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Comparative Study of Diabetic Retinopathy Images Using Feature Extraction Algorithms

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ABSTRACT: Today's high-tech health care worlds professionals are diagnosis the diseases with connectivity of body part one from another. The rolling tongue has many relationships and active connections in the physical body. The diabetic is a burly organ used to speak, taste and swallow the food. The purpose of the organ extends to identify the inner working of a human body. For Disease diagnosis analyzing using PCA color segmentation. Diabetic Images are analyzed for diagnosis using GLCM along with SURF method. Analysis of Diabetic for Diagnosis of Ulcer and Thyroid Using HOG. Then segmentation is done to extract the specific part from the tongue and parameters collected from a healthy patient are considered to be the LBP value. The parameters collected from the extracted tongue image are compared with the threshold value and the current condition of patient is identified. SIFT algorithm is introduced to display the details of the patient whether patient is in a safe or critical condition. In the experimental results, the result compared to other available techniques in Diabetic the disease. The proposed system has been simulated in MATLAB.

KEYWORDS: DIABETIC IMAGE, FEATURE EXTRACTION ALGORITHMS, PCA, SURF, SIFT, GLCM, HOG, LBP.

I. INTRODUCTION

The insulin is defined has hormone, diabetes is a type of disease that capable to affect our body's through producing insulin or make use of it. Insulin will act as a "key". When our body turns into food then it eat as glucose, for transport this glucose into cell the insulin help to release. Due to the increasing of blood sugar level rather than normal level they are individually affected by diabetes.

- Obesity is common for all age,
- Hormone changes.

When the eye damage the retina is named has retinopathy, it causes the vision injury. It often refers to the retinal vascular sickness by causing irregular blood flows. Diabetes Retinopathy is complication it leads the causes of blindness. Membrane defined the retina it covers back of the eye it become highly sensitive in light. Eyes are hit by converting that light signals it will interpret the brain.

DIGITAL IMAGE PROCESSING

The computer visions of image processing succession are classified into low level, mid level and high level of process. In the low-level method both the inputs and outputs are categorized by images. In Mid level process the input categorizes by images and the output is categorized by features this is extracted from the images of output identity, edges and contours.

In the last phase, high-level process is passed out to make the sense of considerate and autonomous routing for vision of individual objects.

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From Low to Mid level processes are devoted to image processing, whereas from mid to high level processes are devoted to computer visualization.

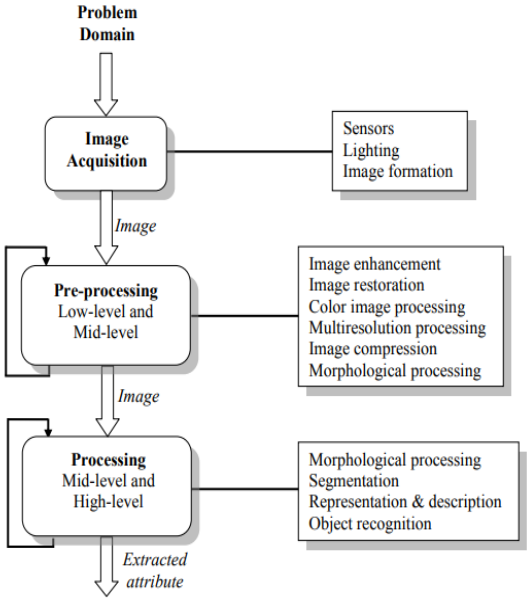

Figure 1. Architecture of Digital Image Processing

DIABETICS RETINOPATHY

The complication of retinal vasculature is affected by microangiopathy diabetes. The diabetes retinopathy are complicated for diabetes person it affects eye directly. In the back of the retina the blood vessels are damaged with light sensitive tissues. At first the diabetic's retinopathy causes no symptoms but mild vision problems occur and it can causes blindness.

In longer if you have diabetes and less control in blood glucose, the more likely to develop the eye complications. When the blood vessels of retina change then it occurs the diabetic retinopathy of eye diseases it is a most common disease for those affected by insulin changes.

Leak fluids and swell vessels sometimes even, if close it off completely. In the retina surface the new abnormal blood vessels grown.

