Retraction

Retraction: Screening the Condition of Diabetic Retinopathy in Infected Retinal Images (J. Phys.: Conf. Ser. 1916 012038)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Screening the Condition of Diabetic Retinopathy in Infected Retinal Images

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Abstract. In recent days, most of the diabetic patients are affected by vision problem due to Glaucoma. In many cases, an untreated glaucoma will lead to loss of sight. To avoid such complications and to identify the risk well in advance, a new image processing based approach is presented in this article. This method detects the existence of hard exudates and evaluate the brutality of the threat based on the extracted features. The proposed method involves three stages of process such as extraction of region of interest (ROI), feature selection and abnormality classification. Initially, a region of interest is calculated using segmentation and the foreground features are selected by estimating the presence of hard exudates from the centre of the optical disc. Finally, the severity of DR is identified with the help of extracted features based on the Bayes classifier. Experiment was carried in MATLAB environment and the performance was evaluated using the metrics such as accuracy, precision and false alarm.

1. Introduction
Glaucoma is one among the major reasons for vision loss in current history for diabetic patients. Macular degeneration (DR) is the sign of increased mental ill. According to the statistics, it is observed that the diabetic patient will have glaucoma after 20 years the diabetes occurred. Based on the statements given by WHO, at present more than 170 million people across the globe are infected with retinopathy and this may further be increased to a large number by 2030. Persistent of DR for long period will lead to blindness. When affected person is detected in the non-escalate stage, then the further severity of the disease will be controlled and it will be cured. On the other hand, if it is identified in the proliferative stage, then it will not be cured and affect the vision. Screening the glaucoma is a rigorous process and it includes a percentage of experimental study. In India, the availability of clinical technicians are very less in proportion to the number patients so that the manual screening process is more time consuming. The implementation of smart system for automatic screening will eradicate this issue. Moreover, the village people can avail telemedicine with automatic process. [1] stated that glaucoma mostly effects on aged 40 years or older people as per the survey around Tamil Nadu, southern part of India. The effect of visual failure and visual deficiency from glaucoma is in all likelihood expensive. Recently, various research articles have been proposed to identify the risk of glaucoma by the research aspirants. [2] presented the super pixel classification to identify glaucoma. Most of the earlier researches involve conventional segmentation algorithms to identify the glaucoma. However, these algorithms fail to
extract the boundary features exactly. [3] used local thresholding to extract the affected retinal blood vessels. [4] used active contour model to get feature descriptors for identifying glaucoma. In view of the above context, image processing based the matching algorithm is presented in this paper to identify the severity of glaucoma with good accuracy. Figure 1 shows the cross sectional view of human eye and its fundus image.

2. System Overview
The overall concept and the process flow of the proposed approach are given in Figure 2 and Figure 3. It involves three stages of processing including foreground detection, features selection and feature localization to locate the severity of diabetic retinopathy.
2.1. Foreground detection
Diabetic macular lump (DME) is that the sophisticated indication of glaucoma and might cause irremediable vision impairments. Severity of Diabetic Macular lump (DME) is decided by the situation of hard exudes (HE) clusters within the macula. The region in and round the macula is typically focused for DME detection. In the first phase of the proposed algorithm, the good features of the fundus mask for input image is found and the region which consists of good features are considered as the region of interest. Since the green color plane of an input image has more details, only the green channel is considered for the extraction of ROI. The process of extraction of ROI determines the macula-centric automatically because of the presence of macula inside the ROI.

2.2. Feature selection
Once the good features are extracted in the region of interest, the presence of hard exudates are identified using log-likelihood approach. Based on the hard exudate features, the feature descriptors are calculated and the feature maps are generated. In this feature map, the affected human eye has peak values with respect to the regions of hard exudates whereas the normal human eye will have uniform values. During learning phase, the feature descriptors of normal retinal image are learned and the severity of glaucoma...
is estimated by matching the cross correlation co-efficient. It aids in the improvement of image quality and enables easy observation of retina by enhancing the interpretability of the fundus image.

2.3. Abnormality detection
Finally, the extracted features are used for the identification abnormality of glaucoma in the retinal image. First the false features are removed from the feature space and the features of normal retinal images are leaned with high accuracy. Once, the learning phase is completed, the input image is transmuted to this feature space. If the features of this input image falls within the extracted region of interest, then that image is interpreted as affected image. Finally, the Euclidian distance from the centroid is calculated and the severity of glaucoma is identified. The proposed method is reliable for the identification of EXs in retinal images.

