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Interactive Visualization with Programmable Graphics Hardware

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Abstract

One of the main scientific goals of visualization is the development of algorithms and appropriate data models which facilitate interactive visual analysis and direct manipulation of the increasingly large data sets which result from simulations running on massive parallel computer systems, from measurements employing fast high-resolution sensors, or from large databases and hierarchical information spaces.
This task can only be achieved with the optimization of all stages of the visualization pipeline: filtering, compression, and feature extraction of the raw data sets, adaptive visualization mappings which allow the users to choose between speed and accuracy, and exploiting new graphics hardware features for fast and high-quality rendering. The recent introduction of advanced programmability in widely available graphics hardware has already led to impressive progress in the area of volume visualization. However, besides the acceleration of the final rendering, flexible graphics hardware is increasingly being used also for the mapping and filtering stages of the visualization pipeline, thus giving rise to new levels of interactivity in visualization applications. The talk will present recent results of applying programmable graphics hardware in various visualization algorithms covering volume data, flow data, terrains, NPR rendering, and distributed and remote applications.