Entry Form
eResearch Australasia 2009 Visualization Challenge

TITLE OF WORK

The Tunnel of Despair

AUTHOR

Name: Paul Bourke

Affiliation: WASP/iVEC, University of Western Australia

Email: paul.bourke@uwa.edu.au

Postal address: M024, 35 Stirling Hwy, Crawley, Perth, WA 6009

Area of expertise: Science Visualisation

COPYRIGHT HOLDER

DESCRIPTION OF WORK

The intention was to develop a live tool with which one could explore the progress of the markets within a 3D environment in real time or over any arbitrary segment of history. The impression was to give the observer the sensation of travelling down or around a time tunnel. No external data was utilised and a very precise mapping of data to visuals was attempted.

The key attribute of the tunnel is the radius, the average radius is determined by the DJ Industrial Average. As the index shrinks the sense of constriction heightens. The length of the tunnel is the time segment under study.

The companies are evenly distributed around the tunnel, this approach scales well since the radius only increases by the square root of the number of companies. Each companies stock is represented as a track made up of spheres, the radius of the sphere is determined by the volume of shares traded. The colour of each sphere is determined by the price of the shares, ranging from blue (low) to red (high). In both cases the ranges (volume and price) can be chosen to be local to the company and time segment being explored, global over the history of the company, or global over time and companies.

Data range selection and reduction is one of the requirements for a meaninful visualisation of large volumes of data. When showing the whole period of the data set provided it is straightforward to create short time windows and average the company stock values within that period. This is not possible with the news items which cannot be meaningfully averaged. The solution is to only show the items within a sliding window, even then it is sometimes overwhelming. In the images and animations provided that window is related to the camera position but the center of the sliding window could equally be user controlled. Where possible, each news item is related radially to the stock it is associated with.

SCIENTIFIC AND/OR COMMERCIAL VALUE

While not necessarily evident in the static images presented here, the self similarity across scales was clearly evident during the data exploration phase. That is, the stock prices on the scale of days, hours, and minutes appears statistically self similar. This is a characteristic of fractal/chaotic systems, with the implied lack of predictability. While time did not permit the further exploration of these ideas, it may be informative to add a “future window indicator” based upon Lyoponov exponents, as one possible choice.

There is an almost endless number of possible ways of visualising such data, any commercial applications would involve a dialog between the experts in this area to determine which variables are most likely to reveal insight, the identification of likely visualisation approaches, and finally testing to determine which provide a benefit. For example, the variables mapped to the glyphs need not be the metrics chosen for this demonstration but may be selected or computed to produce more informative information.

EDUCATIONAL VALUE

As with any visualisation, it would be expected to provide educational insights on how the underlying stock exchange system operates and how that changes between normal operation or during a period of crisis. For example, what is the significance of the large selling volumes at the end of each trading day?

With the current capabilities of graphics cards, largely driven by the gaming market, the scope of viewing data in 3D is often ignored. While this data may be considered essentially a time series, the dimensionality can be readily extended.

From a general visualisation perspective there is value in the demonstation of the various visualisation principles and techniques that have been employed in this example. The use of colour to represent variable ranges, the nonlinear mappings of variables, data preprocessing, glyphs onto which variables can be mapped, requirements and techniques for data reduction, and interactivity in a 3D space.

LINK TO THE WORK

Images and movies related to this submission can be found at the following:

http://local.wasp.uwa.edu.au/~pbourke/exhibition/eresearch2009/

LINKS TO RELATED PROJECTS OR WORKS

The general technique of embedding linear or category data into a 3D structure was used by the author in a previous exercise to visualise HPC (High Performance Computing) queues.

http://local.wasp.uwa.edu.au/~pbourke/miscellaneous/gqstats/

The general idea is to use the availability of 3D space and navigation within that space to concentrate data that would otherwise be difficult to display in a compact way. With the increasing exposure of computer users to navigation within 3D virtual worlds, the user interface barriers to using similar techniques are lowering.

PERMISSION TO DISPLAY AND DISTRIBUTE

By entering the eResearch Australasia 2009 Visualization Challenge, you are granting permission to display the work at the eResearch Australasia 2009 Conference and for the competition sponsors to distribute the work online and via DVD.

Permission granted.