The SVT

A workflow visualization tool

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The SUPREME project

In the summer of 1996, the SUPREME[1] research project was started with the aim to adapt workflow techonology to process industry and power plant maintenance. Part of this was to provide a tool that displayed the contents of the workflow database, enabling those involved in maintenance work to form an understanding of the ongoing and planned work and to enable them to handle scheduling and replanning of activities. During late 1996 to early 1997, Martin Howard and Jonas Lφwgren at Linkφping University designed a system with the working name Supreme Visualization Tool (SVT), to support these activities. At the time of writing, the implementation of the first prototype is taking place, so we have no experience of the system in use. However, it is presented here because it signifies an important alternative approach to the more traditional database applications and one that probably will become more and more common in the future. Additionally, it is an attempt to combine and integrate various visualization and interaction techniques, as well as extending them.

Interactive visualization

Initially, the entire contents of the database is presented. By manipulating a number of filters the user can control which records are displayed. This type of query was first presented by Christopher Ahlberg (Ahlberg *et. al*., 1992) who named them 'dynamic queries'. The SVT extends upon Ahlberg's dynamic queries by handling temporal data. Workflow processes are displayed in a simulated three-dimensional space as bars with fixed height and width. The z-axis is a timeline and the blocks' length along this corresponds to the process' duration. In addition, a semi-opaque sheet extends the width and height of the space. Its location along the z-axis denotes the current time. Objects on the far side are dimmer than those on the near side, allowing the user to perceptually estimate how much work has been completed in processes that intersect this sheet. As time passes, the bars "float" through the room and the progress can be followed.

Navigation

The SVT provides constrained mouse or keyboard navigation. The user can rotate the view (within limits) by moving the viewpoint along a curved plane. They can also move closer or further away along a line from a point of interest (POI). This movement is non-

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1. SUPREME (Support for the Automation of Large Scale Business Processes in Involving Environments) is partly funded by ESPRIT under the Technology for Business Processes programme (project no. 22065).

linear, moving faster when further away from the POI and slowing down when in close proximity to it. Robertson *et al*. (1993) denote this 'logarithmic flight' and discuss how this can be combined with 'logarithmic manipulation' of objects in the virtual space, though the SVT does not support the latter. The combination of these constraints allow navigation in a three-dimensional space using common two-dimensional input devices.

Overview vs. detail

One of the design goals was to smoothly integrate overview and detail. Ideally this transition should be completely seamless, rather than switching between two or more radically different views. When looking at the processes from afar, holistic or gestalt effects can be observed. While details about individual processes are difficult to see, the user can quickly see how much work is taking place, which systems are the most troublesome, and if large amounts of work lay ahead. Moving the viewpoint close to a process block renders it and the surrounding blocks in more detail, enabling the user to see the component tasks that make up the process.

Future work

At the time of writing the design is being refined and implemented. We expect to have a testable prototype in early 1998, at which time it will undergo an empirical usability evaluation. The evaluation will focus on:

- Overview: The user grasps the state of work on a general level.
- Temporal aspects: The user perceives and understands how process instances are oriented in time.
- Status of ongoing work: The user is able to tell how far ongoing processes have proceeded.
- Distinction between types of process instances.
- Dependencies: The user perceives and understands relationships and dependencies between different process instances.
- Aggregate selection criteria: The user understands how the combination of selection criteria is related to the presentation of process instances.

The results from this evaluation will be fed into a second iteration and used to refine the final prototype. It is our hope that this final prototype can be used in a longitudinal study, perhaps over several months, in its intended context, giving us some insight into usability and quality of use aspects that a lab test cannot reveal.

It is also worth noting that, while the domain of our prototype is maintenance work in process or power industries, it seems likely that the concept can be generalized to any data that is temporal and which can be ordered along one or two other ordinal axes.

References

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Robertson, G. G., Card, S. K., Mackinlay, J. D. (1993). Information visualization using 3d interactive animation. *Communications of the ACM*, **36**(4), April 1993.