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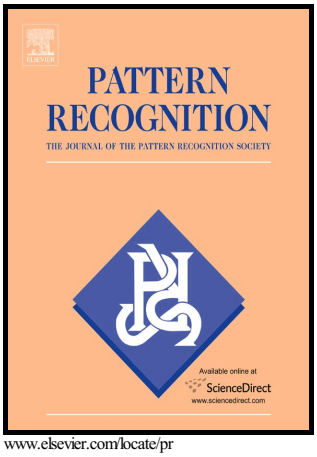

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A Robust Approach for Object Matching and Classification Using Partial Dominant Orientation Descriptor

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Abstract:

This paper introduces a novel approach to measure the correspondence between objects, and exploit it for object and image classification tasks, using the proposed Partial Dominant Orientation Descriptor (PDOD). In particular, the object is represented by a set of stable and informative key locations sampled using Difference of Gaussian. The proposed PDOD at each extracted key location takes into account the position and partially computes the dominant orientation of other key locations relative to it, thus, offering a global distinctive and discriminative characterization. This allows us to learn features that are largely invariant to common image transformations, including changes in object colors and textures. The correspondence in-between two objects is performed by finding for each key location in one object the key location in the other object that has the most similar descriptor. Object classification proceeds by assigning the most relevant category that has maximally similar stored prototype objects to the query object using ***k***-Nearest Neighbors algorithm with Adaptive Object Distance. For efficiency, we further investigate PDOD for image classification by developing powerful image representations based on the popular Bag-of-Words model. The extensive experiments demonstrate that the proposed approach greatly improves the matching and classification results, while achieving the state-of-the-art performances on several challenging benchmark datasets. The obtained results suggest also broader applicability to other classification modalities.

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