Computer-aided diagnosis of human brain tumor through MRI: A survey and a new algorithm

HEBA MOHSEN MOHAMED MOSAAD HUSSIEN ,El-Sayed A. El-Dahshan, Kenneth Revett, Abdel-Badeeh Salem

Abstract

Computer-aided detection/diagnosis (CAD) systems can enhance the diagnostic capabilities of physicians and reduce the time required for accurate diagnosis. The objective of this paper is to review the recent published segmentation and classification techniques and their state-of-the-art for the human brain magnetic resonance images (MRI). The review reveals the CAD systems of human brain MRI images are still an open problem. In the light of this review we proposed a hybrid intelligent machine learning technique for computer-aided detection system for automatic detection of brain tumor through magnetic resonance images. The proposed technique is based on the following computational methods; the feedback pulse-coupled neural network for image segmentation, the discrete wavelet transform for features extraction, the principal component analysis for reducing the dimensionality of the wavelet coefficients, and the feed forward back-propagation neural network to classify inputs into normal or abnormal. The experiments were carried out on 101 images consisting of 14 normal and 87 abnormal (malignant and benign tumors) from a real human brain MRI dataset. The classification accuracy on both training and test images is 99% which was significantly good. Moreover, the proposed technique demonstrates its effectiveness compared with the other machine learning recently published techniques. The results revealed that the proposed hybrid approach is accurate and fast and robust. Finally, possible future directions are suggested.