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Research paper

Extraction Zoning Feature to Diabetic Retinopathic Detection Models

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Abstract

The health sector is one area that has been applying various computer technologies. To diagnose a patient's illness was already done with computers. One is to diagnose diabetic Retinopathic disease that can happen to anyone. Diabetic Retinopathy, which is one of the complications caused by diabetes. Symptoms shown from this disease is mikroneurisma, hemorrhages, excudets and neovascularos. The detection of the disease is done by looking at the information on the retinal image and can then be classified according to severity. This research aims to develop a method that can be used utuk classify Diabetic Retinopathy. The process of classification is based fiture-fiture the retinal image obtained by the extraction process using extraction methods Zoning. The process is then performed to classify the Bayes Method and the results obtained Diabetic Retinopahty classification. The results of this study yield maximum accuracy 65%.

Keywords: *Bayes Methid, Detection, Diabetic Retinopathic*

1. Introduction

This study intends to reveal the detection model of diabetic retinopathy using the Bayes method. The purpose of this study is to find out the process of detection of diabetic retinopathy by using Bayes method analyzers and to see how the Bayes method works to get early detection and control. Bayes method used in this study is used to detect the presence or absence of diabetic retinopathy in diabetics.

Several studies that discuss hard detection executes diabetic retinopathy with contextual clustering and fuzzy art neural network classification methods[1]. The next study discusses detection of retinopathy exudates using FCM clustering classification[2], Diabetic Retinopathy using SVM segmentation, feature extraction and classification models[3]. The writings that raise images of diabetic retinopathy include discussing the use of laser photocoagulation methods in detecting diabetic retinopathy in diabetics[4]. Next is the writing from Kurniawan[5] which uses the K - Nearest Neighbor Classification method in looking at the severity of diabetic retinopathy sufferers. From some of these writings it has similarities with the study to be carried out by the author, but the method that will be used by the author here is the Bayes method.

Retinopathy is an abnormality in the retina that is not caused by inflammation[6]. As for diabetic retinopathy itself is an eye disorder caused by diabetes. This paper will try to reveal the detection of diabetic retinopathy in diabetics using the Bayes method. This research will give special emphasis to this Bayesian analysis method. In addition to the very large classification parameters playing a role in a less significant classification process parameters will be trimmed out. Because most parameters are not definitively related to categorical values, the linear regression model is not found to be consistent. Classification algorithms such as naive bayes, and zeroR oneR are found to be more suitable for categorizing data. Parameter factors such as diet maintenance, drug intake, and other factors such as smoking, obesity, insulin deficiency will also be taken into account when considering predicting blood glucose levels in different age groups.

Image processing can reduce screeners' workload and play a central role in quality assurance tasks. Therefore, there has been an increase in the application of processing techniques for automatic detection of digital images of diabetic retinopathy. For example, the color feature in the Bayesian Statistics classifier is used to classify each pixel into a class-free lesion or lesion. The following sections describe blood vessels, radiating, bleeding, detection of microaneurysms and technical maculopathy. These detection techniques produce most of the features used in the diabetic retinopathy automatic detection system.

Classification Analysis Bayes method makes it easy to detect diabetic retinopathy in retinal images, where retinal image data obtained from Fundus photos is processed using Sobel Operators to obtain binary data. This binary data is used as input data in the analysis process of Bayes method classification. So that the output from this analysis can recognize patterns according to the existing matrix. After going through a training and mapping process, it is logically simple if given training data X, the posteriori probability of a hypothesis H, P (H | X), follows the Bayes theorem, so that the classification results can correctly identify patterns according to the patterns that have been taught. Thus the outcome of this analysis can make decisions regarding the presence or absence of diabetic retinopathy in patients.

With the background of the research above, the authors want to know the extent of the process by using Bayes method classification analysis in determining the detection of diabetic retinopathy, the possible cause of eye disease disorders. So the authors hope that this research can be used to determine the difference between simple complaints as a symptom of diabetic retinopathy that can

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be handled independently, as well as serious or emergency complaints that require medical treatment as quickly as possible.

2. Methodology

Bayes theorem was proposed by Thomas Bayes in 1763. Bayes's theorem was used to calculate the probability or probability of occurrence of an event based on the influence obtained from observations. The basic difference between the Bayesian method and the statistics in general is that in Bayesian, the parameter is considered a random variable whereas in classical statistics, the parameter is unknown and fixed[7].

The Bayes method provides a fundamental way of entering external information into the data analysis process. This process begins with an existing probability distribution for the data set analyzed[8]. The principle of the Bayesian method is based on conditional opportunities, so that in Bayesian there are two important terms, namely:

a. Prior is the distribution of parameters. In determining the prior done with the level of availability of previous research information. Because the distribution is given before any data is considered, it is called a priori distribution.
b. Posterior is a distribution which is the multiplication between priors and the likelihood function. This is also the difference between the Bayesian method and classical statistics where classical statistics infer only based on the likelihood function while the Bayesian method uses the posterior distribution which is the multiplication between the likelihood and prior functions. The new data set makes this priori distribution a posterior distribution. Changes that occur from priori to posterior refer to the Bayes Theorem.

The Bayes Method application is usually used in several categories as follows:

a. Determine the diagnosis of a disease based on symptomatic data (for example hypertension or heart disease).
b. Recognize fruit based on fruit features such as color, shape, taste and others.
c. Recognize colors based on the RGB color index feature.
d. Detect skin color (skin detection) based on chrominant color features.
e. Determine action decisions (sports, art, psychology) based on circumstances.
f. Determine the type of clothing that is suitable for certain circumstances (such as weather, season, temperature, event, time, place etc.)

