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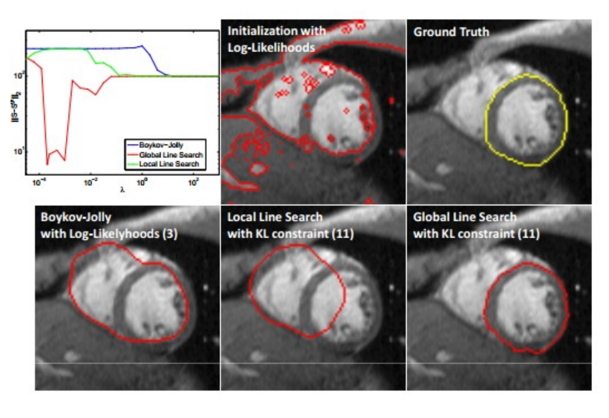

Image Segmentation with Constraints on Geometry and Complexity

Dr. Yuri Boykov

The majority of standard segmentation methods use appearance models summing intensity log-likelihoods inside the object and background segments. Implicitly, this assumes i.i.d. distribution of intensities. The spatial distribution of colors within complex objects is ignored, which significantly limits the robustness and the accuracy of segmentation results. We discuss segmentation models corresponding to general non-i.i.d. appearances. We focus on two types of generic constraints. The first type models complexity of appearance (i.e. MDL principle - useful for both photo and medical imagery). The second type models geometric relations between the parts (e.g. inclusion/exclusion, relative position, etc. - useful in bio-medical applications due to anatomy).

Fast Trust Region for Image Segmentation

Dr. Lena Gorelick

Trust region is a well-known general approach to optimization which offers many advantages over standard gradient descent techniques. In particular, it allows more accurate nonlinear approximation models. In each iteration this approach computes a global optimum of a suitable approximation model within a fixed radius around the current solution, a.k.a. trust region. In general, this approach can be used only when some efficient constrained optimization algorithm is available for the selected non-linear (more accurate) approximation model.

In this talk we will introduce a Fast Trust Region (FTR) approach for optimization of segmentation energies with non-linear regional terms, which are known to be challenging for existing algorithms. These energies include, but are not limited to, KL divergence and Bhattacharyya distance between the observed and the target appearance distributions, volume constraint on segment size, and shape prior constraint in a form of L^2 distance from target shape moments. Our method is 10 to 400 times faster than the existing state-of-the-art methods while converging to comparable or better solutions.

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Carlson Auditorium, Center for Imaging Science (Bldg. 76)