We are living in the big data age: An ever increasing amount of data is being produced through data acquisition and computer simulations. While large scale analysis and simulations have received significant attention for cloud and high-performance computing, software to efficiently visualise large data sets is struggling to keep up.

Visualization has proven to be an efficient tool for understanding data, in particular visual analysis is a powerful tool to gain intuitive insight into the spatial structure and relations of 3D data sets. Large-scale visualization setups are becoming ever more affordable, and high-resolution tiled display walls are in reach even for small institutions. Virtual reality has arrived in the consumer space, making it accessible to a large audience.

This thesis addresses these developments by advancing the field of parallel rendering. We formalise the design of system software for large data visualization through parallel rendering, provide a reference implementation of a parallel rendering framework, introduce novel algorithms to accelerate the rendering of large amounts of data, and validate this research and development with new applications for large data visualization. Applications built using our framework enable domain scientists and large data engineers to better extract meaning from their data, making it feasible to explore more data and enabling the use of high-fidelity visualization installations to see more detail of the data.

Parallel Rendering and Large Data Visualization

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Dissertation

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