ABSTRACT

Glaucoma is a disease that attacks the sense of sight and can lead to permanent blindness. Although this disease cannot be cured, the symptoms of the damage can be minimized by early detection. Glaucoma detection can be performed manually by an ophthalmologist, but this method is somewhat subjective because the results of the observations depend on the domain of the doctor's knowledge, whereas on the other hand, modern medical imaging techniques, such as *Optical Coherence Tomography* (OCT), *Confocal Scanning Laser Ophthalmoscopy* (CSLO) and *Heidelberg Retinal Tomography* (HRT), are high in cost and the availability of devices is relatively limited.

This research proposed a machine learning-based system to detect glaucoma based on retinal fundus images through digital image processing. The process of system design consists of two stages, i.e. training and testing. The retina fundus image, which divided into train and test image, is preprocessed to obtain an optimal composition image. Furthermore, this image goes through feature extraction process using Local Binary Pattern. Then, the feature vectors obtained from the previous process are used as input in the classification stage using Support Vector Machine.

The performance of the system was tested using k-fold cross validation (k = 10) on 485 images consisting of two classes, i.e. normal and glaucoma. By using the proposed method, the system provide the best accuracy rate at 88.45%, sensitivity 80.81%, and specificity 92.65%. This result is achieved on a system model with a number of parameters: LBP uniform pattern ($u2$), radius size $R = 3$, number of pixel points $P = 8$, and 3rd order polynomial kernel.

Keyword: Glaucoma, Local Binary Pattern, Support Vector Machine