A Fuzzy Approach to Liver Tumor Segmentation with Zernike Moments

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Abstract : In this paper, we present a new segmentation approach for liver lesions in regions of interest within MRI (Magnetic Resonance Imaging). This approach, based on a two-cluster Fuzzy C-Means methodology, considers the parameter variable compactness to handle uncertainty. Fine boundaries are detected by a local recursive merging of ambiguous pixels with a sequential forward floating selection with Zernike moments. The method has been tested on both synthetic and real images. When applied on synthetic images, the proposed approach provides good performance, segmentations obtained are accurate, their shape is consistent with the ground truth, and the extracted information is reliable. The results obtained on MR images confirm such observations. Our approach allows, even for difficult cases of MR images, to extract a segmentation with good performance in terms of accuracy and shape, which implies that the geometry of the tumor is preserved for further clinical activities (such as automatic extraction of pharmaco-kinetics properties, lesion characterization, etc).

Keywords : defuzzification, floating search, fuzzy clustering, Zernike moments
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