A 3D Model Retrieval Approach Based on the Combination of PCA Plane Projections

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Abstract

In this paper, a 3D model retrieval approach based on the combination of different PCA plane projection approaches will be proposed. First, each 3D model is aligned by the proposed grid-based principal component analysis (GPCA), continuous PCA (CPCA), and normal-vectors PCA (NPCA), in which each one can align 3D models more accurately than traditional PCA. Then, for each alignment approach (GPCA, CPCA, or NPCA), each 3D model is projected on three PCA planes, with their normal vectors being the computed three eigenvectors, to get six gray-level images (called inner elevations). The gray value of a pixel in the image describes the depth information. The MPEG-7 angular radial transform (ART) is then applied to these inner elevations to obtain the feature descriptor, called inner elevation descriptor (IED), of each 3D model. Experimental results on five different databases have shown that the proposed IED outperforms the state-of-the-art descriptors.

Keyword：3D model retrieval, Grid-based principal component analysis (GPCA), Inner elevation descriptor (IED)