Development of a Computer Aided Diagnosis Tool for Brain Tumor Extraction and Classification

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Abstract : The brain is an important organ in our body since it is responsible about the majority actions such as vision, memory, etc. However, different diseases such as Alzheimer and tumors could affect the brain and conduct to a partial or full disorder. Regular diagnosis are necessary as a preventive measure and could help doctors to early detect a possible trouble and therefore taking the appropriate treatment, especially in the case of brain tumors. Different imaging modalities are proposed for diagnosis of brain tumor. The powerful and most used modality is the Magnetic Resonance Imaging (MRI). MRI images are analyzed by doctor in order to locate eventual tumor in the brain and describe the appropriate and needed treatment. Diverse image processing methods are also proposed for helping doctors in identifying and analyzing the tumor. In fact, a large Computer Aided Diagnostic (CAD) tools including developed image processing algorithms are proposed and exploited by doctors as a second opinion to analyze and identify the brain tumors. In this paper, we proposed a new advanced CAD for brain tumor identification, classification and feature extraction. Our proposed CAD includes three main parts. Firstly, we load the brain MRI. Secondly, a robust technique for brain tumor extraction is proposed. This technique is based on both Discrete Wavelet Transform (DWT) and Principal Component Analysis (PCA). DWT is characterized by its multiresolution analytic property, that's why it was applied on MRI images with different decomposition levels for feature extraction. Nevertheless, this technique suffers from a main drawback since it necessitates a huge storage and is computationally expensive. To decrease the dimensions of the feature vector and the computing time, PCA technique is considered. In the last stage, according to different extracted features, the brain tumor is classified into either benign or malignant tumor using Support Vector Machine (SVM) algorithm. A CAD tool for brain tumor detection and classification, including all above-mentioned stages, is designed and developed using MATLAB guide user interface.

Keywords : MRI, brain tumor, CAD, feature extraction, DWT, PCA, classification, SVM