FROM ABSTRACT DATA MAPPING TO 3D PHOTOREALISM: UNDERSTANDING EMERGING INTERSECTIONS IN VISUALISATION PRACTICES AND TECHNIQUES

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Visualization and the Grid

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At the previous event held in Loughborough earlier in the year I presented a brief set of slides which attempted to explain the "Grid" and the role of visualization. Ahead of creating the summary slide for the Birmingham event I revisited these original slides and was surprised to find that my previous talk did not contain a great deal of visual content. This of course presented the opportunity to rethink how I would present these concepts on a single composite summary slide – the results of which you can see below. The thrust of the slide is to promote "Problem Solving Environments" which require collaboration and the harnessing and orchestration of diverse resources.

The composite summary slide is organised roughly into quadrants with a central section attempting to represent these four aspects in a "block-ology" diagram of the infrastructure to support problem solving environments.

Problem Solving Environments (PSEs) in my opinion have to have an element of collaboration. They should have the capability to run reasonably large scale numerical models and perform advanced interactive visualisation. I am interested in integrating elements of virtual environments and advanced visualization techniques which can take data from a variety of different sources including real world measurements and the output from numerical and predictive models. The missing element, in my view, is not the component parts, but rather the present lack of support for "glueing" all these components together. At present this requires huge technical knowledge and understanding of the underlying infrastructure and processes. If PSEs are going to be used by a more diverse user base, many of which will not possess the necessary technical skills to construct PSEs using present approaches we must seek ways of reducing or removing these barriers. The Grid concepts and developing tools offer real hope of achieving this in the near future.

The top left hand quadrant attempts to explain what I really mean by the "Grid", the current status within the UK, including the established National Grid Service (NGS) and the UK's worldwide standing in this area. An explanation of the operation of the Grid is attempted by means of analogies to the National Power Grid, insect colonies and autonomous systems.

The top right hand quadrant of the slide represents visualization and its potential uses with a particular emphasis on medical applications which is both a personal interest and one which I believe is both easy to grasp and appreciate for a diverse audience. A particular emphasis was placed on interactive visualization since this provides one of the fundamental building blocks of the final Problem Solving Environment (PSE).

The bottom left hand quadrant attempts to highlight research activities associated with Grid based Visualization including the Resource Aware Visualization Environment (RAVE) constructed at Cardiff and the Welsh e-Science Centre and the e-Viz, g-Viz and GAPtk projects conducted by other VizNET partners. In essence all these projects attempt to abstract the user or users from the complexities of discovering, harnessing and orchestrating resources on the grid to perform advanced visualizations.

The bottom right hand quadrant is concerned with attempts to bring all these components together to form a National Visualization Service (NVS). The Reality Grid project was chosen as an example of how visualization is an essential element of performing the task and how the overall system represents an advanced Problem Solving Environment. The photograph of the "post-it notes" resulted from a user requirements exercise to determine the specification of such a national service of scientific users which resulted in the report highlighted below. The iconic image on the extreme bottom right was a clumsy attempt to seek input from the Humanities and Arts communities to this process. I believe that if a National Visualization Service is to be constructed it should reflect the requirements of a more diverse community than that of scientists and engineers. The major aim of the presentation was to promote engagement and input from the Humanities and Arts communities to this process.

During the presentation I stressed that one of the differences I perceive between the scientific and artistic communities is that in scientific and engineering applications of visualization all of the data generation and transformations applied to the visualization are physically based – in that they attempt to model the physics of the situation (albeit often using simplified models). There are of course exceptions such as Non-Physically Based

Rendering. Interestingly these often borrow heavily from artistic visual representations. In contrast, the art community appear to focus on the "end result" and not necessarily worry about the process by which it was achieved. I fear such statements on my part are very naïve and as such I would be interested in exploring this further and for those in these communities to educate me regarding the differences (if any) between the process of scientific visualization and artistic processes and endeavours.

Given this backdrop and context I have been considering and revisiting the scientific visualization process with the aim of identifying why this is perceived as a hard activity and process. It is interesting to note that many Modular Visualization Environments such as AVS and NAG Explorer have been constructed in such a way that users are expected to change the transformations applied to the data – this represents an exploration phase of visualization where the aim is to gain insight into the data by the application of appropriate visualization techniques. Herein lies the first issue, in that to undertake this "exploration" phase the user has to be both a domain expert and also a visualization expert. Since not many of these exist it is often the case that the domain expert employs the skills of a visualization expert and they work collaboratively to actively explore the data and reveal the salient features. This exploration phase is often followed by a presentation phase whereby the domain expert and visualization guru seek to find the best visualization to explain the insight or presentation of the results to the intended target audience.

We must find ways of supporting domain experts directly and allow them to explore and gain insight into their data without the explicit input of a visualization expert.

Future visualization systems will have to both offer a means of seamlessly identifying, harnessing and orchestrating a variety of different resources, be it data, computational devices, scientific instruments and humans and provide means for allowing non-visualization experts to explore their data and make compelling presentation visualizations.

Reference

A Visualization Service for the National Grid Service: A Workshop to derive user needs, Visualization, National Grid Service, NVS, VizNet, Technical Report, Workshop (Ed) R.S. Kalawsky, May 2006, Loughborough. http://www.nesc.ac.uk/technical_papers/UKeS-2006-05.pdf