Dominant Sets for "Constrained" Image Segmentation

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Abstract

Image segmentation has come a long way since the early days of computer vision, and still remains a challenging task. Modern variations of the classical approach involve some form of user assistance (interactive segmentation) or ask for the simultaneous segmentation of two or more images (co-segmentation). At an abstract level, all these variants can be thought of as "constrained" versions of the original formulation, whereby the segmentation process is guided by some external source of information. In this talk, I'll describe a new approach to tackle this kind of problems in a unified and principled way. The work is based on some properties of a family of quadratic optimization problems related to dominant sets, a graph-theoretic notion of a cluster which generalizes the concept of a maximal clique to edge-weighted graphs. The proposed algorithm can deal naturally with several types of constraints and input modalities, including scribbles, sloppy contours and bounding boxes, and is able to robustly handle noisy annotations on the part of the user. Extensive experiments show the effectiveness of our approach on a variety of natural images under several input conditions and constraints.

References

1. E. Zemene, L. Alemu, and M. Pelillo. Dominant sets for "constrained" image segmentation. *IEEE Transactions on Pattern Analysis and Machine Intelligence* 41(10):2438-2451 (2019).