Fast Retrieval of Disk-Resident Unstructured Data for Volume Visualization

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Abstract

This paper addresses techniques for supporting volume visualization of disk resident data sets. We assume the data sets to be visualized are too large to fit in memory and hence too expensive to visualize in its entirety. Our solution is to retrieve and visualize data subsets of interest. We investigate how to efficiently retrieve, in particular, unstructured volume data subsets from disk. A brute force approach and two multidimensional indexing algorithms, octrees and R-trees are considered. We analytically compare the three methods and experimentally compare the brute force method with R-trees. Both our analysis and test results demonstrate that R-trees are an excellent choice for efficient subset retrieval of unstructured data. Finally, we propose a visualization system architecture utilizing multiresolution data representations, an approximated rendering method and R-trees for locating and retrieving subsets of interest.