

## Public Abstract

First Name: Ian

Middle Name: Joseph

Last Name: Roth

Degree: Master of Science

Department: Computer Science

Advisor's First Name: Kannappan

Advisor's Last Name: Palaniappan

Co-advisor's First Name:

Co-advisor's Last Name:

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Title: Real-time Visualization of Massive Imagery and Volumetric Datasets

The visualization of arbitrarily large multi-dimensional datasets requires highly scalable geometric algorithms. For an algorithm to be classified as scalable, its complexity must remain constant regardless of the size of the entire dataset on disk. Its complexity should instead be determined by the visible volume and resolution of the data at any given time.

In this paper, we present several scalable algorithms for visibility culling and level of detail calculation for arbitrarily large datasets displayed in a variety of viewing models. These solutions are applicable to a wide range of datasets including 2D geospatial imagery, terrain elevation data, and 3D medical images such as those produced by magnetic resonance imaging (MRI) or computed axial tomography (CAT) scans.

The algorithms presented herein are implemented on top of an existing out-of-core image tile caching and paging system known as Kolam, developed at the University of Missouri, Columbia. Performance tests using Kolam have shown that the visualization algorithms provided are sufficient for handling datasets significantly larger than the amount of available memory. Simulations using various cache sizes and degrees of multi-threading have indicated that these algorithms can perform well even on low-end computers with limited resources.