Abstract

Since the advent of video display terminals as the primary interface to the computer, how to make the best use of the available screen space has been a fundamental issue in user interface design. The necessity for effective solutions to this problem is intensifying as the ability to produce visual data in greater volumes continues to outstrip the rate at which display technology is developing. Most research in this area has concentrated on specific applications, exploiting their underlying information structure to obtain reasonable displays. In this work we take a different approach, examining the display problem independent of the application.

In particular, we divide the display problem into two components: representation and presentation. Representation is the act of creating a basic image that corresponds to the information such as creating a drawing of a graph. Presentation is the act of displaying this image, emphasizing and organizing areas of interest. For example, a map of Vancouver may be presented with one's route to work magnified to reveal street names. Since representation is inherently dependent on the information, this part of the problem is not considered. Instead we concentrate on presentation and assume the existence of a two-dimensional representation.

Our research into the presentation problem has led to the development of a framework that describes a presentation space in which the adjustments and reorganizations are elastic in the sense that reverting to previous presentations is facilitated. Within this framework the approach is to map the representation onto a surface in three dimensions and use perspective projection to create the final display. Varying the surface provides control for magnification and organization of representation details. Use of the third dimension provides the possibility of making these presentation adjustments comprehensible. Our framework encompasses previous techniques and indicates a broad range of new ones.

Existing presentation methods create displays that vary considerably visually and algorithmically. Our framework provides a way of relating seemingly distinct methods, facilitating the inclusion of more than one presentation method in a single interface. Furthermore, it supports extrapolation between the presentation methods it describes. Of particular interest are the presentation possibilities that exist in the ranges between distortion presentations and magnified insets, distortion presentations and a full-zooming environment, and distortion presentations and those that support the repositioning of separate views.

Our elastic presentation space framework describes existing presentation methods, identifies new presentation variations, and provides methods for combining them. This removes some of the current difficulty around making a presentation choice, and allows a designer of new information visualizations to include a combination of presentation methods that best suit the needs of their application's information and tasks.