LITERATURE REVIEW

The various medical imaging techniques for detecting DR lesions and classifying them into PDR or NPDR of different types have been proposed. These methods are based on more than one algorithm because DR has different indications. The indications of DR are blurred vision, fluctuating vision, spots or dark strings floating in vision and patches in retina. After the detection process various algorithms can be used for classification of diseases.

1.1 RED LESION DETECTION USING DYNAMIC SHAPE FEATURES FOR DIABETIC RETINOPATHY SCREENING.

The development of an automatic telemedicine system for computer-aided screening and grading of diabetic retinopathy depends on reliable detection of retinal lesions in fundus images. Lama Seoud (2016) proposed dynamic shape feature method for diabetic retinopathy screening. In this work microaneurysm and haemorrhages are detected. The main contribution is a new set of shape features, called Dynamic Shape Features (DSF), that do not require precise segmentation of the regions to be classified. The method is validated per-lesion and per-image using six databases, four of which are publicly available. It proves to be robust with respect to variability in image resolution, quality and acquisition system.This method comprises six steps. First, spatial calibration is applied to support different image resolutions. Second, the input image is pre-processed via smoothing and normalization. Third, the optic disc (OD) is automatically detected, to discard this area from the lesion detection. Fourth, candidate regions corresponding to potential lesions, are identified in the pre-processed image, based on their intensity and contrast.

1.2 AN ENSEMBLE-BASED SYSTEM FOR MICROANEURYSM DETECTION AND DIABETIC RETINOPATHY GRADING.

Reliable microaneurysm detection in digital fundus images is still an open issue in medical image processing**.** B´alintAntal (2012) proposed an ensemblebased system for microaneurysm detection and grading. In this method a combination of internal components of microaneurysm detectors, namely preprocessing methods and candidate extractors have been used. In pre processing method includes contrast enhancement is done using gray level transformation, contrast limited adaptive equalization, vessel extraction is done. Circular HoughTransform is used for candidate extraction. The evaluation metrices is based on sensitivity, specificity and accuracy.

1.3 SPLAT FEATURE CLASSIFICATION WITH APPLICATION TO RETINAL HEMORRHAGE DETECTION IN FUNDUS IMAGES.

Li Tang, MeindertNiemeijer (2013) proposed a novel splat feature classification method to retinal haemorrhage detection in fundus images. Reliable detection of retinal haemorrhages is important in the development of automated screening systems which can be translated into practice. Under supervised approach, retinal colour images are partitioned into non-overlapping segments covering the entire image. Each segment, i.e., splat, contains pixels with similar colour and spatial location. A set of features is extracted from each splat to describe its characteristics relative to its surroundings, employing responses from a variety of filter bank, interactions with neigh boring splats, and shape and texture information. An optimal subset of splat features is selected by a filter approach followed by a wrapper approach. A classifier is trained with splat-based expert annotations and evaluated on the publicly available Messidor dataset. The limitation in this method is single expert dataset.

2.4 A SUCCESSIVE CLUTTER-REJECTION-BASED APPROACH FOR EARLY DETECTION OF DIABETIC RETINOPATHY.

Keerthi Ram, Gopal Datt Joshi (2011) proposed a successive clutter rejection-based approach for early detection of diabetic retinopathy. In this method microaneurysm (MA) detection is formulated as a problem of target detection from clutter, where the probability of occurrence of target is considerably smaller compared to the clutter. A successive rejection based strategy is proposed to progressively lower the number ofclutter responses. The processing stages are designed to reject specific classes of clutter while passing majority of true MAs, using a set of specialized features. Results of extensive evaluation of the proposed approach on three different retinal image datasets are reported and used to highlight the promise in the presented strategy.

1.5 RETINOPATHY ONLINE CHALLENGE: AUTOMATIC DETECTION OF MICROANEURYSMS IN DIGITAL COLOR FUNDUS PHOTOGRAPHS.

The detection of microaneurysms in digital color fundus photographs is a critical first step in automated screening for diabetic retinopathy (DR), a common complication of diabetes. To accomplish this detection numerous methods have been published in the past but none of these was compared with each other on the same data. In this work the result of the first international microaneurysm detection competition, organized in the context of the Retinopathy Online Challenge (ROC), a multi-year online competition for various aspects of DR detection was presented. For this competition, the results of five different methods, produced by five different teams of researchers on the same set of data were compared.

