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EARLY DIABETIC RETINOPATHY DETECTION USING DEEP LEARNING ALGORITHMS

[1]Bhonde Swati B., [2]Walunj Yashashree A., [3]Unde Komal B., [4]Vaishnav Rutuja K., [5]Sonawane Chhaya N.

[1]*Department of Computer Engineering, Amrutvahini College of Engineering, SangamneMaharashtra, India*
[2]*Department of Computer Engineering, Amrutvahini College of Engineering, SangamneMaharashtra, India*
[3]*Department of Computer Engineering, Amrutvahini College of Engineering, SangamneMaharashtra, India*
[4]*Department of Computer Engineering, Amrutvahini College of Engineering, SangamneMaharashtra, India*
[5]*Department of Computer Engineering, Amrutvahini College of Engineering, SangamneMaharashtra, India*

Abstract : *Diabetic retinopathy is the diminishment of the eyeball lifeblood vessels due to difficulty of diabetes, which can later lead to dropping of eyesight. The problem have only one solution through the use of a eyeball covering system that would identifiy the eyeball harm at an primal phase. This paper suggest the use of analysis working and breakdown techniques for the disclosure of lifeblood vessels, exudation and microaneurysms (are the most typical lesions of diabetic retinopathy, but also present in other pathologies that affect microvessels). The eyeball fundus image (as the process whereby reflected light is used to obtain a two-dimensional (2D) representation of the 3D, semitransparent, retinal tissues projected on to the imaging plane) is divided into four substitute images. Several features are educe from the eyeball fundus image. Haar wavelet transformations are applied for feature extraction this prosses comes after feature selection. Principal component analysis technique is then applied for greter feature selection. Back propagation neural network(Back-propagation is just a way of propagating the total loss back into the neural network to know how much of the loss every node is responsible for, and subsequently updating the weights in such a way that minimizes the loss by giving the nodes with higher error rates lower weights and vice versa.) and one rule classifier techniques are used for the classifying the images as diabetic or non-diabetic.*

Keywords : *Microaneurysm(are the most typical lesions of diabetic retinopathy, but also present in other pathologies that affect microvessels), One rule classifier, Principal component analysis, Back propagation neural networks, Classification, Diabetic retinopathy.*

I. Introduction

Diabetic retinopathy is a diabetic complications that affects eyes and it is diminishment of the eyeball lifeblood vessels due to difficulty of diabetes, which can later lead to dropping of eyesight. The problem have only one solution through the use of a eyeball covering system that would identifiy the eyeball harm at an primal phase. This paper suggest the use of analysis working and breakdown techniques for the disclosure of lifeblood vessels, exudation and microaneurysms (are the most typical lesions of diabetic retinopathy, but also present in other pathologies that affect microvessels). The eyeball fundus image (as the process whereby reflected light is used to obtain a two-dimensional (2D) representation of the 3D, semitransparent, retinal tissues 2 projected on to the imaging plane) is divided into four substitute images. Several features are educe from the eyeball fundus image. Haar wavelet transformations are applied for feature extraction this prosses comes after feature selection. Principal component analysis technique is then applied for greter feature selection. Back propagation neural network(Back-propagation is just a way of propagating the total loss back into the neural network to know how much of the loss every node is responsible for, and subsequently updating the weights in such a way that minimizes the loss by giving the nodes with higher error rates lower weights and vice versa.) and one rule classifier techniques are used for the classifying the images as diabetic or non-diabetic.

Motivation

Diabetic retinopathy identifes is an backbreaking task that needs to be executed conscientious that means equipping something with or the usage of and associated automation by computers and software. The closely resembling each other of this system will be exceedingly lead. subjective discernment are normally construct depend on health worker discernment and understanding sooner on the technical details accessible in the database. It is not simple for a doctor to have proficiency in every subspecialty. This leads to undesired preconception, faluts and unessential medical charge that might act on the aspect of service as long as to patients. Image Inspection tools can be cast-off for computerized observation of these various features and phase of Diabetes Retinopathy and can be mention to the expert correctly for interfere, thus making it a very successful tool for helpful conceal of DR patients.

