

1. Laplacian-based 3D mesh simplification with feature preservation

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Abstract: We propose a novel Laplacian-based algorithm that simplifies triangle surface meshes and can provide different preservation ratios of geometric features. Our efficient and fast algorithm uses a 3D mesh model as input and initially detects geometric features by using a Laplacian-based shape descriptor (L-descriptor). The algorithm further performs an optimized clustering approach that combines a Laplacian operator with K-means clustering algorithm to perform vertex classification. Moreover, we introduce a Laplacian weighted cost function based on L-descriptor to perform feature weighting and error statistics comparison, which are further used to change the deletion order of the model elements and preserve the saliency features. Our algorithm can provide different preservation ratios of geometric features and may be extended to handle arbitrary mesh topologies. Our experiments on a variety of 3D surface meshes demonstrate the advantages of our algorithm in terms of improving accuracy and applicability, and preserving saliency geometric features. © 2019 World Scientific Publishing Company. (30 refs)

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