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3D point cloud descriptors: state-of-the-art

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Abstract
The development of inexpensive 3D data acquisition devices has promisingly facilitated the wide availability and popularity of point clouds, which attracts increasing attention to the effective extraction of 3D point cloud descriptors for accuracy of the efficiency of 3D computer vision tasks in recent years. However, how to develop discriminative and robust feature representations from 3D point clouds remains a challenging task due to their intrinsic characteristics. In this paper, we give a comprehensively insightful investigation of the existing 3D point cloud descriptors. These methods can be principally divided into two categories according to their advancement: hand-crafted and deep learning-based approaches, which will be further discussed from the perspective of elaborate classification, their advantages, and limitations. Finally, we present the future research directions of the extraction of 3D point cloud descriptors.

Keywords 3D point cloud · Hand-crafted descriptor · Deep learning-based descriptor

1 Introduction

The availability of the low-cost 3D sensors, e.g., Microsoft Kinect, Prime Sense, has gained increasing interest in using three-dimensional point clouds (Rusu et al. 2011; Han et al. 2017) for many applications in real scenarios, such as robot localization and navigation (Su et al. 2018), autonomous driving, augmented reality (Wang et al. 2019) and 3D medical imaging. Compared to the traditional 2D image, 3D point clouds have the capability of providing much richer information cues for analyzing objects and environments.

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