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A computer aided diagnosis system for white matter volume extraction in Alzheimer's disease

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Computer method development for early diagnosis of Alzheimer's disease (AD) is one of the helpful ways in its prevention. Computer aided diagnosis system (CADS) based on magnetic resonance (MR) image processing can improve medical analysis and interpretation. Mental status in AD can be recognized by related biomarkers such as involvement of white matter (WM) and gray matter (GM) atrophy. WM volume in AD changes more than controls and it can show the reduction of GM also. An automatic system to measure WM atrophy from MR images can support the neuropsychological tests and be helpful in treatment. We developed a CADS that allows segmentation of WM by a novel method in a reliable way to extract the features of the extracted volume. We assume that all datasets were analyzed including a preprocessing. The method consists of a series of morphological operations on the binary images to extract WM volume, feature extraction from images using single level discrete wavelet transform, feature reduction using principle component analysis (PCA). The extracted features are used to identify the characteristics of segmented WM. This system has the possibility to classify these features with a support vector machine (SVM). This classification is helpful to categorize specifications of WM in different types of AD. This method was applied to a reference public dataset (OASIS). The accuracy of our system to extract WM was 85%. Therefore, with this system, WM volume segmentation, assessment of its features and classifying them were feasible and trustable in MR images of AD. This result is a marked improvement on the state-of-the-art in the prognostic precision of AD.

Recent Publications:

1. Colucci L, Molino I, Amenta F and Gaeta G L (2018) Desire to institutionalize in Alzheimer's caregivers: An empirical analysis on Italian data. Arch Gerontol Geriatr. 75:165–170.
2. Rea R, Carotenuto A, Traini E, Fasanaro A M, Manzo V, et al. (2015) Apathy treatment in Alzheimer's Disease: Interim results of the ASCOMALVA trial. J Alzheimers Dis. 48(2):377–83.
3. Colucci L, Bosco M, Fasanaro A M, Gaeta G L, Ricci G, et al. (2014) Alzheimer's disease costs: what we know and what we should take into account. J Alzheimers Dis. 42(4):1311–24.

Biography

Francesco Amenta graduated from the University of Rome as a Doctor of Medicine and Surgery in 1977. He received his Specialist Degree in Neurology in 1981. Since 1978, he has been teaching and working on research projects. In November 1992, he assumed his present position at the University of Camerino, Italy. He has more than 500 research articles and around 7780 citations.

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