Fuzzy-marker-based segmentation using hierarchies and preliminary results of its use in a neural network for automatic marker proposal

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Résumé

In this talk, we present an extension of a classical marker-based image segmentation method proposed by Salembier and Garrido in 2000, in which markers are propagated over a hierarchy of partitions to produce a segmentation. In the original approach, the segmentation relies on two sets of pixels which play the role of object and background markers. In the proposed extension, the markers are not represented by crisp sets, but by fuzzy ones, i.e., functions of the image domain into the real interval [0,1] indicating the degree of membership of each pixel to the markers. We show that when the fuzzy markers are indicator functions of crisp sets, the proposed method produces the same result as the original one. Additionally, we present a linear-time algorithm for computing the result of the proposed method given two fuzzy markers, and we establish the correctness of this algorithm. We also demonstrate possible applications of the proposed approach, in particular, how we can use the fuzzy-marker-based segmentation in conjunction with convolutional neural networks to create an automatic marker proposal system.

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