Hierarchical Methods in Computer Graphics

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Abstract

A central problem in computer graphics is the enormous size of the data sets that need to be processed. With the development of ever more powerful modeling and simulation tools and with the increasing availability of high-resolution 3D scanners and advances in medical imaging this problem will become even more severe in the future.

In order to deal with these huge amount of data, hierarchical methods, multiresolution representations, and wavelets are currently evolving into a core technique in computer graphics. Their power lies in the fact that they only require a small number of coefficients to represent complex functions and large data sets accurately. This leads to new compression algorithms and efficient computations by exploiting smoothness and coherence. Examples of their use in computer graphics include

- curve and surface modeling,
- mesh simplification,
- global illumination computations.

Several examples from ongoing projects illustrate the approach and demonstrate the strength of the underlying concepts.