Financial Viewpoints: Using Point-of-view to Enable Understanding of Information

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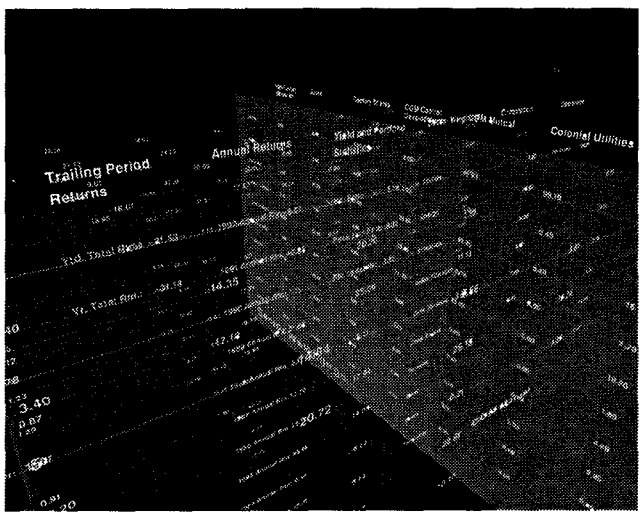

Figure 1
Transparent intersecting planes provide different points of view on seven mutual funds.

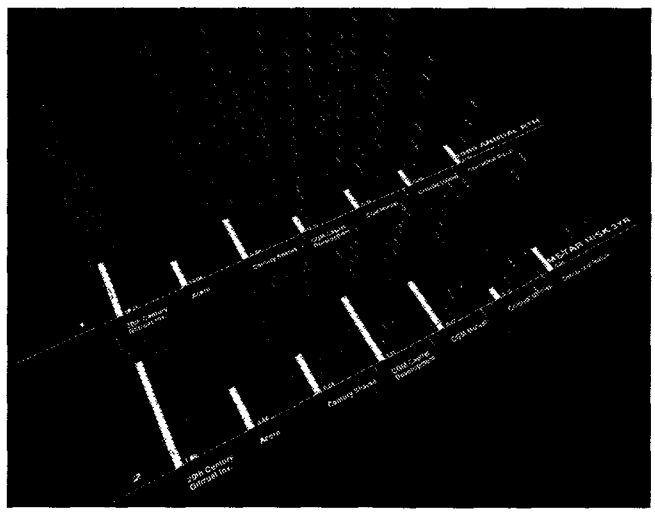

Figure 2
Bar charts slice through information grid to show comparison of annual return versus 3 year risk for all seven mutual funds.

ABSTRACT

This paper presents *Financial Viewpoints*, an experimental interactive 3D information space that spatially and volumetrically represents a portfolio of seven mutual funds. 3D *point-of-view* is used to represent context and context shifts in the information and to allow users to view multiple representations of the information in a single, continuous environment. This project is the first in a larger and ongoing research effort to explore the notion of *embodied virtual space*.

KEYWORDS: Information visualization, 3D interactive graphics, financial visualization, point-of-view, embodied virtual space, user interface metaphors.

INTRODUCTION

Imagine yourself without size or weight. You are in a zero-gravity space and you see an object in the distance. As you fly towards it, you are able to recognize the object as a financial portfolio. From this distance the form of the object conveys that the portfolio is doing well. You move closer. As you near the object, you pass through an atmosphere of information about net assets and overall return statistics. You continue moving closer. Suddenly you stop and look around. The financial portfolio is no longer an object, but a space that you now inhabit. Information surrounds you...

This scenario is a potential experience of future explorers of virtual information worlds. Recent research into the development of these multi-dimensional worlds has uncovered both the potential of these spaces to enhance our understanding of complex information as well as some very new problems of information navigation and access.

FINANCIAL VIEWPOINTS

In this project we were faced with the challenge of spatially and visually organizing about 350 pieces of data (50 pieces of data for each of seven funds). Each one of these pieces of

data has several contexts within which it can be viewed and understood. For example, the piece of data which represents the percentage of CGM Mutual's holdings in consumer durables belongs to several different categories or *contexts* which include: 1) the mutual fund it belongs to (CGM Mutual), 2) a group of data representing the present holdings in other areas (sector weightings), and 3) the group consisting of the percentage of consumer durables for all seven funds. In each one of these contexts, this single piece of data may have a different meaning for the user. The following description represents an experience of an explorer of *Financial Viewpoints:*

...You are now inside a grid of numbers. These numbers represent a portfolio of seven mutual funds over the past ten years. This data begins to become information when a translucent plane appears that slices through the space along one axis. This plane highlights all of the information on each one of the seven funds, one at a time. As the plane moves back and forth, numbers become perceptually "foregrounded" by being highlighted and labeled, while remaining numbers fall to the background. In examining information on CGM Mutual, you observe that this fund's annual return in 1991 was exceptionally high and you desire to compare it to 1991 annual returns from the other funds. Another plane appears. This plane slices through the grid of information perpendicular to the first plane. As this second plane moves to the "annual returns" position you rotate your point of view 90 degrees. CGM's 17% now resides in a different context: you see it along with annual returns over the past ten years for all seven funds...

Financial Viewpoints makes use of multiple information representations which include bar charts, graphs, and manager photos. Each one of these representations alone may produce a specific meaning or force a particular interpretation of the information. Using graphical and spatial design techniques such as transparency and dynamic objects to focus attention, *Financial Viewpoints* allows all of these representations to coexist in a single continuous space. The user's ability to move freely through the space and access these representations from multiple points of view allows her to grasp the complexity of the information much like we grasp the complexity of our physical environment, by aggregating a sequence of familiar and simplified representations.

POINT-OF-VIEW AND UNDERSTANDING

The use of point-of-view to enable understanding of complex information relies on the conceptual metaphor "understanding is seeing." (We also use this metaphor when we say, "I *see*" or "I'm not *clear* about what you're saying.") In our research we have discovered the significance of the role of the *body* in metaphors for understanding. Language provides much evidence, in fact, that understanding is structured by our bodily experience in the physical world.[3]

3D virtual information spaces, because they are abstract worlds of suspended text and images rather than simulations of the physical world, have a somewhat paradoxical relation to the body. As explorers of these spaces we become (at some level of consciousness) both embodied and disembodied. We rely on bodily intuition to navigate through and understand the structure and contents of the space, but we also have the ability to do what our bodies do not allow us to do in the physical world: we can fly (even through time), change our size (e.g. zoom through multiple scales of information) and see through objects (via transparency).

EMBODIED VIRTUAL SPACE

Financial Viewpoints represents a first experiment within an approach for enabling understanding of information that we have termed *embodied virtual space*. Embodied virtual information spaces are spaces that both embody and disembody us, as users. Our objective is to create information spaces that empower us, by allowing us to rely on our bodily intuition for natural navigation, and also by giving us additional superhuman abilities that can greatly enhance our capacity for understanding.

Thus far in our research we have identified two ways in which virtual space can become embodied: by engendering either a sense of *scale*, a sense of *point-of-view* or, ideally, a sense of both. Several researchers have used scale successfully in infinite zoom information interfaces. [1][2][5][6] Navigation through these information spaces feels intuitive, we argue, because the user is, at some level of consciousness, projecting his or her body into the virtual space.

SUMMARY AND FUTURE WORK

Financial Viewpoints makes use of *point-of-view* to enable understanding of information in 3D virtual space. Future work will explore the combination of multi-scaled and multiple point-of-view interfaces as well as possible representations of the body in information space that may further enhance our understanding of complex information.

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