

Detection of Diabetic Retinopathy using Image Processing

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Abstract—Diabetic Retinopathy (DR) is one of the main sources of visual impairment and eye malady in working age population of the world. This undertaking is an endeavour towards finding a robotized approach to distinguish this ailment in its initial stage. In this task we are utilizing directed learning strategies to characterize a given arrangement of pictures into 5 classes. For this task we are employing various image processing techniques and filters to enhance many important features. This approach intends towards finding an automated, suitable and sophisticated approach using image processing and pattern recognition so that DR can be detected at early levels easily and damage to retina can be minimized and also to help ophthalmologists to diagnose fast, accurate, and reliable diabetic retinopathy.

Keywords- Diabetic Retinopathy (DR), Supervised learning, Image processing.

I. INTRODUCTION

Diabetic Retinopathy is an infection which is caused because of long haul diabetes. It is a visual sign of diabetes and around 80 percent of the population having diabetes for more than at least 10 years has some phase of the ailment. Additionally, the more drawn out an individual is in this infection, higher are the odds of having DR in his visual framework. Analysis of it demonstrates that it contributes around 5% of absolute instances of visual deficiency. By observing underneath picture one can see the contrast between the normal eye and diabetic retinopathy eye.

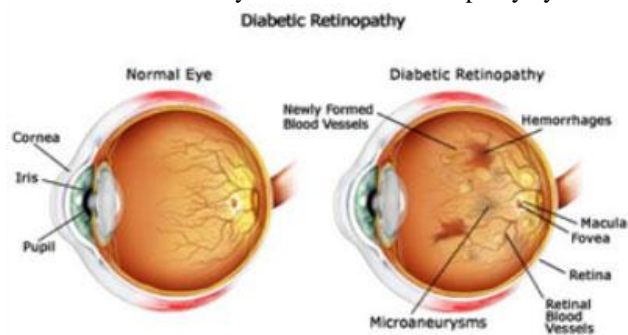


Figure 1. Normal eye vs DR eye

There are different variables influencing the ailment like the time of diabetes, poor control, pregnancy and various other factors. Yet the disease can be brought under control or can be totally recovered if the diabetic retinopathy is distinguished in an early stage. A large number of the population are experiencing this illness, yet at the same time testing is done physically via prepared experts, in actuality, which is a significant time taking and long procedure and as

a rule because of miscommunication and postponed results, in the end, prompts deferred treatment and obliviousness. So the point of the task is to give a robotized, appropriate and modern methodology using image processing and convolution neural network to detect DR at an early stage and harm to the retina can be limited.

II. RELATED WORK

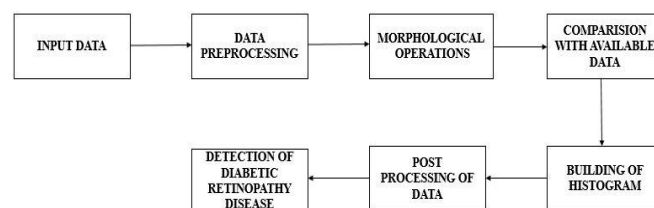


Figure 2. The proposed algorithm

One of the vital steps involved in the process is to input the available data set into the neural networks setup which would distinguish each data being inputted, into different class of DR defined.

The main care had to be taken with respect to the data sets that were collected, as they differed from each other in terms of the picture resolution, image clarity and size. Thus it was an immense requisite to avert the heterogeneity amongst the data sets by bringing down their resolution to a common number through the compression technique, thus making it easy for us to classify them under different classes.

After the compression of the digital data sets into a standard size, we apply gray scaling algorithm on them and convert them into gray scaled images, through gray scaling algorithm.

Once we obtain the gray scaled data set, we perform certain morphological operations on the same and try to intensify the region we concentrate on to, especially the blood vessels.

Since the ruptured blood vessels near the patient's retina are the major indication for the presence of DR, it is essential to remove the noise in the background and take out only the blood vessels near retina as the result of morphological operations. Once the images are obtained from this step, histograms are built in order to compare the normal eye with diabetic retinopathy.

III. METHODOLOGIES

All the above modules viz, Gesture Technology for deaf and dumb follows the same methodologies.

