Information Esthetics: From MoMA to Wall Street

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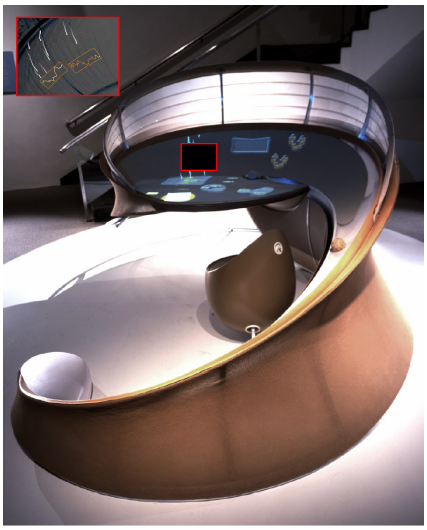
MoMA Desktop/Data Rain: InfoVis as Design in an Art Museum

The Workspheres exhibition

In February of 2001 New York's Museum of Modern Art (MoMA) held an exhibition called *Workspheres: Design and Contemporary Work Styles*. Its purpose was to explore how design and technology might influence the work environment in the near future. I was commissioned to design and implement a near-future computer interface to go along with a "concept desk" (think of Detroit's concept cars) designed and built by Haworth furniture company's advanced technology/design Ideation group and hired collaborators.

The desk took its physical shape from group leader Jeff Reuschel's focus on memory and attention, providing a central flat surface for current work, an adjoining surface that sloped up to vertical for past work and information feeds, and a nautilus-like tapering surface that curved away and around the desk's occupant mimicking how memory's traces diminish and seem to move to the back of one's mind over time. The whole flat to upright to curving-behind surface we decided would be a computer display. We expected LED or light-emitting polymer technology to soon be available at reasonable cost (we still do…), with high resolution and the ability to follow curves. My job was to fill the desk with information (projected, to fake the future display technology).

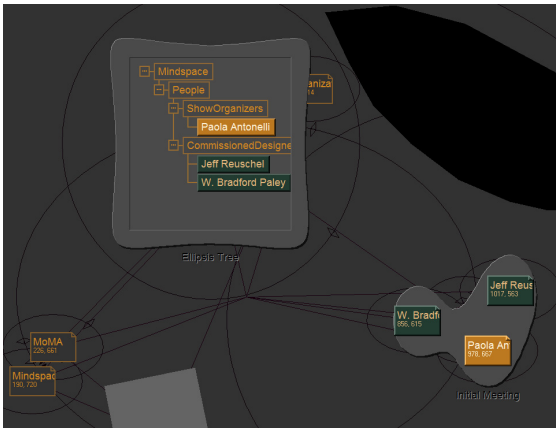


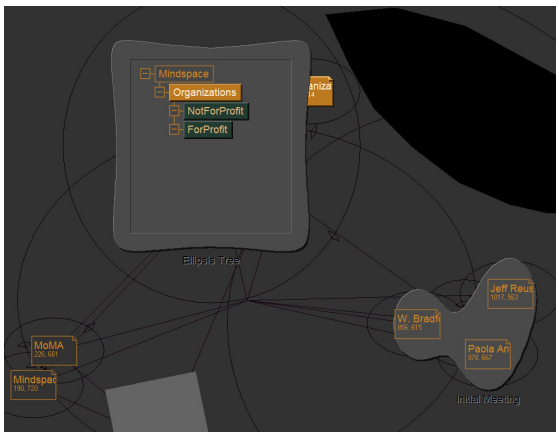
But I wanted to fill it with information that was active and easy to interpret, not just create a cluttered stand-in for a possible future "messy desk" style kinesthetic/memory filing system. So I attempted to get across one of the key ideas of Xerox Parc's Model View Controller (MVC) paradigm, showing multiple views of a single data set. (One of the central ideas of the MVC paradigm is to separate data (their "Model") and views, so that different views of the same data could support different needs. So the flat part of the Mind'Space desktop (forgive the name, I had nothing to do with it…) showed a small hierarchy of data (entities involved in the creation of the piece) in two ways: structured, in the familiar indented tree; and as ad-hoc relationship "blobs."

