

# BRIDGING THE GAP BETWEEN LOCAL AND GLOBAL APPROACHES FOR 3D OBJECT RECOGNITION

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## ABSTRACT

Approaches to 3D object recognition have dueled over the apparent existence of only two paradigms: local and global. In the first case, both keypoint detectors and descriptors have been defined to capture and match properties of the keypoints themselves or their neighborhoods (also known as their support regions). These approaches proved to be more robust to occlusions and clutter, but have struggled to provide high repeatability in point detection and a general and global enough representation of objects. On the other hand, under the global paradigm, keypoint detectors and descriptors have been unable to handle satisfactorily the same occlusion and clutter more easily handled by their local counterparts. In this research, we bridge the gap between these two approaches. We reveal what we believe is a false dichotomy between the two paradigms by proposing a hybrid approach that leads to better repeatability and better generalization of the representation of objects while increasing the tolerance to occlusion and clutter. First, we propose the Least Expected FeaTure (LEFT) detector, which relies on local features of the objects while these features are selected based on their global and outstanding occurrences within the objects. Then, we introduce the Local-to-Global Signature (LGS) descriptor, which takes into account different surface variations across the entire object in order to construct a signature of its local feature vectors. As our experiments demonstrate, the combination of either or both of the two proposed techniques lead to much improved results when compared to SOTA approaches using benchmark datasets. These results support our claim that hybrid solutions between global and local properties are not only possible, but advantageous over each one of them alone.