Scale-Space Representations and their Applications to 3D Matching of Solid Models
Extended Abstract

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During the last decade, hierarchical segmentation has become recognized as a powerful tool for designing efficient feature detection methods for object recognition algorithms. The most common form of such hierarchical segmentations is the scale-space decomposition in computer vision. Intuitively, an inherent property of real-world objects is that they only exist as meaningful entities over certain ranges of scale. The fact that objects in the world appear in different ways depending on the scale of observation, has important implications if one aims at describing them. Specifically, the need for multi-scale representation arises when designing methods for automatically analyzing and deriving information from real-world measurements. We will presented a computationally efficient approach to hierarchical matching of 3D models. The approach is based on a combination of scale-space feature decomposition of 3D models, rooted tree representation of these feature decompositions, and dynamic programming matching of vertex-labeled graphs. In this context, features are intrinsic properties of the 3D shape which may encompass local geometry and topology related to design or manufacturing operations. Due to the strengths of the these components, our approach is able to establish robust correspondences in the presence of sampling noise. In a series of experiments we have demonstrated the performance of our approach.