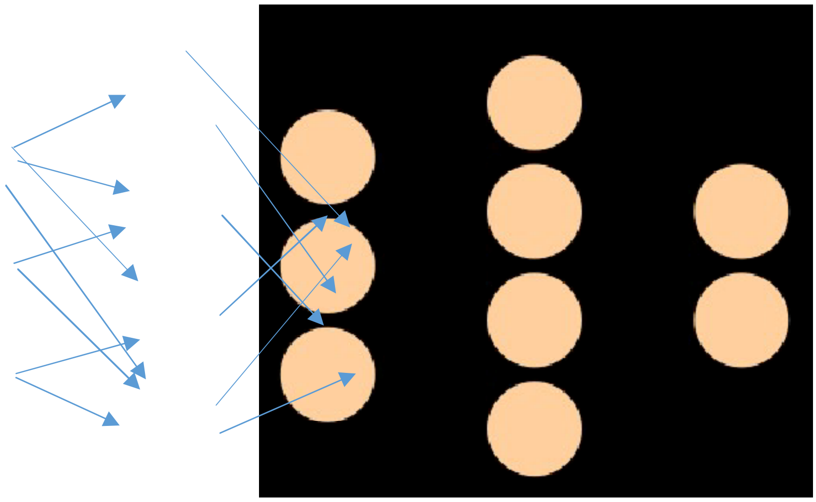
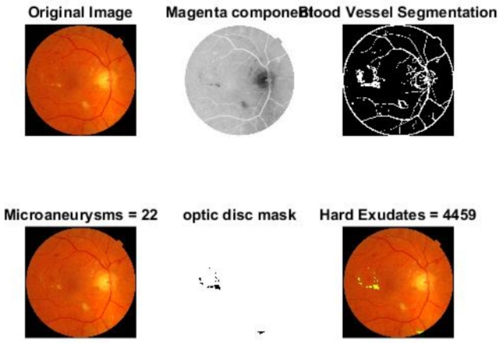


Figure 1. A simple neural network with one hidden layer.2

The hidden layers can be thought of as individual feature detectors, recognizing more and more complex patterns in the data as it is propagated thought the network. For example, if the network is given a task to recognize a face, the first hidden layer might act as a line detector, the second hidden takes these lines as input and puts them together to form a nose, the third hidden layer takes the nose and matches it with an eye and so on, until finally the whole face is constructed. This hierarchyenables the network to eventually recognize very complex objects.3As stated before, the network is able to accurately approximate an arbitrary function by altering its weights in a systematic way. Initially, the weights are given random values and the network must be trained in order to find the weight parameters that produce the desired effect. In order to achieve this, we must first compare the neural network output to the desired output, calculate the error and use this to adjust the weights of the network in proportion to their contribution for the error in the output. Because of the computationally expensive backpropagation phase that has to be done for every input set, neural networks are very slow learners and need huge amount of computational power to produce desirable results. Even more so, if we consider that today's top of the line networks contains millions of neurons and in some extreme cases, up to billion connection weights.



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