

Ischemic Stroke Detection in Computed Tomography Examinations

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Abstract : Stroke is a worldwide concern, only in Brazil it accounts for 10% of all registered deaths. There are 2 stroke types, ischemic (87%) and hemorrhagic (13%). Early diagnosis is essential to avoid irreversible cerebral damage. Non-enhanced computed tomography (NECT) is one of the main diagnostic techniques used due to its wide availability and rapid diagnosis. Detection depends on the size and severity of lesions and the time spent between the first symptoms and examination. The Alberta Stroke Program Early CT Score (ASPECTS) is a subjective method that increases the detection rate. The aim of this work was to implement an image segmentation system to enhance ischemic stroke and to quantify the area of ischemic and hemorrhagic stroke lesions in CT scans. We evaluated 10 patients with NECT examinations diagnosed with ischemic stroke. Analyzes were performed in two axial slices, one at the level of the thalamus and basal ganglion and one adjacent to the top edge of the ganglionic structures with window width between 80 and 100 Hounsfield Units. We used different image processing techniques such as morphological filters, discrete wavelet transform and Fuzzy C-means clustering. Subjective analyzes were performed by a neuroradiologist according to the ASPECTS scale to quantify ischemic areas in the middle cerebral artery region. These subjective analysis results were compared with objective analyzes performed by the computational algorithm. Preliminary results indicate that the morphological filters actually improve the ischemic areas for subjective evaluations. The comparison in area of the ischemic region contoured by the neuroradiologist and the defined area by computational algorithm showed no deviations greater than 12% in any of the 10 examination tests. Although there is a tendency that the areas contoured by the neuroradiologist are smaller than those obtained by the algorithm. These results show the importance of a computer aided diagnosis software to assist neuroradiology decisions, especially in critical situations as the choice of treatment for ischemic stroke.

Keywords : ischemic stroke, image processing, CT scans, Fuzzy C-means

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