



# GLCM feature extraction in Retinal Image

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**ABSTRACT**— Precise recognition of exudates in the diabetic retinal pictures is a testing assignment. The pictures can have changing complexity and shading qualities. In this paper creators introduce the execution examination of two element extraction strategies in particular shading power elements and second request surface components taking into account GLCM. Creators have proposed and executed new approach for GLCM highlight figuring in which the data picture is isolated into number littler pieces and GLCM components are processed on these squares. The execution of every element extraction strategy is assessed utilizing Back Propagation Neural Network (BPNN) classifier that is grouping the pieces as either anomalous square or Ordinary Square. With GLCM highlights, a precision of 76.6% was gotten and with shading includes an exactness of 100% was acquired. It was found that shading elements are preferred in distinguishing genuine positives over GLCM based composition highlights.

However utilization of GLCM components diminishes the event of false positives. The pictures will have varieties and shading qualities. In this paper creators speak to the execution correlation of 2 highlight extraction methodologies square measure first is shading power alternatives and another is request composition choices basically in light of GLCM. we tend to have arranged and execute new approach for GLCM highlight count in that the information picture is isolated into extent littler pieces and GLCM choices square measure ascertained on these pieces. The execution of each element extraction method is assessed abuse Back Propagation Neural Network (BPNN) classifier that is isolating the pieces as either anomalous square or customary square. Abuse GLCM choices, Associate in nursing exactness of seventy six.6% was gotten and with shading choices get the 100 percent precision. Amid this we tend to find that shading choices square measure higher in trademark genuine positives than GLCM basically based surface alternatives. Misuse GLCM choices decreases the rate of false positive.

**KEYWORDS**- Texture features, Hard exudates, GLCM features, Back propagation neural network, Naïve bias Classifier.

## I. INTRODUCTION

Anomaly recognition in pictures is anticipated to assume an imperative part in some genuine applications. One key case is the screening of medicinal pictures. A quick, precise, and dependable technique for variation from the norm discovery in pictures will help incredibly in enhancing the social insurance screening process. Existing endeavors in variation from the norm location have to a great extent been centered around social databases. They can be sorted into two principle approaches. In the principal approach, a standard of what are the standards is initially settled.

Another imperative part of variation from the norm recognition in medicinal pictures is that a therapeutic picture information is normally exceptionally boisterous, which is a normal for all restorative data.[19][12] To acquire significant discovery exactness, we require, specifically, to manage inaccurately named preparing information. As indicated by WHO estimation, more than 75% of patients, who have had diabetes for over 20 years are liable to build up some type of Diabetic Retinopathy (DR). Various types of strange injuries are brought about by diabetic retinopathy. Changes in vein measurement, smaller scale aneurysms, lipid, protein stores otherwise called hard exudates, cotton fleece spots, hemorrhages and new vessel development are different attributes of Diabetic Retinopathy.

Diabetic Retinopathy can prompt visual deficiency. To keep this, occasional screening and robotized early location is required. The screening programs create a huge number of retinal pictures since diabetic patients normally have both their eyes inspected in any event once in a year.

The manual screening strategies have both high money related expense and human asset necessities. These days, a few methodologies have been considered to construct programmed PC based screening programs. Mechanized recognition can diminish the workload and expansion the viable subsequent administration of diabetic patients. As per United Nations office estimation, more than seventy fifth of patients, United Nations organization have had polygenic malady for more than a quarter century surely to build up some sort of Diabetic Retinopathy (DR). Changes in vessel width, small scale aneurysms, lipid, and macromolecule stores conjointly called hard exudates, plant fiber spots, hemorrhages and new vessel development are differed qualities of Diabetic Retinopathy. Diabetic Retinopathy will bring about visual deformity. To keep this, occasional screening and turn out a colossal number of retinal pictures since diabetic patient's programmed early location is required. The screening programs by and large have each their eyes inspected at least once amid a year. The manual screening ways have every high cash cost and human asset needs. These days, a few methodologies are considered to make programmed PC based screening programs. Robotized discovery will downsize the work and expand the compelling subsequent administration of diabetic patients. In numerous patients, the sole unmistakable side effects of DR are Exudates. Grave exudates happening inside the macula will bring about imperative visual issue. These components affect the looks of exudates inside the retinal pictures. A few procedures like agglomeration, morphological operations, pel shrewd order misuse BPNN, SVM are used for the exudates identification. of these systems have high process prerequisite.