The evaluation was performed in a uniform manner using an algorithm presented in this work. The set of data used for the competition consisted of 50 training images with available reference standard and 50 test images where the reference standard was withheld by the organizers (M. Niemeijer, B. van Ginneken, and M. D. Abràmoff). The results obtained on the test data was submitted through a website after which standardized evaluation software was used to determine the performance of each of the methods. A human expert detected microaneurysms in the test set to allow comparison with the performance of the automatic methods. The overall results show that microaneurysm detection is a challenging task for both the automatic methods as well as the human expert. There is room for improvement as the best performing system does not reach the performance of the human expert.

1.6 NON-PROLIFERATIVE DIABETIC RETINOPATHY DETECTION AND CLASSIFICATION USING NEURAL NETWORKS.

Diabetic Retinopathy (DR) causes blindness in the working age for people with diabetes in most countries. The increasing number of people with diabetes worldwide suggests that DR will continue to be major contributors to vision loss. Early detection of retinopathy progress in individuals with diabetes is critical for preventing visual loss. Mohammad A. Al-Jarrah & Hadeel Shatnawi (2017) proposed non proliferative diabetic retinopathy detection using neural networks. In this work neural networks have been used for classification purpose. Morphological based approach is used for detecting lesion. First, the proposed algorithm detects the three DR lesions, namely haemorrhages, microaneurysms and exudates. Second, a set of features from detected lesions are extracted. The set of selected feature emulates what physicians looked for in classifying NPDR case.20 Finally, we designed an Artificial Neural Network (ANN) classifier with three layers to classify NPDR to normal, mild, moderate and severe. The performance is measured based on sensitivity and specificity.

1.7 RETINAL MICROANEURYSM DETECTION THROUGH LOCAL ROTATING CROSS-SECTION PROFILE ANALYSIS.

Istvan Lazar and Andras Hajdu (2013) proposed local rotating cross section profile analysis method for retinal microaneurysm detection. Peak detection is applied on each profile, and a set of attributes regarding the size, height, and shape of the peak are calculated subsequently. The proposed method has been tested in the Retinopathy Online Challenge, where it proved to be competitive with the state-of-the-art approaches. Local maximum region method is used for feature extraction. FROC is used for performance evaluation. In future optic disc can be detected.

1.8 DETECTION OF DIABETIC RETINOPATHY IN FUNDUS IMAGE.

Rajan (2015) proposed a new algorithm to detect the blood vessels effectively. The initial enhancement of the image is carried out using preprocessing stage, followed by curvelet Transforms that are applied to the equalized image. This enhanced image is used for the extraction of the blood vessels. The estimation of exudates is obtained from blood vessels and optic disc extracted images. The result shows the enhanced retinal images of blood vessels have a better PSNR and area shows the exudates severity.

1.9 AUTOMATIC DETECTION OF RETINAL EXUDATES IN FUNDUS IMAGES OF DIABETIC RETINOPATHY PATIENTS.

Mahsa Partovi1, Seyed Hossein Rasta and Alireza Javadzadeh (2016) proposed different image processing techniques such as noise removal image, resizing and21 contrast enhancement for diabetic retinopathy detection. The morphological function was applied on intensity components of Hue Saturation Intensity (HSI) space. To detect the exudates regions, thresholding was performed on all images and the exudates region was segmented. To optimize the detection efficiency, the binary morphological functions were applied. Finally, the exudates regions were quantified and evaluated for further statistical purposes. Performance was measured based on sensitivity, specificity and accuracy.

1.10 SVM AND NEURAL NETWORK BASED DIAGNOSIS OF DIABETIC RETINOPATHY.

R.Priya, P.Aruna (2012) used SVM and Neural Network for Detection of Diabetic Retinopathy. In this method to diagnose diabetic retinopathy, two models like Probabilistic Neural network (PNN) and Support Vector Machine (SVM) are described and their performances are compared. Performance is evaluated based on accuracy, sensitivity and specificity. The input retinal images were preprocessed using Grayscale conversion, Adaptive Histogram Equalization, Discrete Wavelet Transform, Matched filter and Fuzzy C-means segmentation. From the pre-processed images features were extracted for classification process. The classifier algorithm is used for classification of retinal images.

1.11 SUMMARY

There are many automated systems for detecting Diabetic Retinopathy Microaneurysm. From this Literature Review, the best system that are used for detecting and classifying Microaneurysms are Neural Network which has 95% accuracy, Curvelet Transform method which acquires 93 % accuracy and SVM which has 94% accuracy

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