ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 10, Issue 4, 2017

Online - 2455-3891
Print - 0974-2441

Review Article

AUTOMATIC DETECTION OF DIABETIC RETINOPATHY THROUGH OPTIC DISC USING MORPHOLOGICAL METHODS

UDAYAKUMAR E*, SANTHI S, YOGESHWARAN K, RAMA J

Department of ECE, KIT-Kalaignarkarunanidhi Institute of Technology, Coimbatore, Tamil Nadu, India.
Email: udayakumar.sujith@gmail.com

Received: 06 January 2017, Revised and Accepted: 29 January 2017

ABSTRACT

This paper proposes a method for the automatic detection of optic disc in retinal images. In the diagnosis and grading, the essential step is recognition of optic disk for diabetic retinopathy. The analysis of directional cross-section profile focused on the local maximum pixel of pre-processed image is realized by the proposed method using optic disc detection. Each profile is implemented by peak detection and property like shape, size, and height of the peak are estimated. The statistical measure of the estimated values for the attributes, where the orientation of the cross-section changes the constitute feature used in morphological classification to exclude encourages candidates. The result is to find the patient is affected by diabetics or not.

Keywords: Diabetic retinopathy, Optic disk, Naives Bayes algorithm, Local maximum region.

 DOI: http://dx.doi.org/10.22159/ajpcr.2017.v10i4.16962

INTRODUCTION

Retinal defects due to diabetes are detected by diabetic retinopathy detection [1]. Various steps are involved in this method, in diagnosing the retina (optic disk) affected parts consisting numerous rods and cons. By using morphological algorithm [2], blood vessels of defected eye are enhanced and extracted. In this algorithm, color images are converted into colorless images to make the process easy to spot the damage in the retina when compared to another algorithm such as Naives Bayes algorithm. The first undergoing pre-processing techniques are the extracted nerves of an affected optic disc. Selecting, sharping, and smoothing are the different process for identifying the exact position of defected region of a human eye [3]. In the next step, local maximum region (LMR) of a gray-scale (intensity) image is connected component of pixels, with constant intensity value such that every neighboring pixels of the region have low intensity. The LMRs of the pre-processed image is considering as MS candidate regions. In this process, we applied similar simple breadth-first search algorithm and calculation of gray-scale morphological reconstruction [4]. Sequentially pixels of the image are processed, and other neighboring images are compared. The next step for detecting is cross-sectional scanning, where scanning is done to the image, to shady the surrounding of a single maximum pixel in an optic disc candidate region, the intensity values along the discrete line segment of different orientations, where the central pixel is also referred as candidate pixel, and they are recorded.

DESIGN AND DEVELOPMENT

The design phase process many steps, referred as multi-step process, which targets on the system creation along with user specification and information's gathered to above phases. The operational details are translated from system requirement in this phase.

System design

The newly designed system fully operational and consistent in performance is made by the system design process. In the implementation of the system following step is followed.

- User training
- Implementation in planning.

In this implementation part, the system takes the site and loaded onto client's computer. In some case, the user's level exposure to computer, etc. For a month, these users are trained and run the system the documentation is prepared for the employees in a detailed manner; they are trained to access the software [5]. The hardware specification is checked on installing the software. The software is loaded for pilot run if hardware specification is satisfactory. By this time user training starts, user manual which documents how to use the system and all the exception handling procedure is given to user [6].

Input design

The part of overall system design is input design which requires very careful attention. In terms of both the equipment used and the number of people involved, the most expensive part of the system is the collection of input data: It is the point of most contact for the users with the computer system, and it is prone to error. The processing and output will magnify this error if input data are incorrect. The inputs are given in two ways to the system, existing users can directly enter into the system using a login form, and registration form has to be registered by the new users.

Output design

In the existing system, the micro aneurysms (MA) [7] is used for detection of diabetes. Diabetic retinopathy is the complications of diabetes and leading cause for blindness [8]. The evaluation of retinal images is performed for diagnosis of diabetic retinopathy. Resource demanding and manual grading of these images will determine the severity of diabetic retinopathy. In retina, the MA [9] is present, also it is the symptom of diabetic retinopathy.

The mathematical morphology which includes image enhancement, image segmentation, noise removal, and edge detection [10]. Dilation and erosion is very important techniques used in morphological operations. The object is to shrink is known as erosion. Due to the structuring element they shrink or grow in nature. The change in the light-blue square into blue square by a disk is known as erosion. Dilation and erosion are defined later for gray-scale images, and it is used for binary images in later. The intersection of input images coordinates and translated kernel coordinates is examining by dilation and erosion process. The block diagram is shown in Fig. 1.

