Interdisciplinary Centre for Scientific Computing

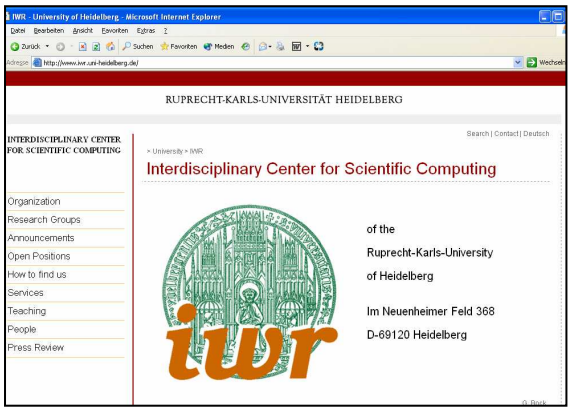
Scientific computing is a sub-discipline of mathematics. Scientific computing offers solutions to many application problems in diverse areas of scholarship. It does so by applying mathematical methods and implementing these methods through computation. Measured in terms of its conceptual design and size, the Inter-Disciplinary Centre for Scientific Computing (IWR) at the University of Heidelberg is among the leading scientific establishments in this area of inquiry. Centre researchers work together on projects with experts from a diverse range of fields. These fields include physics, chemistry, biology, medicine, astronomy, environmental physics and economics (and, in recent years, branches of the humanities as well). Together with their partners from these disciplines, Centre researchers tackle problems of modelling, simulation and, in the end, optimisation.

Computer graphics is an aspect of scientific computing. Intellectually, computer graphics is situated between mathematics (from which many of the most interesting algorithms emanate) and informatics (concerned with the efficient implementation of new processes, especially involving large volumes of data). The main objective of computer graphics is to represent clearly the data and results of scientific computing simulations. Computer graphics should also make interpretation easily accessible.

In this exhibition the Centre showcases projects involving the digitisation of objects. Beyond generating computer representations of real-world objects, another important field of the Centre's work is the goal-oriented, post-digitisation improvement of data records.

Through our example of a virtual globe from a castle (Gottorf) in the German region of Schleswig, we demonstrate how we combine both of these tasks. We began by creating high-resolution digital scans of cartographic originals from the Viennese National Museum. To improve the display and contrast, the Centre undertook "digital purification", that is, we made use of anisotrophic diffusion filters. The result was the removal of dust effects from the map shading. Application of the diffusion filters produces a substantially improved digital map resource. The digitisation of sculptures and artefacts from the temple area at Angkor in Cambodia is a step toward the creation of a virtual museum. The intake of large volumes of three-dimensional object data via low-cost areal digitisation is one of this project's central challenges. Here, we are applying many different techniques and evaluating the results of each in light of their suitability to the project's goals. These techniques include brush light digitisation, photogrammetry and low-cost laser scanning (developed by the Technical University at Braunschweig).

Digital acquisition of entire structures requires first and foremost the generation of laser-range scanning data. Fashioning a compact representation of the structure in question from the cloud of data points supplied by the measurement instrument is both an interesting and important task: only compact models with a small memory footprint allow us to realise a real-time portrayal of the structure. When it comes to true-to-detail representations of historic structures such as Cloister Lorsch or the temples at Angkor, both hardware memory and calculating capacity place severe limitations on our work.



Internet: http://www.iwr.uni-heidelberg.de/