3D Mesh Coarsening via Uniform Clustering

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Abstract : In this paper, we present a fast and efficient mesh coarsening algorithm for 3D triangular meshes. Theis approach can be applied to very complex 3D meshes of arbitrary topology and with millions of vertices. The algorithm is based on the clustering of the input mesh elements, which divides the faces of an input mesh into a given number of clusters for clustering purpose by approximating the Centroidal Voronoi Tessellation of the input mesh. Once a clustering is achieved, it provides us an efficient way to construct uniform tessellations, and therefore leads to good coarsening of polygonal meshes. With proliferation of 3D scanners, this coarsening algorithm is particularly useful for reverse engineering applications of 3D models, which in many cases are dense, non-uniform, irregular and arbitrary topology. Examples demonstrating effectiveness of the new algorithm are also included in the paper.

Keywords : coarsening, mesh clustering, shape approximation, mesh simplification

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