Maximum region extraction

The intensity maximum structured and retinal image is an optical disc with a Gaussian intensity distribution. Every optic disc region has one regional maximum.

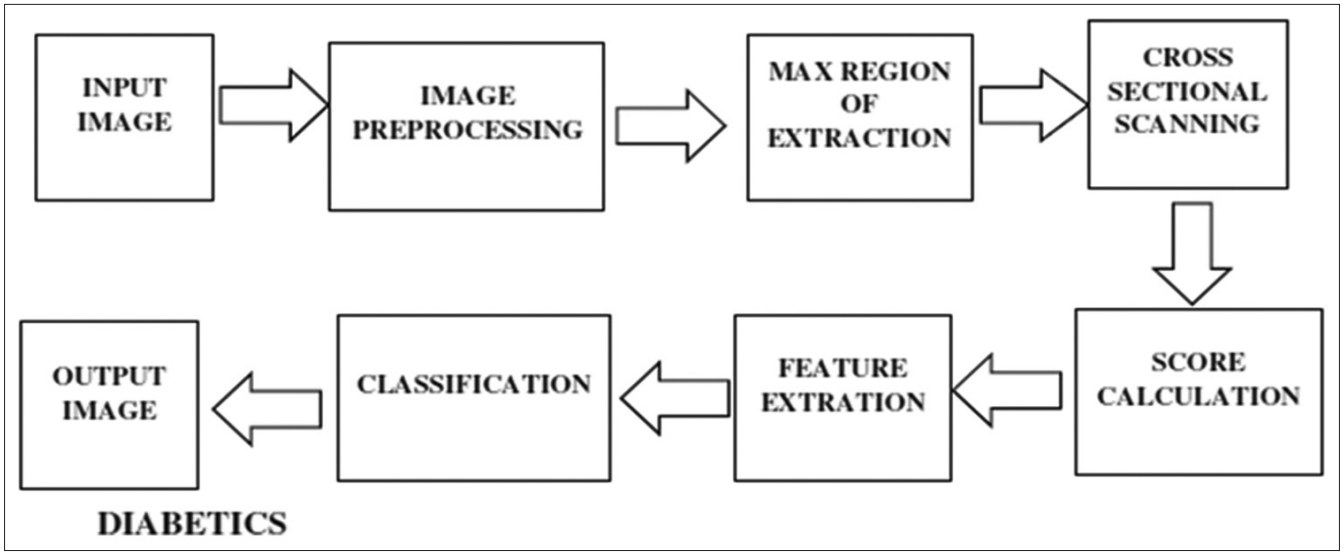

Fig. 1: Block diagram

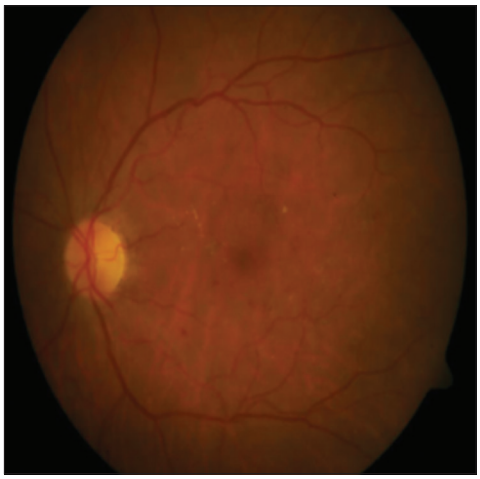

Fig. 2: Input image of normal patient

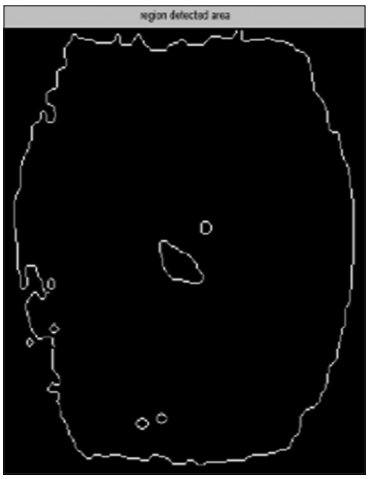

Fig. 4: Preprocessing of normal patient

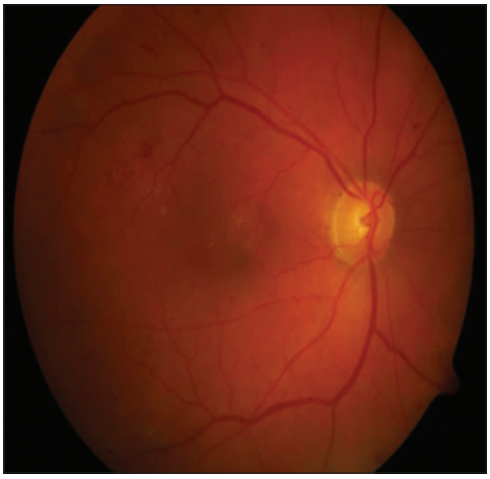

Fig. 3: Input image of affected patient

Fig. 5: Preprocessing of affected patient

Exudates segmentation

In an optic disc to find the surrounding of a pixel where the candidate pixel value is recorded.

