

1 Optic Disc and Blood Vessels Screening in Diabetes Mellitus 2 using Otsu's Method

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7 **Abstract**

8 Diabetes Mellitus (DM) has type-1 type 2. So in diabetes type-2 is very severe disease which
9 creates complications and effect on various part of body. Most sensitive part of body is Eye
10 which is affected by DM responsible in progression of Diabetic Retinopathy (DR). DR is a
11 slowly effects on eye come to focus when the changes on the retina have progressed to a level
12 at which treatment turns complicate, so an early diagnosis and referral to an ophthalmologist
13 or optometrist for the management of this disease can prevent 98

14

15 **Index terms**— diabetic retinopathy, thresholding, otsu.

16 **1 I. INTRODUCTION**

17 The Diabetes Mellitus (DM) is nothing but it is a set of chronic and degenerative disorders that involves alterations
18 in the metabolism of carbohydrates, lipids, and proteins, as a consequence of a decreasing in the production of
19 the hormone insulin for the β cells from the pancreas, and a resistance to the hormone's action in the different
20 tissues [1]. One of the most serious complications of the DM is the DR [2], which is the main cause of worldwide
21 blindness in the economically active population, because it affects people between 20 to 74 years old [3,4]. Two
22 types of clinical DR exist: Non-Proliferative Diabetic Retinopathy (NPDR), also called Background Retinopathy
23 and Proliferative.

24 Diabetic Retinopathy (DR), this work aims to detect the optic disc (OD) and the blood vessels; these are
25 very important & sensitive part from anatomy of eye. Also, the optic disc and the exudates are the bright area
26 of the image. Detection of optic disc and the blood vessels can help the ophthalmologists to detect the diseases
27 earlier and faster. With help of using mathematical morphology methods such as closing, filling, morphological
28 reconstruction and Otsu algorithm Optic disc and the blood vessels can be detected and eliminated.

29 Main cause of Diabetic Retinopathy is increase in high sugar level in the small blood vessels in retina. This
30 increase in glucose level attacks on tiny blood vessels and optic disk in eye causes increase in ocular Author ?: P D
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33 pressure in eye. Due to increase in pressure vessels may leak, or swelling may be observed in severe stage of
34 retinopathy.

35 We in this research work using the screening method of diabetic retinopathy which can reduce the risk of
36 blindness by 50% [1]- [2]. Therefore, early detection could reduce the severity of the disease and treating the
37 disease more efficiently. It is very important to detect the optic disc so that after optic disk detection we can
38 identify the other fundus features. The optic disc looks like as the elliptical shape in the eye fundus image. Its
39 size varies from human eye to eye, between one-tenth and one-fifth of the image [3]. In color image, it appears as
40 the bright yellowish region as the exudates. The optic disc is the normal feature of the image but the exudates
41 are the abnormal case. Detection the optic disc can be used to reduce the false positive in the detection of the
42 exudates [4] [5].

43 A number of methods for optic disc detection and blood vessels detection have been published. Osareh et al. [6]
44 located the optic disc center by means of template matching and extracted its boundary using a snake initialized

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45 on a morphologically enhanced region of the optic disc. Lowell et al. [7] also localized the OD by means of
46 template matching as well as also selected a deformable contour model for its segmentation. Another deformable
47 model-based approach was presented in [8]. Another template-matching approach for OD segmentation is the
48 Hausdorff-based template matching presented by Lalonde et al. [9]. Initially, they determined a set of OD
49 candidate regions by means of multi resolution processing through pyramidal decomposition. For each OD region
50 candidate, they calculated a simple confidence value representing the ratio between the mean intensity inside
51 the candidate region and inside its neighborhood. As final step, using the Hausdorff distance between the edge
52 map regions and circular templates with different radii, they decided the OD among all the candidates. There
53 are some methods for blood vessels detection in retinal fundus images such as region growing technique [10] All
54 possible thresholds are evaluated in this way, and the one that maximizes γ is chosen as the optimal threshold.
55 The closing (morphology) operator is useful in detection of vessels. While using closing operator it is important to
56 select structuring element. The closing is a dilation followed by erosion that joins the very close objects together.
57 Then, the result image is binaries by thresholding using Otsu algorithm [11]. The result image is shown in
58 Fig. 6 (b). The filling operator is applied to fill the holes in the image and the result image is shown in Fig. 6
59 (c). The result image is reconstructed by using the morphology reconstruction and is shown in Fig. 6 (d). To
60 detect the optic disc region, the Otsu algorithm is applied on the difference between the original image and the
61 reconstructed image. The optic disc detected area is shown in Fig. 6 (e). The results of the optic disc detection
62 are shown in Fig. 6