II. LITERATURE SURVEY

M.Kamel,S.Belkassim A Neural Network Approach for automatic Detection of Microaneurysms in retinal Angiograms Explored a method using neural networks for detection of MA in retinal fundus images.

T.Spencer, J.Oison, K.Mc Hardy, p.sharp and J.Forrester An image Processing Strategy for the Segmentation Quantification in Flourescein Angiograms of the Ocular Fundus , Computers and Biomedical Researcd Used morphological processing where MA are detected from fluorescein angiograms. In this Technique, a bilinear type of top-hat transformation was used for the segmenting the images followed by region growing algorithm. Karnowskietal Retina Lesion and Microaneurysm segmentation using Morphological Reconstruction Methods with Ground-Truth Data Proposed a morphological reconstruction method for the segmentation of retinal lesions to separate blobs from true lesions.

Wei Zhou The sparse principal component analysis based unsupervised classification approach (SPCA-UCM) for Microaneurysms (MA) detection. The characteristics of the sparse Principal Component Analysis which blends the elastic net penalty with Principle Component Analysis can be used to select effective features.

Kedir M. Adal An Automated System for the Detection and Classification of Retinal Changes Due to Red Lesions in Longitudinal Fundus Images To detect spatio-temporal retinal changes, the absolute difference between the extremes of the multiscale blobness responses of fundus images from two time-points is proposed as a simple and effective blobness measure.

Junhao Wen Automatic Detection of Diabetic Retinopathy: A Review on Datasets, Methods and Evaluation Metrics The detection of DR can be manually performed by ophthalmologists and can also be done by an automated system.

Keerthi Ram, Gopal Datt Joshi A Successive Clutter-Rejection-Based Approach for Early Detection of Diabetic Retinopathy This present a new approach for automatic MA detection from digital color fundus images.

Sehrish Qummar A Deep Learning Ensemble Approach for Diabetic Retinopathy Detection. we used the publicly available Kaggle dataset of retina images to train an ensemble of five deep Convolution Neural Network (CNN) models.

Juan Shan Microaneurysm Detection Using Principal Component Analysis and Machine Learning Methods The performance of three classifiers and the pattern with different percentage of principal components are consistent on the two datasets.

Maria Mendonca Data Augmentation for Improving Proliferative Diabetic Retinopathy Detection in Eye Fundus Images. A heuristic-based data augmentation scheme based on the synthesis of neovessel (NV)-like structures that compensates for the lack of PDR cases in DR-labeled datasets.

Current Market Survey

The main causing of visual loss in the world is diabetic retinopathy. In the initial stages of this disease, the retinal microvasculature is affected by several abnormalities in the eye fundus such as the microaneurysms and/or dot hemorrhages, vascular hyper permeability signs, exudates, and capillary closures. Microaneurysm dynamics primarily increase the risk that the laser photocoagulation requires progression to the level. Diabetic retinopathy lesions are commonly accepted to be reversed and the progression of the retinopathy can only be slower during the early stages of the disease. The identification by repeated examination of patients affected of these initial lesions (mainly Microaneurysms and small blood cells) is expected as a new possibility of improving retinopathy treatment.

III. PROPOSED SYSTEM

1 Selection of retinal(Eyeball) fundus image:-

To use collection of image of dataset real to shortly recognition of disease. This data set was cast-off in the evaluation for image pre-processing that is pretreatment and extraction(removal) of features(aspect) for categorize of images into standard or untypical. There are total 89 images taken from this database to detect the patient is diabetic or not.

