NONPARAMETRIC SHAPE PRIORS FOR ACTIVE CONTOUR−BASED IMAGE SEGMENTATION (WedAmOR11)

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Abstract :

When segmenting images of low quality or with missing data, statistical prior information about the shapes of the objects to be segmented can significantly aid the segmentation process. However, defining probability densities in the space of shapes is an open and challenging problem. In this paper, we propose a nonparametric shape prior model for image segmentation problems. In particular, given example training shapes, we estimate the underlying shape distribution by extending a Parzen density estimator to the space of shapes. Such density estimates are expressed in terms of distances between shapes, and we propose two distance metrics that could be used in this framework. We then incorporate the learned shape prior distribution into a maximum a posteriori estimation framework for segmentation. This results in an optimization problem, which we solve using active contours. We demonstrate the effectiveness of the resulting algorithm in segmenting images that involve low−quality data and occlusions. The proposed framework is especially powerful in handling "multimodal" shape densities, involving multiple classes of objects.

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