The eye is a fluid-filled spherical structure wrapped in three layers. From the outermost to the deepest, the layers are (1) sclera / cornea; (2) choroid / ciliary / iris body; and (3) Retina[9].

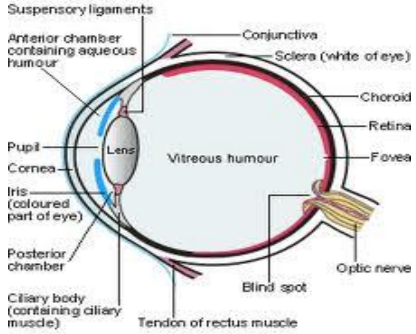


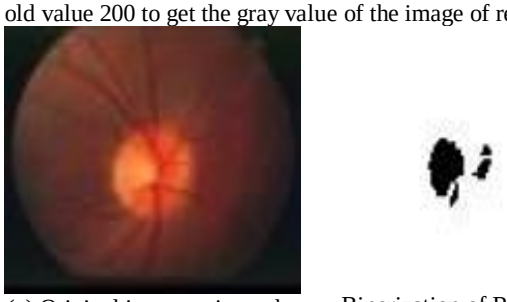
Fig 1. Eye Structure

The retina is a thin layer of cells located on the back of the eyeball. The retina is the part of the eye that converts light into nerve signals. The retina has photoreceptor cells (stem cells and cone cells) that receive light. When the retina absorbs light, the photopigment molecule dissociates into a retinent component and opsin causes the closure of the Na channels + the gate of the chemical intermediate so that membrane hyperpolarization occurs (receptor potential) which decreases the release of the inhibitor transmitter so that bipolar neurons do not experience inhibition or, in other words, experience excitation, resulting in the occurrence of an action potential in ganglion cells that propagate to the visual cortex in the brain's occipital lobe for visual perception[9].

The aim of this study is to be able to do a classification process on the image of retinopathy suspected as diabetic retinopathy. In this study will use the zoning method as feature extraction and Bayes method for classification.

3. Results and Discussion

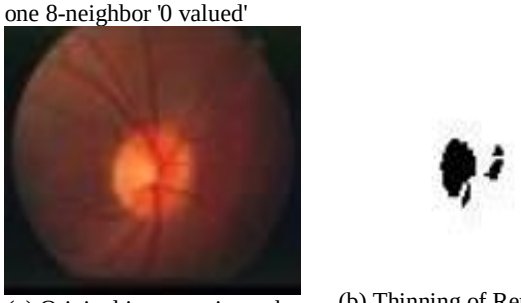
The initial process that is mostly done in image processing is changing the color image into a grayscale image, this is used to simplify the image model and use thresholding to adjust the amount of gray degrees in the image, at this stage use the threshold value 200 to get the gray value of the image of retinopathy.



(a) Original image retinopathy (b) Binerization of Retinopathy

Fig 2. Binerization Image

At this stage the image of Retinopathy that has undergone a binarization process will experience a process of thinning. Thinning is the process of extracting a frame from an object in a digital image. This can also be defined as the act of identifying the number of pixels that an object has. In this study Thinning Zhang-Suen technique was used. This algorithm is used for binary imagery, defined as 0 pixels of the background image, and the foreground (region) pixel is worth 1. Zhang Suen's method uses two successive basic steps applied to the contour points of a particular region, where contour points are each pixel with a value of '1' and having at least one 8-neighbor '0 valued'



(a) Original image retinopathy (b) Thinning of Retinopathy

Fig 3. Thinning Image

Zoning is one of the popular methods used for optical character recognition of documents. The zoning method consists of three processes, namely:

a. Calculate the number of black pixels for each zone from Z1 to Z1024.
b. Determine the zone that has the highest number of black pixels.
c. Calculate the feature value of each zone from Z1 to Z1024

That is using the formula:

The Zn = Zn / Z feature value is highest

where $1 \leq n \leq 1024$

Feature value is obtained by comparing the number of black pixel from one zone to the one obtained from process No. 2. At this stage, an image measuring 1024 x 1024 pixels is divided into 11 columns and 11 rows with each column having 10 pixels. The feature extraction process using zoning can be seen in Figure 4

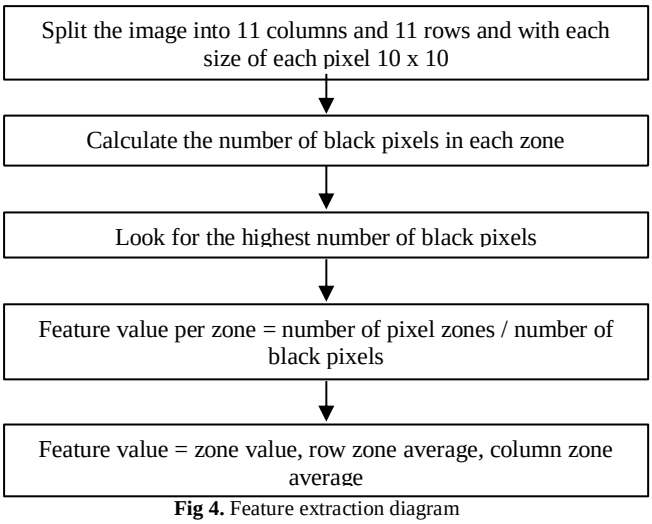


Fig 4. Feature extraction diagram

The above process is carried out up to the entire pixel image of the image known for its value and the next process is to find the Eigen value from the feature extraction feature.

Conclusion

Zoning is one of the processes carried out to extract the image features on retinal imagery before the identification process is carried out using Bayesian method and from the results of pixel testing, it is obtained in detail and then the recalculation process can be done to get the Eigen value.

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