- Image Processing
- Input image
- Pre-processing
- Feature Extraction
- Training, testing and sign recognition.
- Data Set

A. Image processing

Image processing is a technique used to take out or extract certain specific parts from an image data for certain technological purposes and also to get an enhanced form of the image as an output.

Image processing involves by taking the data sets to be processed as input and it outputs enhanced desired features incorporated within the input data set.

It involves mainly three steps:-

- Takes in the input data
- Analyses and process the data to identify the specified specifications
- Outputs the desired features

B. Input Image

Information picture through the web cam is caught and afterward it tends to be effectively used to store as dataset for preparing or as info picture intended to perceive the character. The picture is caught and further put away in any bolstered configuration indicated by the gadget.

This image serves as an input to the device.

The supported format of the captured image is obtained using device ID and then it is stored by web cam. Training and testing is implemented by web cam.

C. Pre-Processing

Pre-processing is especially required on each picture to improve the usefulness of picture preparing. Caught pictures are at first in the RGB group. The pixel esteems and the dimensionality of the pictures that are caught are high. As pictures are lattices and scientific, tasks are performed on pictures. So we convert the RGB picture into Gray picture utilizing "rgb2gray" work. Picture Segmentation procedure is utilized on the Binary picture to distinguish the hand locale.

Segmentation is then done to isolate picture into two locales, foundation and the closer view containing area of intrigue for example the hand district. The portioned picture has the hand locale with the pixel esteem '1' and the foundation as the '0'. The picture is then utilized as a veil to bring the hand area from the RGB picture by duplicating the high contrast picture for example twofold picture with the first RGB picture. The picture is then resized to lessen size of the lattice utilized for the acknowledgment procedure. The got pictures are then changed over into segment framework for highlight extraction.

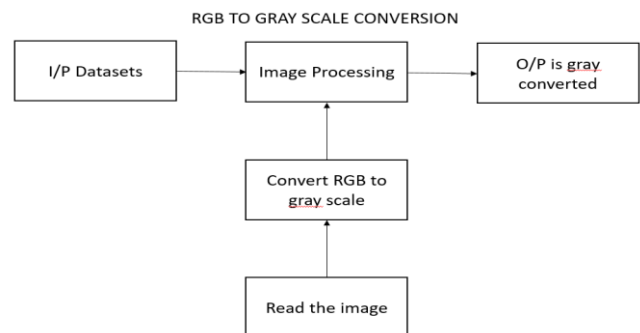


Figure 3. RGB to Gray Scale conversion

D. Feature Extraction

Feature extraction is a standout amongst the most huge strides in acknowledgment organize as the span of the information dimensionality is diminished in this specific stage.

In Feature extraction the picture is changed over into section framework, for every one of the pictures the segment grid is shaped and afterward joined to shape single network, at that point mean of lattice is determined.

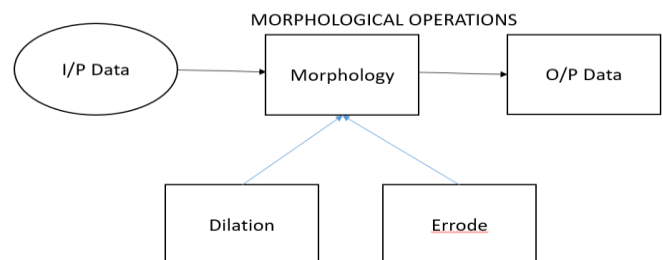


Figure 4. Morphological Operations methods

E. Training, testing

Identification of human hand or the signals all in all with white foundation will improve the execution of picture pre-handling, as far as precision and speed. Preparing stage and the acknowledgment stage are two unmistakable Sign acknowledgment stages. Preparing stage: Training stage is the primary stage, in which the age and putting away of dataset is finished. Number of pictures per character put away here is straightforwardly corresponding to the precision of the framework present. Amid age of the preparation set the pictures are preprocessed at first. Segment network is created for every one of the pictures of dataset and linked lattice is shaped. This component vectors are utilized further for arrangement process.

F. Data Set

Single distinctive picture of every one of the character for information picture is put away on the database. Expanding number of pictures in dataset will build exactness of retina location.

IV. RESULTS AND DISCUSSION

A. RGB to Gray Scale Conversion

All the images will be in RGB form. The range of Red is 0 to 255, range of Green is 0 to 255 and range of Blue is also 0 to 255. These are shadings. The RGB image is converted to Gray because editing is easy when the image is in Gray Scale format. The formula is $I=(R+G+B)/3$ where I represents intensity. When the image is converted to Gray Scale it exists in matrix format. In gray scale image, the value of each pixel represents an amount of light.

