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Research Article

Image Processing Based Types of Chronic Ailments of the Human Eyes for Glaucomatic Disease Detection Using KNN Techniques

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Abstract

In this research paper, the Image Processing Based Glaucoma Detection Using KNN Techniques – a prototype is being presented in a nutshell. The human eye is one of the most essential organs in the body. The eye is continuously vital in our daily lives; without them, the world would be dark and doing daily activities would be exceedingly difficult. In the sense that it would be exceedingly difficult for anyone to accomplish any work without sight. The loss of vision/sight in the human eyes can be caused by a number of reasons. As a result, blindness in the human eyes must be avoided, as the most valued human organ is totally responsible for seeing. One of the reasons of blindness and vision loss in the eyes is various types of diseases that develop in the eyes as a consequence of a variety of conditions. A Convolutional Neural Network (CNN) is proposed in this approach for detecting glaucoma using fundus pictures of the eyes. We utilise the Otsu thresholding approach for segmenting, followed by HOG feature extraction techniques and Knn algorithm classification. For training and testing the model, we utilise a Convolution Neural Network.

Keywords: Fundus Images; Glaucoma; Retinal Fundus Image; Convolution Neural Network

Introduction

Glaucoma is a quiet thief of sight that causes vision loss in human eyes owing to a rise in pressure that destroys the optic nerves, resulting in permanent blindness, i.e., loss of vision. This illness affects people of all ages, from newborns to the elderly. Even while glaucoma is not completely curable, its progression and symptoms can be managed. As a result, we must detect glaucoma illness at an early stage, so that this detection procedure becomes extremely important whenever a person learns that he or she is suffering from the condition. further precautionary measure could be taken from the doctors and proper diagnosis could be done, further loss of vision Is controlled. In the early stages, patients frequently have no symptoms or discomfort. Glaucoma affects your side/peripheral vision first, then gradually moves to the centre if left untreated. Glaucoma is the second biggest cause of vision loss, accounting for roughly 5.2 million instances of blindness (15 percent of all blindness cases reported) and possibly affecting 80 million people in the next decade, according to the World Health

Organization (WHO). There is currently no cure for glaucoma. Fortunately, it is typically a slow-progressing illness that may be successfully treated if discovered early. The key to preventing vision loss is early detection. The progressive degeneration of optic nerve fibres results in structural anomalies in the optic nerve head, known as the optic disc, the nerve fibre layer, and a concurrent functional failure of the visual field. Vision loss develops gradually and over a long period of time as the sickness advances. There are several types of glaucoma, including open-angle, angle-closure, congenital, primary, secondary, neo-vascular, ex-foliate, and pigmentary glaucoma.

Figure 1: (a) Normal eye, (b) Glaucoma affected eye.

Proposed methodology

Picture processing is a method of improving picture quality by altering images in a variety of ways. Images are used as input and output in image processing methods. Image to image transformation analysis is used for image enhancement, such as enhancing the contrast of the input image, as well as to correct geometrical distortions. Picture segmentation is one of the most important components of image processing. It is the process of dividing an image into separate homogeneous areas, each having the same set of characteristics or attributes for its pixels.

The end result of segmentation is a collection of homogenous areas, each with its own label. Image segmentation is used to separate the region of interest from the background noise. We utilised Matlab R2014a for image processing algorithms. MATLAB is a high performance language for technical computing. MATLAB (MATRIX LABORATORY) is a scientific and engineering-oriented interactive system for matrix-based computing. It is suitable for a wide range of numerical calculation and visualisation tasks. As a result, MATLAB was utilised for image processing activities of Human cancer pictures to improve image quality and to convert images to binary for feature extraction from the original images.

The CNNS – convolution neural networks

The Neural Network (NN) is a function inspired by biological neural networks that is used to approximate the outputs for given inputs. An input layer, a hidden layer, and an output layer make up the three layers of NN. Depending on the difficulty of the task, the concealed layer may have one or many layers. In addition, each layer has one or more neurons, whether it is input, hidden, or output. In general, NN is shown as a network of connected neurons that communicate with one another, analogous to human neurons. The links provide quantitative weights that may be determined based on prior experiences as well as current circumstances.

