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THREE DIMENSIONAL MODELING RECOGNITION AND RECONSTRUCTION OF 3D IMAGES

H. K. GREWAL, PRADEEP KUMAR, D. S PATHANIA, AND SANDEEP KUMAR SINGLA

Abstract

3D computer graphics use a three dimensional representation of geometric data that is stored in the computer for the purposes of performing calculations and rendering 2D images. The polygon remains a popular graphics primitive for computer graphics application. Because the polygon is linear, often thousands or millions of primitives are required to capture the details of complex geometry. Models of this size are generally not practical since rendering speeds and memory requirements are proportional to the number of polygons. Consequently applications that generate large polygonal meshes often use domain-specific knowledge to reduce model size. Polygonal simplification techniques offer one solution for developers grappling with complex models.

These methods simplify the polygonal geometry of small, distant, or otherwise unimportant portions of the model, seeking to reduce the rendering cost without a significant loss in the scene's visual content. No algorithm today excels at simplifying all models. Some approaches best suit curved, organic forms, while others work best at preserving mechanical objects with sharp corners, flat faces, and regular curves. Many models, such as radiositized scenes or scientific visualization data sets, have precompiled colors or lighting that must be considered. Some scenes, such as terrain data sets and volumetric iso surfaces from medical or scientific visualization, comprise a few large, high-complexity, individual objects. The monsters in a video game, on the other hand, might consist of multiple objects of moderate complexity, mostly in isolation. This paper includes Simplification Approaches and Algorithms for the 3D Objects or Scenes such as Static, Dynamic and View-dependent Simplification, Triangle Mesh Decimation, Vertex Clustering, Multiresolution analysis of arbitrary meshes, Simplification envelopes, Voxel-based object simplification, Appearance-preserving simplification, Quadric error metrics, Image-

driven simplification, Progressive meshes and Hierarchical dynamic simplification. At the end, the paper recommends a Simplification Approach (algorithm) suitable for a specific type of problem with 3D model or scenes.

Keywords: 3D Model, View-dependent Simplification, Triangle Mesh Decimation, Vertex Clustering, Simplification envelopes, Voxel-based object simplification, Appearance-preserving simplification, Quadric error metrics, Image-driven simplification, Progressive meshes