RESULTS AND OUTPUT

- The image will be collected from the patient and collected in one folder

- The image will be taken for testing automatically from the folder
- First step is maximum region of extraction here the eye image will be preprocessed because the colored image cannot read in the software

Fig. 6: Extraction of normal patient

Fig. 7: Extraction of affected patient

- Second step is cross-sectional peak frequency the image will be calculated by taking seven parts such as peak width, top width, increasing ramp height, decreasing ramp height, and increasing ramp slope and decreasing ramp slope
- Third step is feature extraction in this step the affected part will be extracted from the patient eye image then the affected part will be shown in the display
- In final step is classification will show in the display that the patient is affected or not.

Input image (Figs. 2 and 3)

The input image of Normal and Affected patient is taken and after that it will be preprocessed. The input image of Normal and Affected patient image is shown in Fig. 2 and Fig 3.

Preprocessing (Figs. 4 and 5)

It is an improvement of the image that takes the unwanted distortions or enhances some features important for processing next. The Pre-processing of Normal Patient and Affected Patient image is shown in Fig. 4 and Fig. 5

Feature extraction (Figs. 6 and 7)

The Feature Extraction is used to extract a certain featured within an image. It is a transition from pictorial to non-pictorial data representation. The Feature Extraction of Normal Patient and Affected Patient image is shown in Fig. 6 and Fig. 7.

Classification (Figs. 8 and 9)

Every image is classified according to its visual content. The output image of normal Patient and Affected Patient is shown in Fig. 8 and Fig 9.

CONCLUSION

In this paper, proposed results for detecting the retinal damage of an affected diabetic patient using an optic disc which is more helpful in identifying blindness in an early stage. The databases of various input images are collected such as JPEG, GIF, and PNG in online. The techniques used here are preprocessing, maximum region calculation, feature extraction, and classification can easily determine the defected portion of a retina (optic disc). In existing system using MA for detecting retinal damage of a human eye instead of using the optic disc, the disadvantage is that high contrast is produced using of optical density (OD). Using of MA is not much easier as compare to OD because MA involves various steps, tedious process and calculations, and algorithms. In proposed

