International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 08 | Aug -2016 www.irjet.net p-ISSN: 2395-0072

Implementation of the Exudates detection for Diabetic Patients

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Abstract - *The objective of the paper is to detect the Exudates formed due to the long term Diabetics. Diabetic retinopathy is a major cause of blindness that is formed due to long term Diabetics. Early Detection and cause prevents the blindness. First the Enhancement of the retinal images is done by contrast Enhancement technique. Contrast Enhancement can be done using the AHE or CLAHE technique and the noise is removed using the median filtering technique. The optic disc detection can be done using Hough transform technique which is similar to exudates to avoid the confusion. The Fuzzy C Means (FCM) Clustering can be applied to detect the Exudates that are formed in the selected retinal Images and the Fuzzy Classifier distinguishes weather they are Exudates or not. So this helps the Ophthalmologists to get the clear idea regarding whether they are Exudates or not. It helps in the more accuracy and less time consuming. This technique can be applied for the automated system to detect the Exudates. So it avoids the manual screening process.*

Key Words: **Exudates, Diabetic Retinopathy, Contrast Enhancement, Median Filtering, Ophthalmologists.**

1.INTRODUCTION

Diabetic retinopathy is harm to the attention's retina that occurs with long-term diabetes. Diabetic Retinopathy (DR) is a major Intent of blindness in the people with diabetes. The World Health Organization (WHO) estimates that.135 million people have diabetes mellitus worldwide and that the number. Of people will increase to 300 million by the year 2025. In line with WHO greater than seventy five percent of sufferers, who have had diabetes for than twenty years, will Enhance some form of DR. Early detection and treatment can prevent visual loss and blindness. For this, mass screening is done on a regular basis. These Screening programs produce a huge amount of retinal photographs.

2. Proposed System

An automated system to detect the hard Exudates in the retinal Images (primary sign Of DR). We propose to work on the automatic detection of exudates using different algorithms. Extraction of hard exudates is carried out in the following stages.

• Image enhancement: Contrast enhancement is carried out using either of AHE or CLAHE techniques. The noise is removed using Median filter technique

• Optic disc detection: Hough Transform is used.

• Detection of Exudates in the image: FCM clustering algorithm is used to detect clusters in the image and the fuzzy classifier distinguishes whether the clusters are exudates or not.

2.1 IMAGE ENHANCEMENT:

To obtain an Image suitable for feature extraction, We perform severalesteps of pre-processing. First, each Image is converted To grayscale by taking the average of the,red, green and blue Channels. Second, we perform Median filtering to remove Noise. Finally, Contrast-Limited Adaptive Histogram Equalization (CLAHE) is applied To Enhance the Contrast. Exudates and Optic disc,regions are typically much higher in Intensity, so CLAHE technique assigns them highest Intensity values.

2.2 OPTIC DISC DETECTION:

The optic.disc has similar Characteristics to hard Exudates. To preclude the optic disc from interfering with detection of exudates, We first realize the optic disc in the image. It.is detected using Hough transform.

2.3 EXUDATE DETECTION:

Exudates are the Yellow lesions of various shapes and measurement with quite distinctive margins. These are detected using FCM or Fuzzy C-means Clustering method. In fuzzy clustering, every point has a measure of belonging to clusters, as in fuzzy common sense, instead than belonging totally to only one cluster. For this reason, facets on the threshold of a cluster could also be within the cluster to a lesser measure than facets in the center of cluster.

3. Sample Code

3.1 Pre-processing of the selected image:

```
functionpreprocess Callback(hObject, eventdata,
handles)
Module:
gray=rgb2gray(handles.S );
L= med f ilt2(gray, [45]);
J= adapthisteq(L);
handles.pre=J;
axes(handles.axes2);
imshow(J);
```