In the computational model, inputs X_1, X_2,... X_n are similar to biological dendrites with weights W_1, W_2....W_n. The bias of X0 is W_0 for i = 0 to n, the summation W_iX_i is comparable to the biological model's soma. If the result of this summing is greater than zero, 1 is returned; otherwise, −1 is returned. This output can be compared to the axon of a biological model.

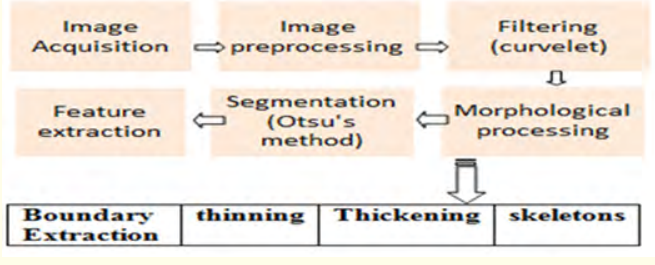

Figure 2: Flow-diagram of the proposed CNN framework.

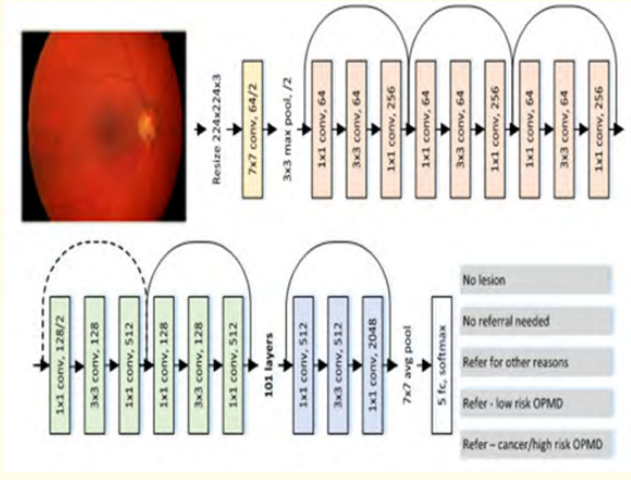

Figure 3: Block diagram of the proposed neural network design.

Image segmentation

In computerized picture handling and PC vision, picture division is the most common way of isolating an advanced picture into a few areas (sets of pixels, otherwise called picture objects). The objective of picture division is to make a picture's portrayal more significant and more straightforward to survey by streamlining and additionally altering it. Picture division is a strategy for recognizing objects and limits (lines, bends, and so forth) in photos. The procedure of naming each pixel in a picture so that pixels with a similar name have indicated credits is known as picture division.

OTSU segmentation using thresholding

OTSU's methodology, named after Nobuyuki Otsu (tsu Nobuyuki), is utilized in PC vision and picture preparing to do programmed picture thresholding. In its most fundamental form, the method offers a solitary power limit that isolates pixels into two classes: frontal area and foundation. This breaking point is controlled by limiting intra-class power fluctuation while expanding between class variety. Otsu's methodology is a discrete one-dimensional variation of Fisher's Discriminant Analysis that is identified with the Jenks improvement technique and is similar to an all around the world ideal k-implies performed on the power histogram. The expansion to staggered thresholding was depicted in the first paper, and computationally productive executions have since been proposed.

Image segmentation feature extractions using histogram of gradients (Hogs)

The histogram of arranged angles (HOG) is a component descriptor that might be utilized to perceive objects in PC vision and picture preparing. The strategy counts how often a slope direction shows up in a specific segment of a photo. This technique is like edge direction histograms, scale-invariant component change descriptors, and shape settings, however it is more exact since it is processed on a thick framework of consistently separated cells and utilizations covering neighborhood contrast standardization.

Classification using KNN's

K closest neighbors is a direct strategy that saves every single accessible example and orders new cases dependent on a closeness metric (e.g., distance capacities). KNN has been used as a non-parametric methodology in factual gauges and example acknowledgment since the mid 1970's. A case is classified by the larger part vote of its neighbors, with the case given to the class generally common among its K closest neighbors as controlled by a distance work. In case K is equivalent to one, the case is basically allotted to the class of its nearest neighbor [1-9].

Conclusions

In this research paper, the Image Processing Based Glaucoma Detection Using KNN Techniques – a prototype is being presented in a nutshell. The proposed methodology is also being presented. This paper gives a overview of how we are going to implement the glaucoma detection process in our future works.

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Conflict of Interest

There are no conflicts of interest involved.

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