Seminar on Combinatorial Computing
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Topological zone organization of scalar volume data

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Abstract

Isosurface extraction from volume data is an important technique in applications including CT, MRI, X-ray crystallography, and computational fluid dynamics.

We present a preprocessing method for organizing discrete scalar volume data of arbitrary dimension on external storage with important applications to out-of-core volume visualization of extremely large data sets. Unlike related work on contour trees our methods work for both regularly and irregularly gridded data and no perturbation of the data is required. Rather than making a direct application of Morse theory we identifyi and exploit the properties shared by the most popular isosurface construction (extraction) methods and give a combinatorial characterization of the topology changes in the dataset as the isovalue is varied.

Finally we present a simple and provably correct isosurface extraction method that extends to any dimension.

For further information contact Janos Pach at pach@cims.nyu.edu, or visit our website: http://www.math.nyu.edu/ pach/combinatorics_seminar.html