



Master Class II: Computer Graphics and Visualization

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Computer graphics is a research field with many applications in various domains; ranging from lighting simulations for architecture, over data visualization in geology and the medical field, to special effects in movies or games. One traditional challenge is the simulation of natural scenes, including complex geometric models and a realistic reproduction of physical phenomena, requiring novel theoretical insights, appropriate algorithms, and well-designed data structures. In particular, there is a need for efficient image-synthesis solutions, which is fuelled by the development of modern display devices, which support 3D stereo, have high resolution and refresh rates, and deep color palettes.



We will give insights into methods to efficiently perform image synthesis, exceeding the boundaries of current rendering techniques. Important aspects are the trade-off between performance and visual fidelity, as well as scalability to large-scale data sets (e.g., point-cloud or medical scans). Further, we show that a deeper understanding of the human visual system can be crucial in the development of rendering solutions for modern display devices. This direction opens up new possibilities and has high potential for future image-synthesis solutions.

In Depth master class on Volumetric Data Sets

This in-depth master class will cover volumetric data sets. Volumetric data is used in many contexts; physics simulations, medical data, or as a level-of-detail representation for point cloud data to name a few examples. While conceptually simple, there are a lot of exciting topics attached to this kind of data structure, which are of high practical relevance for exploration, interaction, and display. In many cases, it requires smart technical solutions to deal with the often huge amounts of information - just 2000 colored voxels along each axis amount to 32 GB of data. We will demonstrate techniques that are able to handle in some cases up to 10^{15} voxels along each axis interactively.

Master Class

- Introduction to the basic representation
- hierarchical data structures
- transfer functions
- examples of typical applications
- Explore the display process
- standard techniques
- level-of-detail representations combined with stochastic rendering solutions.
- out-of-core rendering for large scale visualisation
- on-the-fly caching systems
- remote rendering solutions to perform server side evaluations
- recent compression algorithms
- drastic reduction techniques, compressing petabytes of data to a few gigabytes.