2 Pre-processing or Pretreatment of images:-

The medical image data, datset, figures come in varying size because they are comparable from unlike data bases

3 Feature Extraction:-

The next phase behind the preprocessing(pretreatment) is the feature extraction, where the features of the image that is to say, the area of lifeblood vessels, granulation and MA in the images are intended. The area intended is ready by utilize a curve to scan from peak left district of the image to the foot right district of the image to determine and number the dot with dublicate 1 that's means white pixels(dot). This idea is used for workout the field of lifeblood vessels, granulation and MA respectively from the final segmented images.

4 Vision selection:-

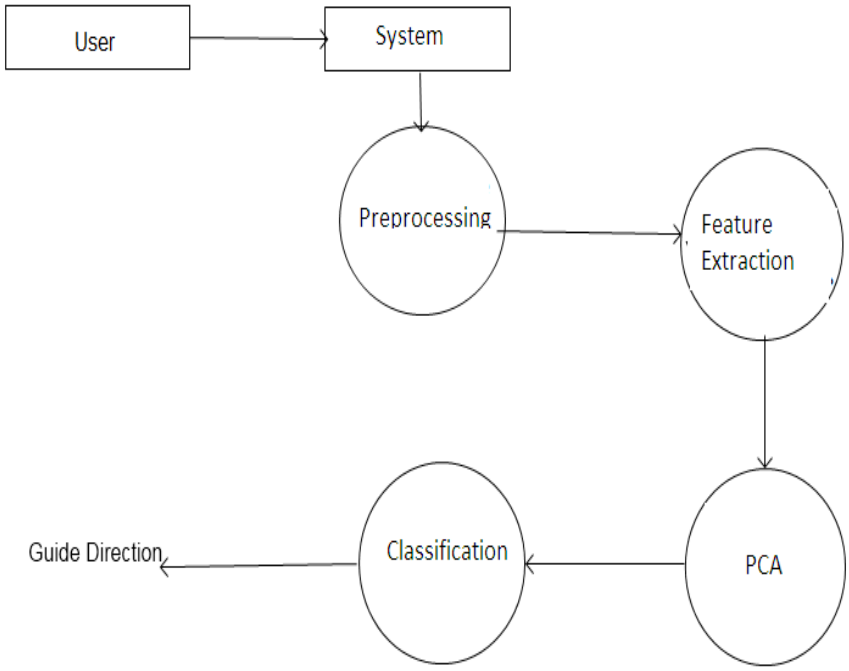
To choice important vision, Haar transform(avelet analysis is similar to Fourier analysis in that it allows a target function over an interval to be represented in terms) technique is cast-off, which would turn the evoke forty one vision towards sixty five discrete visions. Haar wavelet has been cast-off considerable in design identification due to its low computing precondition.

5 Categorization:-

Categorization is a data qurry technique whose aim is to isolate the data set into various classes which are extend.

6 BPNN Allocation:-

The BPNN breakthrough should be trained with the examples of intensionaloutturn. It modify the heaviness of the network in very rapidly mode.



IV. Working of Proposed System

To analyse the presence of microaneurysm in fundus image using convolutional neural network algorithms that embeds deep learning as a core component accelerated with GPU(Graphics Processing Unit) which will perform medical image detection and segmentation with high-performance and low-latency inference. The semantic segmentation algorithm is utilized to classify the fundus picture as normal or infected. Semantic segmentation divides the image pixels based on their common semantic to identify the feature of microaneurysm. List of Modules:

1. Selection of retinal fundus image
2. Image preprocessing
3. Feature extraction
4. Segmentation
5. Template Matching
6. Lesion detection algorithm

