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Hierarchical mesh segmentation based on fitting primitives

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Author(s): Attene M, Falcidieno B, Spagnuolo M

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Abstract: In this paper, we describe a hierarchical face clustering algorithm for triangle meshes based on fitting primitives belonging to an arbitrary set. The method proposed is completely automatic, and generates a binary tree of clusters, each of which is fitted by one of the primitives employed. Initially, each triangle represents a single cluster; at every iteration, all the pairs of adjacent clusters are considered, and the one that can be better approximated by one of the primitives forms a new single cluster. The approximation error is evaluated using the same metric for all the primitives, so that it makes sense to choose which is the most suitable primitive to approximate the set of triangles in a cluster. Based on this approach, we have implemented a prototype that uses planes, spheres and cylinders, and have experimented that for meshes made of 100 K faces, the whole binary tree of clusters can be built in about 8 s on a standard PC. The framework described here has natural application in reverse engineering processes, but it has also been tested for surface denoising, feature recovery and character skinning.

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KeyWords Plus: SURFACE APPROXIMATION; TRIANGLE MESHES

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