

Large-Scale Visualization of Scientific Data: Volume Data and Flow Fields

This talk will give an overview of selected research of the High-Performance Visualization research group (vccvisualization.org) at the KAUST Visual Computing Center (VCC). Interactive visualization is crucial to exploring, analyzing, and understanding large-scale scientific data, such as the data acquired in medicine or neurobiology using computed tomography or electron microscopy, and data resulting from large-scale simulations such as fluid flow in the Earth's atmosphere and oceans. In data-driven sciences, the extreme size as well as complexity of data presents a tremendous challenge to interactive visualization and analysis. We will give an overview of two major research directions that we have been working on: (1) Custom data structures and algorithms for large-scale visualization, also taking the characteristics of GPU architectures into account; and (2) Mathematical techniques from differential geometry and mathematical physics for the visualization of large flow fields and important features such as vortices.

Bio

Markus Hadwiger is a professor of computer science at KAUST in Saudi Arabia. He is leading the High-Performance Visualization research group at the KAUST Visual Computing Center (VCC). His main research interests are in the area of extreme-scale visual computing and scientific visualization, in particular volume visualization, flow visualization, medical and biological visualization, differential geometry and mathematical physics in visualization, image and volume processing, multi-resolution techniques, data streaming and out-of-core processing, interactive segmentation, and GPU algorithms and architecture. He is a co-author of the book *Real-Time Volume Graphics* published in 2006, and he has been teaching courses and tutorials at IEEE VIS, ACM SIGGRAPH, ACM SIGGRAPH Asia, and Eurographics, about volume rendering, visualization, GPUs, and Riemannian geometry for visualization.