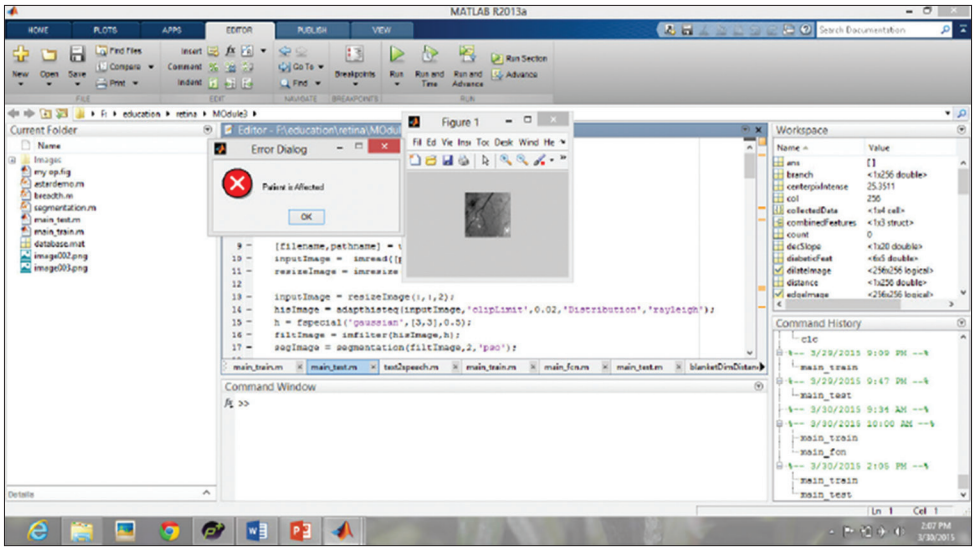

Fig. 8: Output image of normal image

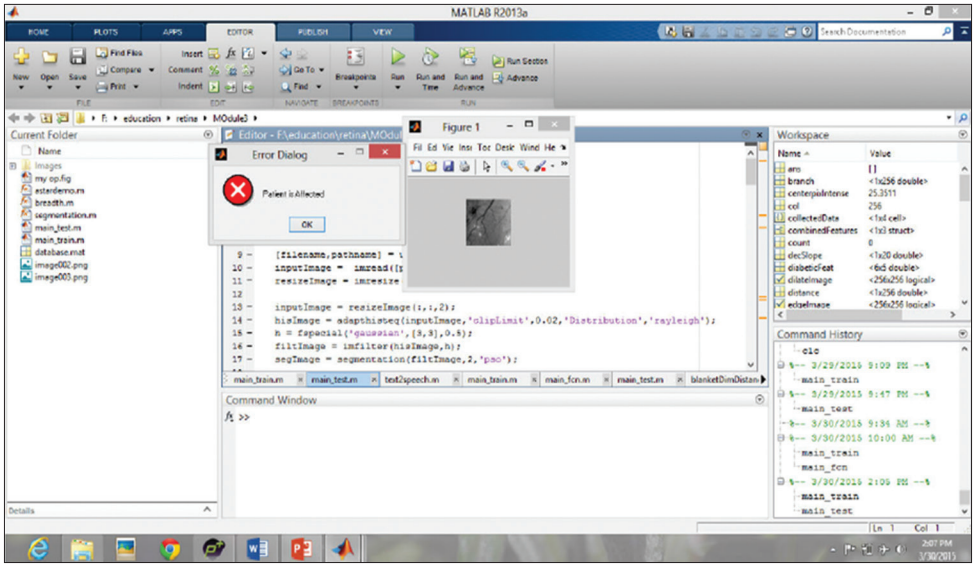

Fig. 9: Output image of affected patient

method, we are using the optic disc for identifying individual retinal defects in unique patterns. High contrast outputs images by using OD are suppressed in maximum region extraction because in proposed system using a morphological algorithm instead of Navie-Baye's calculation. Various steps done in existing method are reduced by this technique, score calculation of different candidates are identified. The efficiency, accuracy, and performance are highly increased using of the optic disc, the classification based on OD uses a simple based line detector, vessel segmentation, vessel enhancement, and most important technique used in proposed is drive and stare.

REFERENCES

1. Udayakumar E, Dhivya S, Pugalarasi M, Srihariand K, Karthik S. Certain investigation on human body using various algorithms. Aust J Basic Appl Sci AENSI J 2014;8:559-64.
2. Lazar I, Hajdu A. Retinal microaneurysm detection through local rotating cross-section profile analysis. IEEE Trans Med Imaging 2013;32(2).
3. Antal B, Hajdu A. An ensemble-based system for microaneurysm detection and diabetic retinopathy grading. IEEE Trans Biomed Eng 2012;59(6):1720-6.
4. Niemeijer M, van Ginneken B, Cree MJ, Mizutani A, Quellec G, Sanchez CI, *et al*. Retinopathy online challenge: Automatic detection of microaneurysms in digital color fundus photographs. IEEE Trans Med Imaging 2010;29(1):185-95.
5. Abdurrazak M, Rao MU, Ado AB, Mohd KS, Zin T. Some natural products and their secondary metabolites attributed towards diabetic cure: A review. Int J Pharm Pharm Sci 2015.
6. Kalsi A, Singh S, Taneja N, Kukal S, Mani S. Current treatments for Type 2 diabetes, their side effects and possible complementary treatments. Int J Pharm Pharm Sci 2015;7(3):13-8.
7. Lazar I, Hajdu A. Microaneurysm Detection in Retinal Images Using a Rotating Cross-section Based Model. In: 2011 IEEE International Symposium on Biomedical Imaging; 2011. p. 1405-9.
8. Agurto C, Barriga ES, Murray V, Nemeth S, Crammer R, Bauman W, *et al*. Automatic detection of diabetic retinopathy and age-related macular degeneration in digital fundus images. Invest Ophthalmol Vis Sci 2011;52(8):5862-71.
9. Giancardo L, Meriaudeau F, Karnowski TP, Li Y, Tobin KW, Chaum E. Microaneurysm Detection with Radon Transform-based Classification on Retina Images. Proceeding IEEE Annual International Conference EMBC; 2011. p. 5939-42.
10. Abràmoff MD, Reinhardt JM, Russell SR, Folk JC, Mahajan VB, Niemeijer M, *et al*. Automated early detection of diabetic retinopathy. Ophthalmology 2010;117(6):1147-54.