Automated System for Detection of High Risk Diabetic Macular Edema in Color Retinal Images

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Abstract

The detection of macula and classification of macular edema condition is an open issue for researchers in the field of ophthalmology. Diabetic Macular Edema (DME) is a secondary disease associated with DR (Diabetic Retinopathy), and it acts as a major reason for vision loss in diabetic patients. In this paper an automated system is presented with a Binarized Macula Detection (BMD) algorithm for detection of macula, irrespective of the location of Optic Disk (OD). The work tries to target high risk DME which occurs within 1 Optic Disk Diameter (ODD) area in the macular region. This will help to provide immediate treatment to the patients with high risk of DME. The extraction of texture features from the green channel of Region of Interest (ROI) reduces the time for working with whole image, and the classification system with Support Vector Machine (SVM), K Nearest Neighbor (KNN) and Random Forest classifiers predicts the individual result for input images. The binary classification of Stage 0 (Normal) and Stage 2 (High Risk Diabetic Macular Edema) was performed on dataset from MESSIDOR database, and the SVM classifier with RBF kernel obtained highest accuracy and specificity as 94.58 % and 96.94% respectively. Higher sensitivity was obtained by KNN as 89.66%. The system was also
compared with a feature reduction system using Principal Component Analysis (PCA) and the system with, SVM and RBF kernel without feature reduction technique outperformed the results.

References

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Index Terms

Computer Science  Automated Systems

Keywords

Diabetic Retinopathy; Diabetic Macular Edema; Exudates; High Risk DME; BMD Algorithm; Principal Component Analysis.