3.2 Optic Disk Detection:

```
functionopticdiscdetection Callback(hObject,
eventdata, handles)
Module:
s=max(max(max(gre1)));
s=double(s);
t=8;
[gr, nr, si, ti, s1]=regiongrow(gre1, s, t);
area = regionprops(L, Area );
area1 =struct2array(area);
area2 =max(area1);
lar = find(area1(:) == area2);
BB = regionprops(L, Centroid );
centr =BB(lar).Centroid;
if centr(1,1)¡150
centr(1, 1) =centr(1, 1) − 10;
else
centr(1, 1) =centr(1, 1) + 10;
end
[hc, mc, nc] =circle(centr, 25, 30);
xs = mc;
xs =xs ;
ys = nc;
ys =ys ;
handles.Ae =r;
axes(handles.axes3);
```

3.3 Exudate detection:

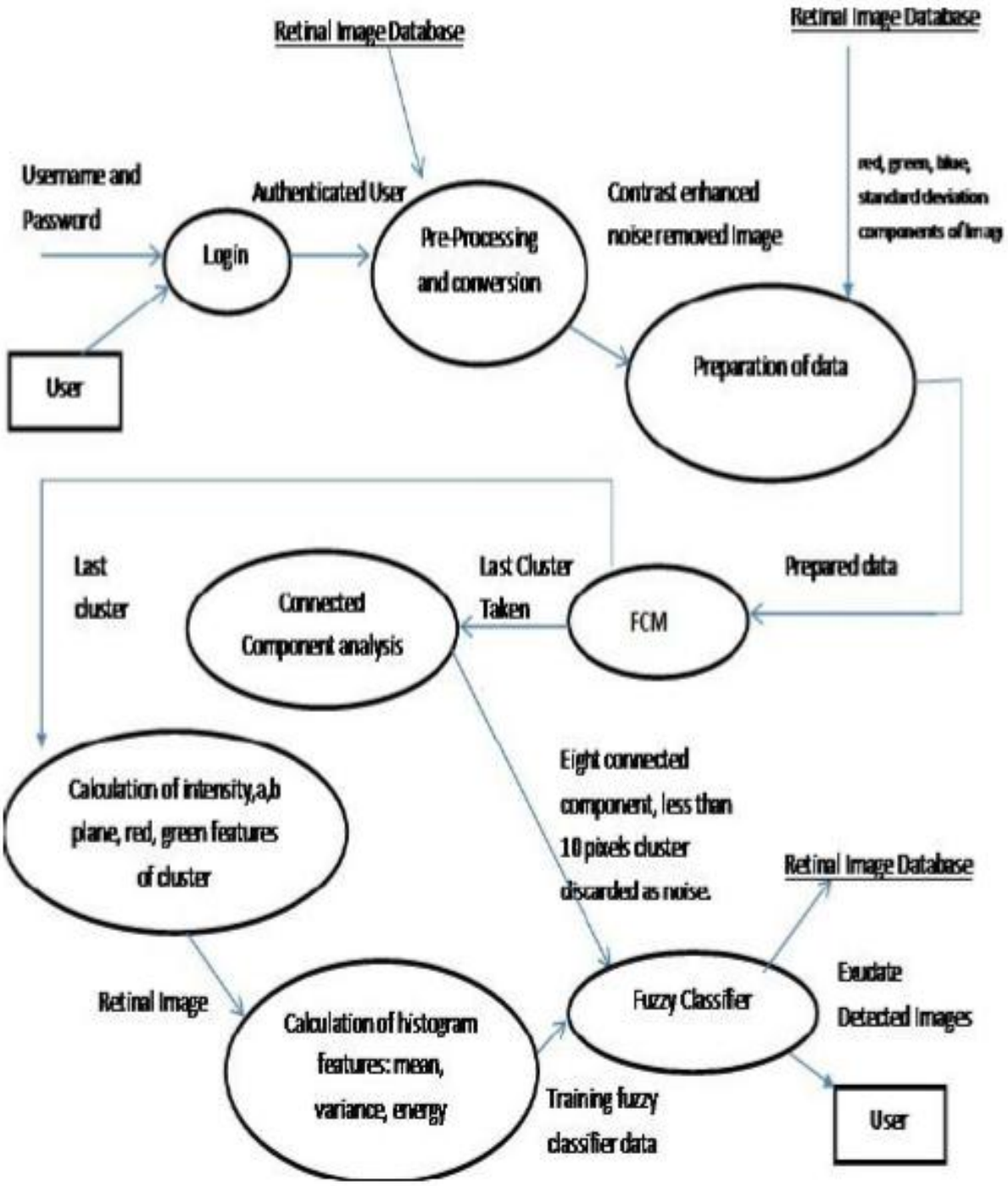
```
functionexudatedetection Callback(hObject,
eventdata, handles)
Module:
red=rgb(:, :, 1);
green =rgb(:, :, 2);
blu =rgb(:, :, 3);
red= med f ilt2(red);
green=med f ilt2(green);
blu= med f ilt2(blu); red=imad just(red);
green= imad just(green);
blu= imad just(blu);
hsi=rgb2hsv(rgb);
hue=hsi(:, :, 1);
sat =hsi(:,:,2);
inte=hsi(:, :, 3);
inteadapt=adapthisteq(inte);
rgbhsi=cat(3, green, hue, inteadapt);
ab=double(rgbhsi);
nrows = size(rgbhsi, 1);
ncols = size(rgbhsi, 2);
data = reshape(ab, nrows ∗ ncols, 3);
[clusterc enter, U] = f cm(data, 6);
[dmp, clusteri dx] = max(U);
```