## **II. LITERATURE SURVEY**

Shantala Giraddi, 2015 According to estimation, a lot of than seventy fifth of patients, United Nations agency had polygenic disease for a lot of than twenty years square measure seemingly to develop some variety of Diabetic Retinopathy. Completely different sorts of abnormal injuries square measure caused by diabetic retinopathy. Changes in vessel diameter small aneurysms, lipid, super molecule deposits conjointly identified as laborious exudates, cotton wool spots, haemorrhages and new vessel growth square measure varied options of Diabetic Retinopathy (DR).

Akara Sopharak et.al, 2009 [1] during this planned system AN automatic technique to establish exudates from low-contrast digital pictures of Retinopathy patients with non-dilated pupils mistreatment a fuzzy c-means (FCM) clump technique. The clusters was optimally designated on the idea of a quantitative experiment.

These clusters was varied from 2 to eight based mostly on the sensitivity and specificity.\item Hussain F. Jaafar,2010[2] In complex body part images, bright Injury representing onerous and soft exudates square measure the earliest signs of diabetic retinopathy. In this paper, associate machine-driven technique for the detection of those exudates in retinal pictures is delineate. Candidates square measure detected by exploitation combination of coarse and fine segmentation. The coarse segmentation is predicated on neighbourhood variation operation to justify the boundaries of all candidates that have clear the borders. The fine sectionation is based mostly on associate ability of thresholding and a replacement split-and-merge technique to segment all bright candidates domestically. Exploitation a clinician's reference for ground truth exudates were notice from a information with eighty nine.7per sensitivity, 99.3per specificity and ninety-nine.4per accuracy. Due to its totally different performance measures, the projected system is also with success applied to pictures of variable quality.

Keerthi Ram,2011 [4] The presence of micro aneurysms (MAs) is typically associate degree early sign of diabetic retinopathy(DR) and their automatic detection from color retinal pictures is of clinical interest. During this paper, we have a tendency to represent a brand new approach for automatic MA detection from digital color complex body part pictures. we have a tendency to formulate MA detection as a drag of target detection from litter, wherever the chance of prevalence of target is significantly smaller as compared to the litter. The process stages are designed to reject specific categories of litter whereas passing majority of true MAs, employing a set of specialised options. Results of analysis of the projected technique on 3 completely different retinal image datasets is reported , and are wont to highlight the promise within the conferred strategy.

Eman M.Shahin,2012 [5] Diabetic retinopathy (DR) could be a scenario wherever the tissue layer is broken thanks to fluid unseaworthy from the blood vessels into the tissue layer. In extreme cases, the patient are blind. Therefore, early detection of diabetic retinopathy is decide to stop visual defect. the most steps of diabetic retinopathy arnon-proliferate polygenic disease retinopathy (NPDR) and proliferate polygenic disease retinopathy (PDR). during this paper, we have a tendency to propose a system for machine-driven classification of traditional, and abnormal retinal pictures by mechanically detective work the blood vessels, arduous exudates micro aneurysms, entropy and homogeneity. the target measurements like blood vessels space, exudates space, micro aneurysms space, entropy and homogeneity are evaluated from the computed retinal pictures. Different techniques for image restoration AR compared on complex body part pictures.

D. Siva SUNDHARA RAJA,2015[6] In developing countries, diabetic retinopathy (DR) is the leading cause of visual disorder in diabetic patients due to the content like intraocular high blood pressure or highaldohexose level. Its detection in associate earlier stage is important to forestall vision loss in diabetic patients. In this technique, the pc based mostly automatic screening system for diabetic retinopathy is planned.



DR is known by police work the abnormal lesions like haemorrhages in retinal pictures and analysing its relationship with the area region. The planned system consists of the following steps, these are: retinal image sweetening and classification, haemorrhages detection and segmentation, area localization and Diabetic Retinopathy classification. The multi directional native bar chart effort is used to update the retinal image for higher classification rate. The Dennis Gabor translate and Support vector machine (SVM) classifier is employed for retinal image classifications. The sensitivity and specificity of haemorrhages detection are ninetyfour.76per.and 99.85per. Severally. During this approach, the severity of Diabetic Retinopathy in diabetic patients will be simply known by police work area region and haemorrhage lesions.

Santosh Kumar, 2015[7] Macular dropsy is associate one advance stage of diabetic retinopathy that affects central vision of polygenic disorder patients. the most reason for dropsy is that the presence of exudates close toor on macular region in human membrane. If the exudates are seem within the macular region of membrane, it'll cause diabetic macular dropsy.

