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Walkthrough in Complex Environments at Interactive Rates using Level-of-Detail

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Abstract: One of the biggest problems in computer graphics is displaying huge geometric models at interactive rates. A lot of work has been done to achieve the required frame-rates in architecture, simulation, computer-aided design and entertainment applications. In this paper, a system that enables walkthrough in complex environments using level-of-detail approximations is explained. The system uses hierarchical triangulated models as input. In the preprocessing phase, multiresolution models of objects are created using polygonal simplification techniques. During walkthrough, fast frustum culling based on bounding boxes is performed to eliminate branches of hierarchy that are not visible. An appropriate level for detail of objects is selected and displayed depending on the distance of the objects to the camera. For far nodes in the hierarchy, geometric data in lower levels is ignored and textured bounding boxes are displayed. The system achieves interactive frame rates for moderately complex models containing up to a million polygons.

Key Words: level-of-detail, visibility culling, geometric simplification, rendering, walkthrough, frame rate.