

VOOGLE: Tools for Labeling & Manipulating Objects in Images using Low-Level & “Semantic” Level Information

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Abstract

We propose a system, that employs a hierarchical content representation (a scene graph consisting of object and low-level region nodes) and shape and color matching schemes, to automatically segment and label objects of interest given a set of labeled example objects presented by the user. The scene graph is automatically initiated with only “low-level region nodes” for all images prior to the learning phase. The “learning” phase refers to labeling of combinations of low-level regions that have resulted in successful color and/or shape matches to the labeled example objects. These combinations are stored as “object nodes” in the hierarchical scene graph. The proposed algorithms are also capable of handling full and partial objects using a proximity-based shape representation. A sub-matrix matching algorithm is proposed to determine correspondences for evaluation of partial similarity between an example template and a candidate object region. The method is translation, rotation, scale and reflection invariant. Applications of the proposed partial matching technique include recognition of partially occluded objects in images as well as significant acceleration of recognition/matching of full (non-occluded) objects for object based image labeling by learning from examples. Experimental results are presented to demonstrate the effectiveness of the proposed hierarchical content representation, partial & full matching, and the learning behavior on collections of real-life images.