3.4 Thresholding Image:

```
functionedit3 Callback(hObject, eventdata, handles)
Module:
segmentedi mages = cell(1, 3);
rgbl abel = repmat(mask, [111]);
handles.mask=mask;
for k=1:lplabel
color = rgb;
color(rgbl abel = k)= 0;
segmentedi magesk = color;
end.
```

4. Flow Diagram:

4.1 Data Flow Diagram



4.2 Flow Chart

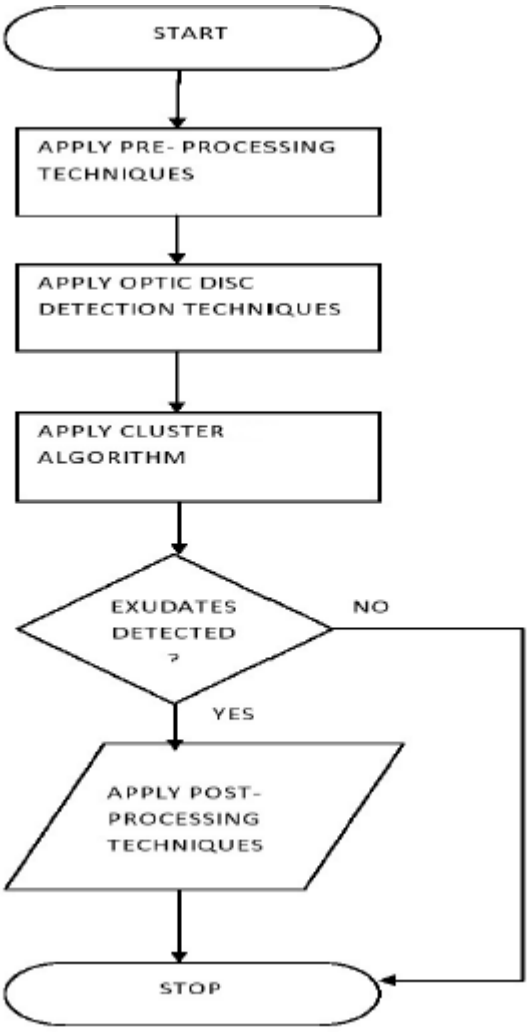


Fig 2: Flow Chart

5. Conclusion:

We proposed 25 images as potentially indicative of 33exudates and used FCM Clustering technique for feature selection. Our outcome exhibit that careful preprocessing and an suitable clustering technique togetheraprovide an excellentaExudate detection performance. 25 images from the DIARETDB0 and DIARETDB1 database were tested. Each Image took approximately 12 seconds to process which includes 3 seconds for optic disc detection and 9-10 seconds for cluster detection. The result of the cluster detection was super imposed on the original Image. The previously unclear Exudates regions were visibly highlighted and The Exudates were clearly seen. This type of presentation will enable the ophthalmologists To diagnose clearly and quickly. The optic disc detection technique proved to be very efficient with 15 out of 20 images presenting good results.

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