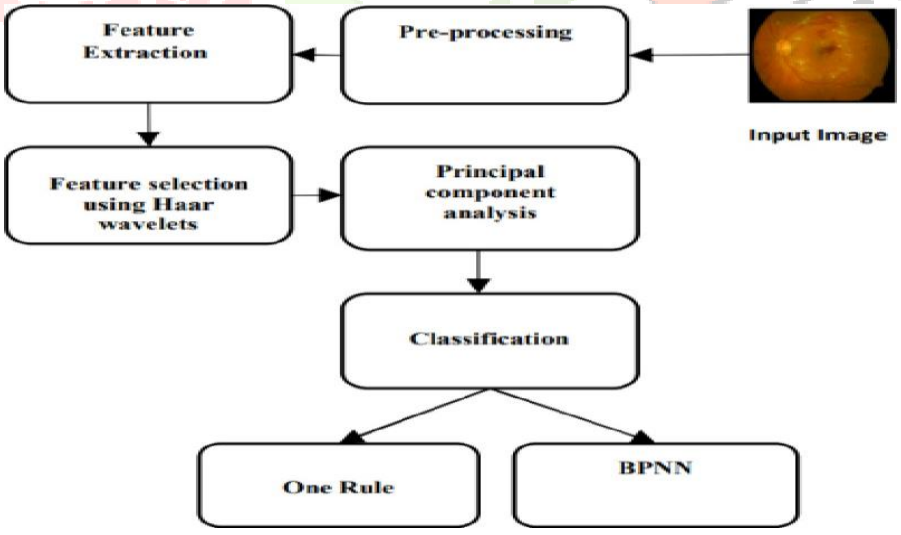


Fig.1. Architecture of System

- **Software and Hardware requirements of the project:**

1. **Software**

Microsoft visual studio 2010 C# .Net,CUDA(Compute Unified Device Architecture)
Operating System : Windows XP, Windows 7.

2. **Hardware**
   RAM–: 2 GB or more
   HDD–: 500 GB or more
   Processor–: Pentium 4.0 GHz or higher

V. Algorithms

1) One Rule Algorithm

- Input data:
T - collection of training data,
A- set of attributes
AttR - Attributes to consider for rules
C- Classes
-Output data: O - rules with maximum accuracy or minimum error
Step 1: Set O = null
Step 2: for each set of attribute A in AttR, do
Assign OA = null
for each possible value, v of A, do
for each Ci belonging to C, do
find the number of Ci
end for
If Cmax is the class with the maximum
Count
OA = OA ((A=v) -> (class= Cmax))
end for
ERROROA = number of entries
incorrectly classified by OA
end for
Step 3: Assign O = OA, where
ERROROA is minimum

2) BPNN Classification algorithm (Back Propagation Neural Network) :

//Initialize the training set T with input pattern p and expected output EO.
//Set the no of Layers L, N- No of nodes, H- hidden layers Terr- total error
//e – error, WN – weight of each node N, T- threshold, A-activation
//set the values of each weight to a random number between -1 and +1 Repeat the following steps till termination condition is reached:
for each input in the T
apply p to the neural network
for each L belonging to the network
for every N in the layer
1. Compute the weighted sum of the inputs to N
2. Sum = Sum + T
3. Compute A
end for
end for
for every N in the output layer
compute e
end for
for each H
for each Nin the L
1. Compute e
2. Revise WN
End
End
compute Terr
end for

VI. APPLICATIONS

Early identification is been done using this application to normal patients.This system can useful in hospitals for pre checkup, if the big system is not available

VII. CONCLUSIONS

Principal Component Analysis based unregulated classification approach for detecting microaneurysm was developed. This System will provide an automated system that will assist ophthalmologists to grade the fundus images as early NPDR, moderate NPDR, and severe NPDR.

VIII. SCOPE OF THE PROJECT

In the present work, more emphasis is given for the retinal images in the Non-proliferative stage of Diabetic Retinopathy. Further, there is a scope to extend this work in the area of proliferative stage of Diabetic Retinopathy.

Various algorithms have been adopted for segmentation purpose and they have been tested for their consistency. However, the algorithm that is not covered in this work may be tried to obtain still better results.

The images from the standard databases are used for evaluation purpose. The real time images can be used for evaluation with the assistance of expert ophthalmologists.

It is further suggested that the future extension of this work may consider the segmentation of other abnormal features like drusen,cotton wool spot etc. during developing of automatic screening system of DR.

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