

Abstract:

Image segmentation is often defined as a partition of pixels or image blocks into homogeneous groups. These groups are characterized by a prototypical vector in feature space, e.g., the space of Gabor filter responses, by a prototypical histograms of features or by pairwise dissimilarities between image blocks. For all three data formats cost functions have been proposed to measure distortion and, thereby, to encode the quality of a partition. Robust algorithms for image processing are designed according to the following three steps: First, structure in images has to be defined as a statistical model. Second, an efficient optimization procedure to find good structures has to be determined. I advocate stochastic optimization methods like simulated annealing or deterministic variants of it which maximize the entropy while maintaining the approximation accuracy of the structure measure. Other optimization algorithms like interior point methods or continuation methods are equally suitable. Third, a validation procedure has to test the noise sensitivity of the discovered image structures. This three step strategy is demonstrated in the context of image analysis based on color and texture features.