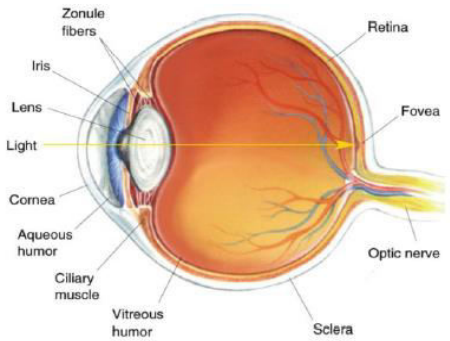

Figure 2: Structure of a human eye

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Then vision loss in human eye's because at the juncture the veins capilleriers are become thick so it will create a spills. The 4 stages of diabetes retinopathy are pictorially shown in the form of slide in Figure 1.2, and also other explained one after other in follows.

II. LITERATUIRE SURVEY

1) A Modern Screening Approach for Detection of Diabetic Retinopathy

Author: S.D. Shirbahadurkar, V. M. Mane and D. V. Jadhav (2017)

Diabetic retinopathy (DR) is an impediment of micro vascular for the diabetes that causes the retina of deformities. The main source of DR is blindness or loss of the vision. The analyzing early and diagnosed is an effective way for the treatment of curing diabetic retinopathy. In this existing system, the screening teleophthalmology has sent all the captured retina images via evaluation of VSAT in hospital to expert the ophthalmologists. This system very expensive and causes the unnecessary traffic of data in the internet as well as evaluate the as ophthalmologists received all type of images. An automated image 'fundus' was presented in this work through analyzing the diabetic retinopathy in the early stages itself, and change the predictable teleophthalmology. This system captures the "fundus image" of retina of patients by handling the funudus cameras at the camp site of screening.

The present techniques provide a low expensive and accurate so the screening camp easily conducts throughout the whole region and it include the rural places. From different regions extract the hybrid features to classify the diabetic retinopathy image at the camp site screening and enable the decision tree holoentropy to utilize the classification. In the base hospital camp site there are three stages implemented to automatically detect MAs from fundus retinal image. All the possible MAs are extracted and the feature vectors of all candidates along with the label class as given input for training HDT classifier. In the DR image level classification gives a better results as well as the detection of individual of fundus images in MAs.

2) AUTOMATED DETECTION OF DIABETIC RETINOPATHY USING SVM

Author: Enrique V. Carrera, Andr´es Gonz´alez and Ricardo Carrera (2017)

For diabetic patients eye diseases is a common for all population it cause the diabetic retinopathy of blindness. From the initial detection of DR protection will help them to vision loss. This process assist the computer diagnosis based on the retinal images of digital process in order to help the people to detect the DR in advanced. At any of retinal images automatically segment the grade from the non-proliferative DR at any of the retinal images. Almost 94% sensibility of DRNP detects using the SVM process, while DRNP can classify the average of 85% accuracy. Those compare with other algorithm of machine learning SVM consist the best results. Potential to detect the retinal image using this algorithm plays major roles to identify the diabetic retinopathy diagnosis are concluded.

In diabetic retinopathy the diagnosis tools are presented to integrate the evaluation of clinical inn future and present results are encouraged. Other futures implemented are in order to analysis the sensibility and accuracy, in addition hard exudates, soft exudates and other texture application developed to diagnosis the diabetic retinopathy.

3) AUTOMATED DETECTION SYSTEM FOR DIABETIC RETINOPATHY USING TWO FIELD FUNDUS PHOTOGRAPHY

Authors: Sharath Kumar P Na, Deepak R Ua, and Rajesh Kumar Ra (2016)

Diabetic retinopathy (DR) lead to cause vision loss is caused by damage the retina from complication for diabetes. Better management for DR and analysis of retinal photograph to characteristics of key used to diagnosis the

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early result of diabetic's retinopathy. This research presents a method to automate the analysis and segment the retina as non DR and DR using this two fields fundus and mydriatic photography.

The region of optic disc is located by multi level wavelet decomposition and region growing recursive for automatically recognize seed points. There are two filtered medium images of blood vessels are applied to extract the histogram algorithm. Using three phase of intensity transformation red lesions detected and analyzing multi-level histogram in white lesions. In DR or Non DR retina is finally classified to aggregate each image from extracted lesions. To validate against the diagnosis by expert of panel ophthalmologists images from databases are the proposed method

The observed specificity and sensitivity were 60% and 80% respectively. Based on the two fields of photography the results show the automated screening it can be applied to routine screening. For achieving the best results the automatic diagnosis methodologies of two fields fundus photography are study in this survey.