RGB TO GRAY SCALE CONVERSION

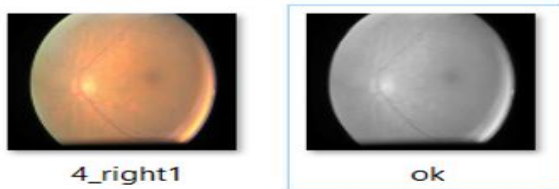


Figure 5. Result of Gray Scale Conversion

B. Edge Detection

Edge Detection algorithm identifies the points in a digital image, where or at which the brightness of the image changes sharply, that points are typically organized into a set of curved line segments termed edges. Thresholding is done in order to get the edges of the image. It is a process of converting a grayscale input image to a bi-level image by using an optimal threshold ($v=127$).

In image processing edge detection is a fundamental tool, also in machine version and computer vision too.

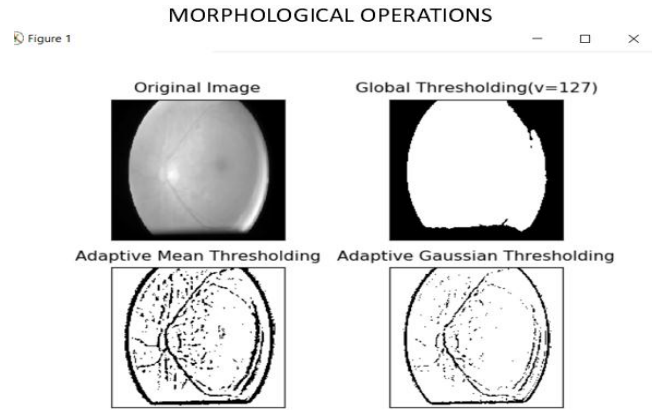


Figure 6. Result of Morphological Operations

C. Contour

Contour training is the technique or a method, which is applied to digital image to extract their boundary. The contour pixels are small subsets of total number of pixels that represent a pattern. Hence, the computation amount is reduced as we run feature extraction algorithms in contour instead of a whole pattern. This contributes to efficiency of feature extraction process.

D. ROI

ROI is Regions of Interest. It is a portion of an image that has to be filtered. ROIs can be created of many shapes using high level ROI functions. ROI in Opencv, the ROI allows to operate on rectangular subset of image, i.e., Create ROI of the image and then perform operation we want or which we require.

E. Testing Data

The data is identified specifically for use tests. It verifies whether a given set of input to function produces some expected output as result. Test data is produced in a focused way; it may also be recorded for its reuse.

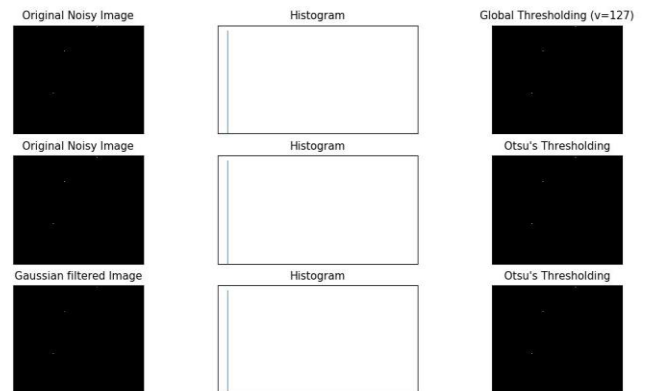


Figure 7. Histogram

V. CONCLUSION AND FUTURE SCOPE

As we all know new technologies pave way for precision and perfection in every arena being applied, the image processing technique that we opted to use as a backbone for our project, could entirely alleviate the snag that the traditional approach for detection of diabetic retinopathy procedure had.

The traditional approach involved capturing of retina images, followed by examination of the disease by a registered ophthalmologist. The main hitch involved here was, the retina images might get captured distorted, owing to damaged clarity and thereby the diagnosis is delayed and the retina images require to be refurbished at frequent intervals. In Contrast, the image processing technique provides much rapid, definitive results and all edge towards early detection of diabetic retinopathy.

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