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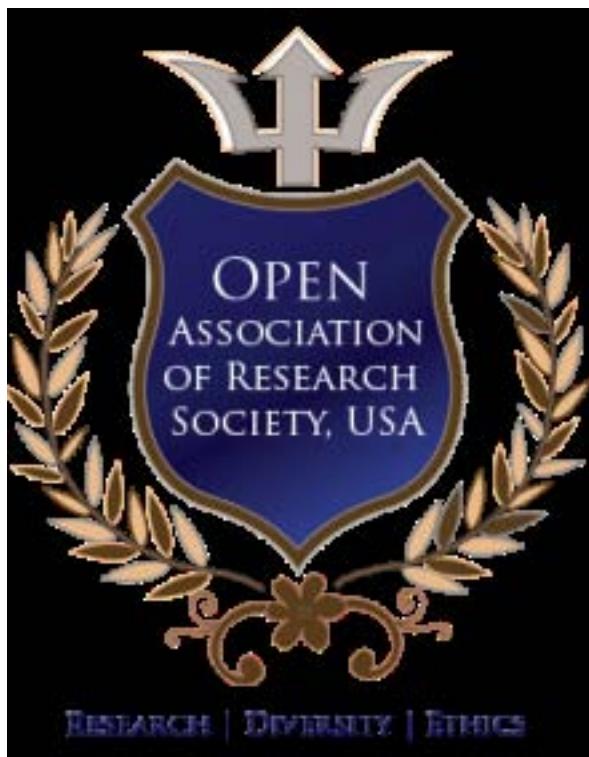


Figure 1: T

$$112 \quad \omega = \sum_{i=0}^T P(i) \quad P(i) = n_i / N$$

Figure 2: Step 1 :Fig. 1 :Fig. 2 :

$$\mu = \sum_{i=0}^T iP(i) / \omega$$

6

Figure 3: Fig. 6 :

$$\partial_t^2 = \sum_{i=0}^T (i - \mu)^2 P(i)$$

Figure 4:

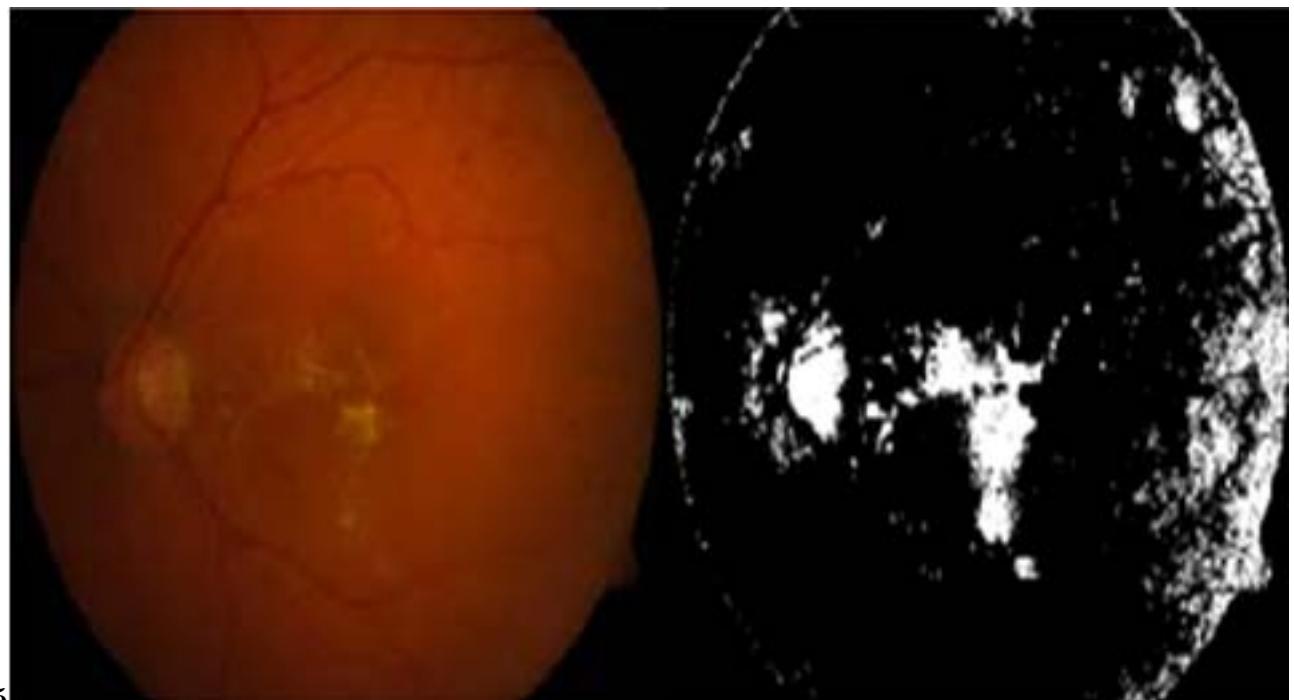


Figure 5: Fig. 5 :

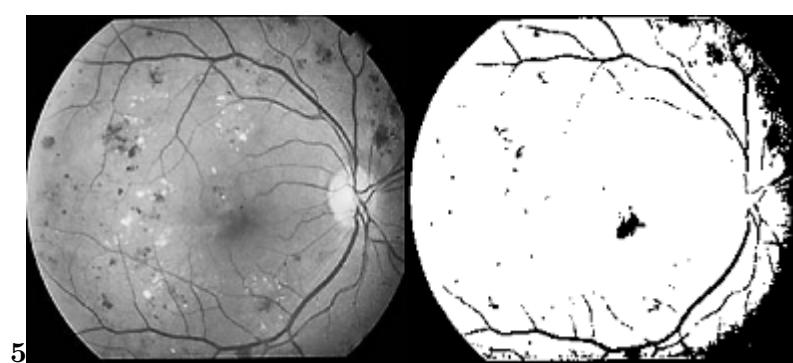
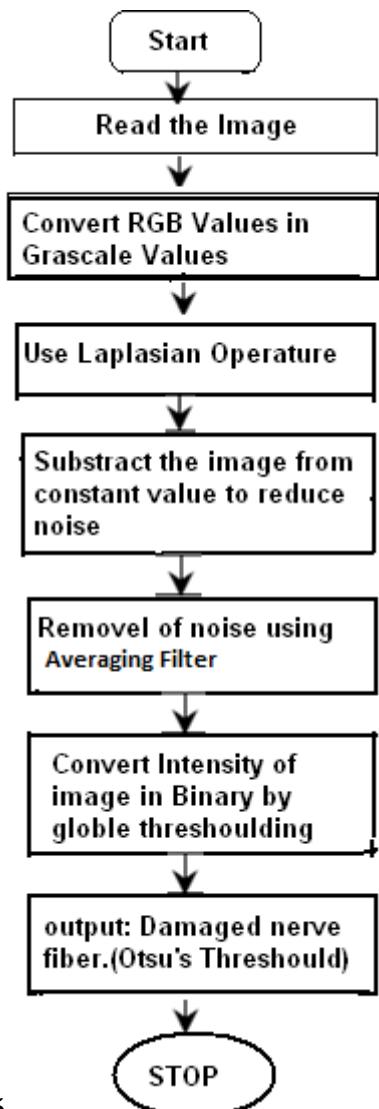


Figure 6: Fig. 5 :



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Figure 7: Fig. 5 :

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