Validate experts against the evaluation of ophthalmologist's fundus images are proposed in this method. It returned overall specificity 73% and specificity 89% in the present techniques. Considering 85% of diabetic population, do not have any of the symptoms from DR4, 55% of specificity will reduce the workload of ophthalmologist by 45% approximately it gives high ration of ophthalmologist gives best advantage to the patients. We plan to improve the further detection rates of mild NPDR case by characteristics of specific analysis it will increase further Sn of system. Similarly the Sp of system to improve devising of algorithm for image quality to quantifying and information used to dynamic selection of red lesion recognize algorithm. An easier usage of system to better organize the details of patients so we also plan to develop the module of applications.

III. RESEARCH METHODOLOGY

FEATURE EXTRACTION

Feature extraction represented the detection of DR disease with the number of features. In the area of image processing feature extraction plays a significant role. There are various processing executed in images like normalization, resizing, thresholding etc. After this process it utilized the images for detection and segmentation process of images.

In the research methodology discussed about the type of features applied, to get better results with comparison algorithms. The initial method is acquiring the images from the database of patients from the zones of hospitals. This carried out the pre-processing techniques and analyzes the color of retina images and similarly the following processes are performed. Extracting green channel,

From general available dataset of patients are considering by two publicly proposed system for trained and tested this are the way the images are separated. For feature extraction the scanning process is analyzed by defined terms of True Positives (TP), True Negatives (TN), False Positives (FP), and False Negatives (FN).

$$Sensitivity\ (sen) = \frac{TP}{(TP+FN)} \times 100$$

$$Specificity\ (spe) = \frac{TN}{(TN+FP)} \times 100$$

$$Accuracy\ (acc) = \frac{(sen+spe)}{2} \times 100$$

Where,

TP - Number of abnormal properly identified image as abnormal

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TN - Number of normal properly identified images as normal.

FP - Number of normal improperly identified images as abnormal.

FN - Number of abnormal improperly identified images as normal.

Retinal based diabetic retinopathy diseases are analyzed in the below feature extraction process and comparison of extraction are being perform same process for all methodologies. Using various methods the features are extracted after the preprocessing completed. Using image processing techniques the unique blood vessels are obtained from the image.

- Smoothing
- Segmentation
- Morphological operations
- Thresholding

The dimensions of parameters of retinopathy diseases are identified with the process of dimensionality reduction. The below methodologies are various types with different equations to identified the main goal of diabetic retinopathy. But the intention is same for all methodologies but the usage is different comparing the algorithms and results identify the solution with optimal results.

B) GRAY LEVEL CO-OCCURRENCE MATRIX

For identifying the region of image the texture interested significantly by their characterized. GLCM is one of the primitive methods proposed in feature extraction. Using several applications many texture are analyzed since and it remained the important extraction of feature method in texture analysis domain. By Using GLCM objects are recognized and matched by the special co- occurrence matrices with multidimensional.

Normalized Diagonal of Co-Occurrence Matrix

Analayzing the co-occurance matrix using the following diagonal

- Maximum number of probabilities entry
- Different moment of element orders

  K: $\sum_i \sum_j (i - j)^2 D_{ij}$

This description is declared high value when the ‘D’ near to the main diagonals then it relatively based on low values. The position of the diagonal operator indicates the bands running in the intensity constant. When K=2 then it known as contrast.

- Contrast = $\sum_i \sum_j (i - j)^2 D_{ij}$
- Entropy = $\sum_i \sum_j D_{ij} \log D_{ij}$

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This will measure the randomness and having the highest values when the elements of D are all equal. In the term of checkpoints it declared the entropy would be very low.

$$\begin{bmatrix} 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \end{bmatrix} \rightarrow \begin{bmatrix} 0 & 8 \\ 8 & 0 \end{bmatrix}$$

- When all entries are equal the smallest value of

$$\text{Energy} = \sum_i \sum_j (i - j) D^2_{ij}$$

- In main diagonal the values are larger than the

$$\text{Homogeneity} = \sum_i \sum_j \frac{Dij}{|i-j|+1}$$

By promising the trace of texture analysis found using this algorithm. Texture database used for testing and feature extracted perform well in the techniques. In the proposed work, investigate regarding the performance of traces with the complete dataset of images and also three dimensional images are extracted. Here Explored the n-dimensional of Euclidean space are developed theoretically.

