ABSTRACT

Medical image processing has played an important role in the advancement of healthcare, particularly with the introduction of diagnostic imaging procedures such as magnetic resonance imaging (MRI) and computed tomography (CT), which provides non-invasive methods to visualise the anatomical structures of the subject. Diabetic retinopathy (DR) is a common complication of diabetes mellitus and is a major cause of vision loss for middle-aged and elderly people. One-third of people with diabetes suffer from DR. Due to increased number of people having DR, it has become burdensome for health professionals to correctly manually distinguish between normal and DR cases. Therefore there is a urgent need of computer aided technique (CAD) to help the health professional to provide an initial screening result of DR and non-DR class.

In this dissertation we have improved an existing feature descriptor for classification of various DR stages. For effective feature extraction from retinal images we have improved the existing Local Line Binary Pattern which is referred to as M-LLBP in this dissertation. In LLBP the horizontal and vertical neighbours along the centre pixel are taken into consideration. However in M-LLBP we have considered not only the horizontal and vertical line information along the centre but we have also considered additionally two more different sets of neighbours around the centre to effectively extract the discriminative relation between the centre and its neighbour. We have tested the result in three publicly available DR image dataset namely DiaretDB0, STARE and IDRiD dataset. The extracted features are trained and tested with support vector machine and k-nearest neighbour classifier and the performance analysis on the proposed method is done by 5-fold cross validation. The results show that the algorithm is capable of classifying the medical images very efficiently. In DiaretDB0 dataset, the M-LLBP got a performance improvement of 7.7% using SVM classifier and 9.06% using KNN classifier with respect to existing LLBP, for binary classification and 8.91% using SVM classifier and 12.45% using KNN classifier for multiclass classification. In STARE dataset we have achieved a percentage improvement of 6.77% using SVM classifier and 2.42% using KNN classifier with respect to existing LLBP for binary classification and 5.49% using SVM classifier and 15.75% using KNN classifier is achieved for multiclass classification. In IDRiD dataset we have achieved a percentage improvement of 2.05% using SVM and 28.99% using KNN classifier for binary classification and 6.44% using SVM and 69.27% using KNN classifier is achieved for multiclass classification.