Representing local shape geometry from multi-view silhouette perspective: A distinctive and robust binary 3D feature

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Representing local shape geometry from multi-view silhouette perspective: A distinctive and robust binary 3D feature

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Abstract

Local geometry description is of central importance in 3D computer vision and robotics, while the design of a distinctive and robust binary descriptor still remains a challenge at present. This paper tackles this problem by proposing to utilize the silhouette cue from multiple viewpoints to represent local shape geometry, forming a new binary feature called rotational silhouette maps (RSM). Key to the RSM descriptor are the leverage of multi-view information for comprehensive characterization paired with the silhouette method for binary and robust feature encoding. Specifically, an RSM is computed for the radius neighbors of a keypoint, at which a local reference frame (LRF) is first constructed to attain rotation invariance. Then, the local shape is rotated in the LRF multiple times to capture the multi-view information. For each view, a silhouette map is generated via projection. By concatenating all the silhouette maps, the RSM feature is computed. Extensive experiments are deployed on three standard datasets, where descriptiveness and robustness with respect to Gaussian noise, shot noise, varying mesh resolutions, the number of keypoints, keypoint localization errors, clutter and occlusion are assessed based on a comparison with nine state-of-the-art descriptors. The results reveal the overall superiority

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