

Brain Tumor Type Classification Based on Support Vector Machine in Magnetic Resonance Images

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Abstract

The objective of this study is to present a computer-aided diagnosis (CAD) system for automatic detection of brain tumors in brain magnetic resonance (MR) images. The proposed system is based on sequential minimal optimization (SMO) algorithm for training Support Vector Machine (SVM) classifier using Weka open source software to classify three different types of malignant brain tumors (i.e., glioblastoma, sarcoma and metastatic bronchogenic carcinoma) on 66 brain MR images. The system composed of three main stages namely: image segmentation, feature extraction and selection and finally, the classification stage. We used the Fuzzy C-means (FCM) and K-means as two techniques for image segmentation and the Gray level co-occurrence matrix (GLCM) and Discrete Wavelet Transform (DWT) followed by Principal Component Analysis (PCA) as two techniques for feature extraction and selection. They form four different models of the CAD system. According to the evaluation of the proposed models of the CAD system, the performance of the FCM and DWT followed by PCA model was promising in terms of the classification rate. The average classification rate for all classes using 7-fold cross-validation was 93.94% with average area under the receiver operating characteristic (ROC) curve of 0.963 and the average classification rate on the training set and the 85% percentage spilt was 100% with average area under the ROC curve of 1.00.

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