![Image](image-url)

**Figure 4.** Experiment results of normal image: (a) Resized image, (b) Green color plane, (c) Pre-processed image, (d) binary image, and (e) identified foreground region
Figure 5. Experimental results of infected image: (a) Resized image, (b) Green component, (c) Pre-processed image, (d) binary image, and (e) identified foreground region

Later, the binary exudation part is exploited for DME severity grading based on the location information. Proposed approach makes use of sample dataset of 20 Normal and 20 affected images and the images are pre-processed initially to make this more suitable to further process. To avoid file path conflicts, all images are loaded using image name of a particular format. The filter value based blobs are properly identified after classifying the images based on the quantity of the blobs present in terms of counts. It is observed that the blob count should be low for normal images and to be high for affected images.

3. Results and Discussion
Experiment is conducted on the proposed system using MATLAB simulation environment and the performance is compared with the other existing methodologies. Figures 4 depict the qualitative outputs of proposed approach, it is observed that, the normal fundus image has no hard exudates and the affected image has more hard exudates. Thus, the proposed method predicts that the image shown in Figure.5 as high risk of glaucoma and it refers the patients for further clinical assistance. From the results, it is observed that the proposed approach effectively detects the presence of the glaucoma by extracting the foreground features accurately compared to the others.
Table 1. Comparison of performance metrics.

| Metrics                   | Precision | Accuracy | False alarm |
|---------------------------|-----------|----------|-------------|
| Gabor filter              | 0.821     | 0.85     | 0.179       |
| Background subtraction    | 0.736     | 0.745    | 0.255       |
| Proposed method           | 0.8752    | 0.90     | 0.084       |

Figure 6. Confusion matrix

Figure 7. Plot of accuracy: (a) For different filter size, (b) For different blob counts
In addition to the qualitative results, the numerical analysis is done by evaluating the performance metrics such as accuracy, precision and false alarm rate [5]. These metrics are calculated using the constraints such as true positives (TP), false positives (FP), true negatives (TN) and false negatives (FN) as per the confusion matrix shown in Figure 6. The quantitative results are listed in Table 1. It is confirmed that this new approach gives 87.52% of precision and 90 % of accuracy. Figure 7 shows the estimated accuracy for different filter size. Figure 8 shows the accuracy versus blob counts. From the results, it is concluded that the proposed approach achieves good accuracy for filter size of 0.05 and blob count as 3.

4. Conclusion
In this article, screening of diabetic retinopathy for diabetic patients with good accuracy is presented. This method uses three stages of processing such as ROI extraction, suitable feature candidate selection and feature classification. The proposed method is implemented in MATLAB environment and 200 normal and 400 infected images are used for testing the performance. The performance of the system is analyzed using evaluation metrics. The classification accuracy for the Generic Database is obtained as 90 % which is high compared with other methods. The performance of the system can be further enhanced by training with a large number of training with the help of deep neural network.

References
[1] Thulasiraj, R. D., et al. 2003. Blindness and vision impairment in a rural south Indian population: the Aravind Comprehensive Eye Survey. *Ophthalmology*, vol. 110, no.8, pp. 1491-1498.
[2] Cheng, J et al. 2013. Super pixel classification based optic disc and optic cup segmentation for glaucoma screening. *IEEE transactions on Medical Imaging*, vol. 32, no.6, pp. 1019-1032.
[3] Singh, N. P., Kumar, R., & Srivastava, R. 2015. Local entropy thresholding based fast retinal vessels segmentation by modifying matched filter. *In proceedings of IEEE conference on Computing, Communication & Automation (ICCCA)*, pp. 1166-1170.
[4] S, D., & H, A. (2019). AODV Route Discovery and Route Maintenance in MANETs. 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS). doi:10.1109/icaccs.2019.8728456
[5] H. Anandakumar and K. Umanatheswari, An Efficient Optimized Handover in Cognitive Radio Networks using Cooperative Spectrum Sensing, Intelligent Automation & Soft Computing, pp. 1–8, Sep. 2017. doi:10.1080/10798587.2017.1364931