Early detection of macular puffiness in diabetic patients covers a path for bar from vision defect. The automated system for early sight ion of diabetic macular puffiness ought to detect all doable exudates gift on the surface of tissue layer. Within the planned methodology, a pc based mostly diagnosing system is style for the detection of the exudates in color retinal anatomical structure pictures. This method consists of following stages; candidate exudates detection, feature extraction and classification. The system is enforced victimization

(i) Background estimation, morphological reconstruction, normalisation for candidate exudates detection (ii) grey level co-occurrence matrix for feature extraction and (iii) support vector machine for classification. Victimization classifier it classifies in between the region of exudates and non-exudates. The system performance is computed in terms of the subsequent parameters like sensitivity, specificity, Mathew's correlation constant, positive predicative price, and accuracy.

Sourav Samanta,2014[8] in line with recent work, glaucoma, AN nervous opticus illness, is taken into account in concert of the main causes cause vision defect. it's affected a additional range of individuals worldwide. Texture of traditional retinal image and eye disease image is exactly completely different. Here texture property of the whole image has been obtained from each with and while not eye disease image. during this system, Horlicks options area unit accustomed distinction between traditional and eye disease affected tissue layer. Extracted options are use to coach the rear propagation neural network. Classification of eye disease affected eye is with success obtained with AN accuracy of ninety six.

### **III. PROBLEM DEFINITION**

To Identifying Abnormalities in the Retinal Images utilizing GLCM highlight to distinguish diabetes of individual. A factual strategy for inspecting composition that considers the spatial relationship of pixels is the dark level co-event lattice (GLCM), otherwise called the dim level spatial reliance network. The GLCM capacities describe the composition of a picture by computing how regularly combines of pixel with particular qualities and in a predefined spatial relationship happen in a picture, making a GLCM, and afterward separating factual measures from this grid.

(The surface channel capacities, portrayed in Texture Analysis can't give data about shape, i.e., the spatial connections of pixels in a picture.).

#### IV. PROPOSED ALGORITHM

In this planned methodology as shown in Fig one. For characteristic racking of image 2 strategies are used. The Feature set I embody numerous 1st order texture properties like mean, variance, asymmetry and kurtosis from red and inexperienced channel of the image.

Feature set II includes second order properties that primarily based on GLCM like homogeneity, contrast, correlation and variance. These 2 feature sets are support to BPNN classifier that annotate the input take a look at image block as traditional or abnormal.

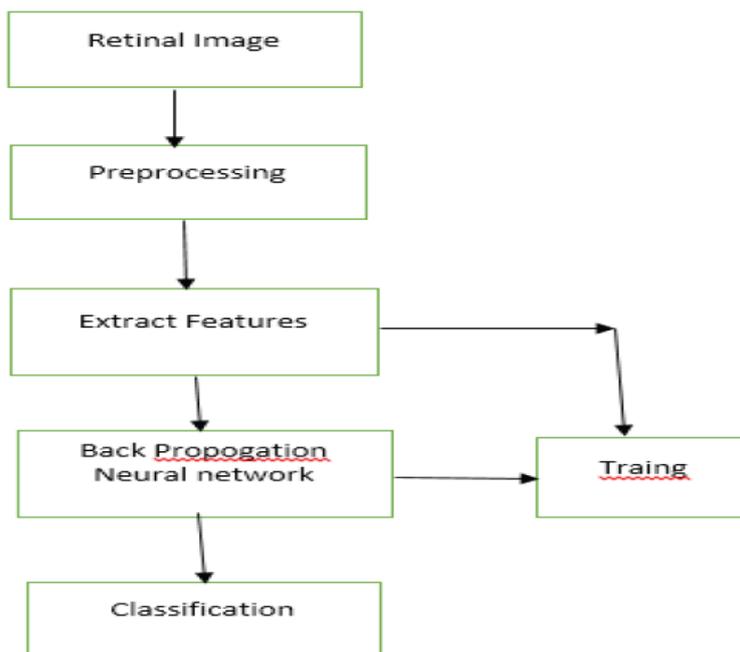
##### A. Pre-processing

The input pictures are color pictures with size 1150\*1500. Images are converse improve exploitation accommodative bar chart effort that works on little knowledge regions. For wrenching 1st order property, inexperienced channel and red channel of the image are extracted. For wrenching second order options, the scaled pictures are changed into gray scale pictures.

##### B. Partitioning of ROI

For partitioning pictures are classes as,

1. Traditional blocks
2. Exudates blocks
3. Vessel blocks
4. Optic disc blocks



**Fig 1. Methodology for Exudates detection**

C. gray Level Co-occurrence Matrix

Gray-level co-occurrence matrix (GLCM) is the applied mathematics techniques of analysing the textures that contain the spatial relationship between the pixels.

