SCALABLE VISUALISATION OF GALAXIES, OCEANS, BRAINS AND CELLS

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The frontiers of Scientific Visualisation now include problems arising with data that scales in size or complexity. New metaphors may be needed to navigate, analyse and display the data emerging from bio-diversity, genomic and soci- economic studies. This talk addresses the challenges in generating algorithms and software libraries which are suitable for the large scale data emerging from tera-scale simulations and instruments. With larger and more complex datasets, moving into the 100GB-1TB realm, scalable methodologies and tools are required.

The collaborative efforts to address these challenges, currently underway at the San Diego Supercomputer Center and within the National Partnership for Advanced Computational Infrastructure (NPACI), will be summarised. The ultimate aim of this R&D program is to facilitate analysis of multiple, large data sets derived from motivating applications in astrophysics, planetary-scale oceanographic simulations, human brain mapping and cellular imaging. Research challenges in such science application domains provide the justification for developing such tools. Previously planetary-scale oceanographic simulations had resolutions limited to 2 deg. latitude and longitude. With Teraflop computing resources coming on line, such simulations will be conducted at 10x (and presently 100x) resolution, soon yielding multiple sets of 100 GByte numerical output. In mapping the human brain, up to four distinct imaging modalities are used, with datasets already at 10s of GBytes. The immediate research challenge is composite these images, facilitating simultaneous analysis of structural and functional information.

These applications manifest the need for higher capacity computer displays, moving beyond the usual 1 Mega-pixel desktops to 10 M-pixel and more. Developments in this area will be discussed.