

# Cluster-Based Interactive Volume Rendering with Simian

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UUCS-03-017

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September 3, 2003

## *Abstract*

Commodity-based computer clusters offer a cost-effective alternative to traditional large-scale, tightly coupled computers as a means to provide high-performance computational and visualization services. The Center for the Simulation of Accidental Fires and Explosions (C-SAFE) at the University of Utah employs such a cluster, and we have begun to experiment with cluster-based visualization services. In particular, we seek to develop an interactive volume rendering tool for navigating and visualizing large-scale scientific datasets. Using Simian, an OpenGL volume renderer, we examine two approaches to cluster-based interactive volume rendering: (1) a “cluster-aware” version of the application that makes explicit use of remote nodes through a message-passing interface, and (2) the unmodified application running atop the Chromium clustered rendering framework. This paper provides a detailed comparison of the two approaches by carefully considering the key issues that arise when parallelizing Simian. These issues include the richness of user interaction; the distribution of volumetric datasets and proxy geometry; and the degree of interactivity provided by the image rendering and compositing schemes. The results of each approach when visualizing two large-scale C-SAFE datasets are given, and we discuss the relative advantages and disadvantages that were considered when developing our cluster-based interactive volume rendering application.