Contrast =

$$\sum_{n=0}^{\sigma-1} n^2 \{ \sum_{i=1}^{\sigma} \sum_{j=1}^{\sigma} p(i, j) \mid |i - j| = n \}$$

$$\text{Correlation} = \frac{\sum_{i=0}^{\sigma-1} \sum_{j=0}^{\sigma-1} \{iXj\}XP(i, j) - \{\mu_x X \mu_y\}}{\sigma_x \sigma_y}$$

$$\text{Energy} = \sum_{i=0}^{\sigma-1} \sum_{j=0}^{\sigma-1} P(i, j)^2$$

$$\text{Homogeneity} = \sum_{i=0}^{\sigma-1} \sum_{j=0}^{\sigma-1} \frac{P(i, j)}{(1+|i, j|)}$$

D. GLCM matrix calculation

A method of examining texture that considers the abstraction relationship of pixels is that the gray-level co-occurrence matrix (GLCM), additionally called the gray-level abstraction dependence matrix. The GLCM functions characterize the feel of a picture by shrewd however usually pairs of element with specific values and in an exceedingly fixed abstraction relationship occur in a picture, making a GLCM, so extracting applied mathematics measures from this matrix.

E. Second Order feature:

Various second order options (haralick) depends on GLCM is wrenched from input image.

F. 1st Order feature:

The intensity and it's variation within the retinal pictures may be measured by options like: median, mode, variance and variance. varied intensity characteristics that square measure wrenched from the colour retinal pictures.

Mean=

$$\sum_{x^*}^M 1$$

$$\text{Variance} = \frac{\sum_{x=1}^M \sum_{y=1}^N (I_i(x, y))}{M \times N}$$

$$\text{Skewness} = \frac{\sum_{x=1}^M \sum_{y=1}^N 1}{M}$$

$$\text{Kurtosis} = \frac{\sum_{x=1}^M \sum_{y=1}^N (I_i(x, y) - \mu)^4}{M \times N}$$

$$\text{Energy} = \frac{1}{M \times N} \sum_{x=1}^M \sum_{y=1}^N 1$$

$$\text{Entropy} = \frac{1}{M \times N} \sum_{x=1}^M \sum_{y=1}^N I_i(x, y) (-\ln I_i(x, y))$$

G. Differentiation Using Back Propagation Neural Network

Supervised learning algorithm is used in back propagation method. The network is learned using the data for which inputs and desired results are known. The algorithm changes the weight so as to reduce the mean square error between required and actual results of the network. Once the training is complete the weights are abstract and used to calculate results.

### V. RESULT AND ANALYSIS

Trials are directed with two models. Model I and Model II. Model II utilizes GLCM (second request) highlights though Model II utilizes shading highlights (first request). For both models, tests are led by changing the quantity of shrouded hubs. The perplexity frameworks for Model I and Model II utilizing BPNN are appeared as a part of Table 1 and Table 2. The execution of our system was assessed quantitatively by contrasting the outcome and ophthalmologists' ground-truth pictures at the square level. It can be seen that shading components are great in distinguishing exudates (100% precision with 5 shrouded hubs. Among the false positives, most elevated number of misclassified squares is ordinary pieces. With second request composition highlights, most elevated precision of 76.67% is acquired with 10 concealed hubs. The relating % of false positives is 17.67%. The precision for the identification of ordinary, Optic Disk and vessel pieces need not be considered since goal of this study is the recognition of exudates squares.

**Table 1. Confusion Matrix for Model I with Second Order texture Feature**

	EXUDATE	NORMAL background	OD	VESSEL
EXUDATE	76.67%	17.64%	8.33%	3.7%
NORMAL	0%	58.11%	0%	3.7%
OD	0%	8.45%	75.01	3.7%
VESSEL	23.33%	15.8%	16.66%	88.90%

**Table 2. Confusion Matrix for Model II with First Order texture Feature**

	EXUDATE	NORMAL background	OD	VESSEL
EXUDATE	100%	24.63%	16.66%	7.4%
NORMAL	0%	37.13	0%	3.7%
OD	0%	4.05%	75%	0%
VESSEL	0%	34.19%	8.34%	88.9%

### VI. CONCLUSION

We creates novel methodology for recognition of exudates in view of first request and second request surface elements. To start with request composition elements can recognize exudates more successfully than second request highlights. False positives couldn't be disposed of totally. Among the hinders that are delegated false exudates, lion's share of them

are ordinary squares. To enhance the specificity, different classifiers like SVM can be utilized. Our future work will taking into account SVM classifiers for exudates discovery.

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