Cooperative Visualization of Geo-Science Data

Proposer. Dennis Burford. This project is being developed for the Centre for Interactive Graphical Computing of Earth Systems (CIGCES) at UCT.

Brief Description.

The Kaapvaal Seismic Experiment is a project that involves wide-scale collaboration amongst geo-scientists from many different disciplines and countries. The aim is to study the Kaapvaal craton and surrounding areas through, in part, seismic analysis. Large collaborative projects of this type raise questions of how to share, visualize, discuss, and finally make valid interpretations of the data. This project shares these challenges, specifically with the integration and interpretation of data of different formats and from different sources.

A Web site for Findings: A web-based system has been developed that allows participants to upload their findings and data to a central web-site. The findings are in the form of text and images that explain the participant’s results and interpretations. These are automatically integrated into the web-site. The primary purpose of the site is to allow participants to view and discuss each other’s results. The system will therefore allow participants to attach their comments to findings published on the site. The comments could allow different threads of discussion to develop. In order to aid the organization and navigation of the site, various “views” will be supported according to interest. The indexing of the reports will be made possible by information supplied during the uploading process.

Integrated Visualization of a 3D Model: Along with the report, the data supporting the findings is uploaded. This will allow the construction of an integrated 3D visual model of the Kaapvaal craton. The model will be accessible via the web-site using VRML or alternative methods and will be continuously updated to show all the data available. The ultimate aim is to automate this into a ‘self-organizing’ model, as new data is delivered from various researchers. In order to correlate the visualization and the findings, links could be inserted from the reports to a visual representation of the data. Backward links could be established by enabling each object within the integrated 3D model to act as a hyperlink to relevant reports.

Current Status: The basic web site with facilities for uploading, storage and presentation of the data has been developed already. A web-based administration system has also been created to manage the site. Substantial work has been done by A. Kahle in developing a framework for the system using Java applets and JDBC. He has also completed modules for 2D visualizations, displaying tables and other queries. Work has also been done on the major visualization aspects of the project and interactive models have been produced in VRML.

1The Kaapvaal craton is the very old core of Southern Africa. Cratons are the blocks around which continents are built. (http://www.uct.ac.za/depts/cigces/kaapvaal.htm)
Computer Science Content. Scientific Visualization, Cooperative Work, Database Management, Web Development.

Degree of Difficulty.

- Theory. Moderate. Some experience with Java and databases will be beneficial.
- Implementation. Moderate to Difficult. Students will use Java, C++, and the Open Inventor libraries. CGI scripting in perl and simple web server administration may be useful.
- Time. Usual deadlines apply.

Facilities needed.

- The website is hosted on a Pentium II PC running Linux and an Apache Web Server.
- A SGI 320 Visual Workstation is available for visualization development. The Open Inventor C++ Libraries for NT will be used along with VRML on this machine.
- All of the substantial computer and printing facilities of the CIGCES are available. Any additional equipment required will be provided for.
- Students may receive personal funding from the CIGCES.

Supervision.

Supervision in the area of computer graphics and visualization will come from Dennis Burford — regular meetings will be held.

This project is being developed the Centre for Interactive Graphical Computing of Earth Systems (CIGCES) at UCT, students will be required to meet and collaborate with them on a regular basis. Members of the CIGCES will provide detailed specifications and give feedback. Any additional technical supervision will be given by Alex Kahle.

Number of Students. Two or three students.