
The Role of Optimum Connectivity in Image Segmentation: Can the algorithm learn object information during the process?

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Abstract

Image segmentation is one of the most investigated research topics in Computer Vision and yet presents challenges due to the difficulty of modeling all possible appearances of objects in images. In this sense, it is important to investigate methods that can learn object information before and during delineation. This paper addresses the problem by exploiting optimum connectivity between image elements (pixels and superpixels) in the image domain and feature space to improve segmentation. The study uses the Image Foresting Transform (IFT) framework to explain and implement all methods and describes some recent advances related to superpixel and object delineation. It provides a guideline to learn prior object information from the target image only based on seed pixels, superpixel clustering, and classification, evaluates the impact of using object information in several connectivity-based delineation methods using the segmentation by a deep neural network as baseline, and shows the potential of a new paradigm, namely Dynamic Trees, to learn object information from the target image only during delineation.

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