In the theoretical result shows the success level of exudates and hemorrhages with specificity 83.1%, sensitivity of 85.9% and accuracy success rate 87.9% are recognized diabetic retinopathy with usage of SIFT algorithm.

IV. RESULT AND DISCUSSION

This chapter presents the investigation analysis of presented model for detecting Diabetic Retinopathy. These presented works' performance is analyzed under various performance metrics such as detection accuracy, dimensionality reduction and time complexity.

COMPARISON OF METHODOLOGY WITH ACCURACY RATE

Exponentially increased the diabetic retinopathy patients from the last few years as a results the DR identified has become a big challenge for the extraction of retinal fundus images.

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Technique	Sensitivity (%)	Specificity(%)	Accuracy (%)
PCA	96.5%	94.5%	97.3%
GLCM	80%	83.1%	85.9%
SURF	81%	79%	83.2%
HOG	80.4%	87%	89.4%
LBP	83.5%	90%	91.5%
SIFT	77%	85.5%	84%

Table 1: Comparison algorithm for DR Accuracy detection

In the above table 4.1 compared the algorithm for final result of best accuracy levels. By comparing the result of tables there are specificity, sensitivity and accuracy level are analyzed.

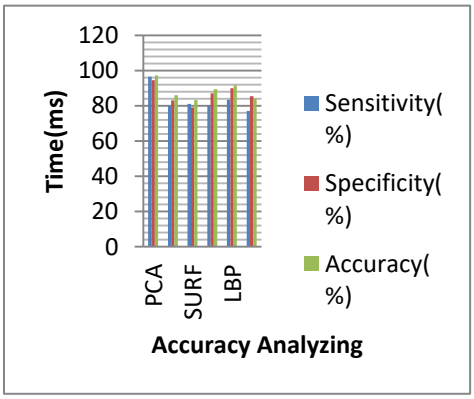

Figure 3 Analyzing Accuracy level

By analyzing the two process sensitivity and specificity the accuracy level is identified. In the comparison algorithm the PCA show the best accuracy rate for finding the DR.

4.2 Dimensionality Reduction methodology

For the feature extraction, the retinal fundus images are detected by using the PCA for reducing the dimensionality of retinal fundus images with large-scale. PCA performed a better function to make a process faster of data reduction and reliable.

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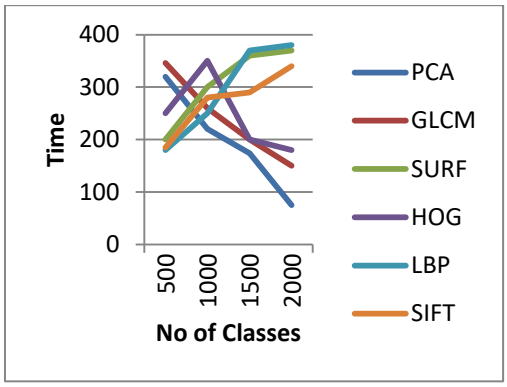

Figure 4. Dimensionality Reduction

The outcomes of the presented optic-disc detection models were compared with various algorithm methods in terms of detection accuracy, dimensionality reduced, time complexity. From the proposed techniques PCA provide more accuracy and dimensionality reduced experimental results.

V. CONCLUSION AND FUTURE ENHANCEMENT

Efficient algorithm for detecting, hemorrhages/microaneurysms, blood vessels, hard exudates and optic disc have been presented. The experimental comparison is commonly used to declare the image segmentation and achieved the performance gain. In order to exploit the high specificity and sensitivity used to enhance the process of increasing the abnormal and normal fundus images by training the method. The proposed extracted features show the high potential for DRNP classification and detection.

PCA decreased the dimensionality of complexity with high accuracy level. Therefore, features extracted are rapidly computed and achieved accuracy by using the PCA algorithm. This algorithm processed significant role to reduce the similar elements using feature vectors. PCA can detect DRNP with the successful rate of sensitivity 98.5% and Specificity 99.5%, while diabetic retinopathy can be segmented with the accuracy of 98.9%. PCA consistently shows better results compared with other algorithms. The results encouraged the future evaluation of diabetic retinopathy disease with the best-fit of results.

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