Low level distinctions in the desktop interface design

On the perceptual level, the interface draws attention to selected nodes using at least three different techniques: they are the brightest things in the display, have the highest contrast lettering, and are drawn in the most saturated color (a bright orange). They also had a pseudo-3D edge (the standard computer upper-left corner highlight/shadow convention) while other unselected nodes remain "flat." When a node is clicked, it is drawn as selected, and so are all other nodes that refer to the same data node in the MVC "model." This can be seen in the figures below: the *Paola* node appears in a blob as well as in the tree, and the *Organizations* node is in the tree, and almost hidden by the tree view's slightly blobby border—but notice how visible it is, even so.

Selected nodes share this 3D appearance with another class of nodes: "related" nodes. This two-level information highlighting technique is worth a few words: when a node is selected (bright orange) the computer may want to suggest a related node (dark green) to support a reasonable next step in the thought process. (I typically create an MVC "view" for each distinct thought process—here, understanding a node with respect to its position in the tree, versus understanding it in the ad-hoc context that people create with blobs.) The Selected/Related highlighting scheme distinguishes both Selected and Related nodes with that 3D appearance for a specific reason.





As an aside, "related" can mean different things in different thought processes, figures X and X show this in action. Figure X shows things related to the *Paola* node in a blob: the other two people are green, and shown in the tree. And the tree should naturally collapse if it knows what's important to you, here just the "attended" objects: what I call both selected and related ones (forming a useful distinction in the interface, as well as a nice conceptual pun with the quantum physics idea that only observed phenomena condense to real objects). And figure X shows what related means in our tree: the selected *Organizations* node leads the eye to its children. (As a nested aside, this is the first example I've seen of something we might call "emergent interface design." When clicking through the tree, each level reveals itself just as you need it—even though I didn't define this aggregate interface behavior; only the simpler rules of selection, what's related, and that the tree should only show attended nodes.)

The human visual system has two major pathways, called by researchers in neurology the "what" and the "where" pathways after their supposed purposes (the "what" pathway supporting the understanding of objects, and the "where" pathway feeding your motor systems). [Ramachandran, pp. 77-82] If these two pathways do exist, and their functions are this clearly distinguished, we can take advantage of them for information design.

The MoMA design tries to use this low-level vision distinction to separate background contextual information (such as nodes not chosen and nodes at higher levels in the tree's hierarchy) from information that might be immediately important to the task at hand (the Selected and Related nodes). The nodes are clearly distinguished on the desktop, and I suggest that there may actually be a physiological distinction that can help people interpret the representation. This suggestion rests on the assumption that we can draw objects that don't engage the "where" pathway (the flat ones) or do (the 3D ones), or at least engages it to a significantly different degree.

Higher level distinctions on and above the desktop

It may also make sense on a higher level of interpretation: making objects that are "in play" more salient to the "where" pathway in this way may prime the human motor system to be ready to act on them. And if we're primed to physically act perhaps we're also primed to do the mental transformations that InfoVis representations are built for. Of course both of these assumptions need to be scrutinized if they are to be taken as more than design guidelines. But imagine the implications if they're true: current windowing systems are wasting one of the most valuable visual resources we have on some of the most common, least important features on a computer screen: window edges, scrollbars, and minimize/maximize/close buttons! We may be ready for a reorganization.

An even higher level of interpretation, the semantic level, is invoked by the shapes of the views themselves: the rigid, unchangeable hierarchy is drawn in clean straight lines, in a relatively stiff-looking blob while the ad-hoc relationships are very free form shapes. This

is done with a specific intention: rigid relationships should be drawn as rigid, and freeform relationships should feel fluid and changeable.

The semantic level also accounts for the raindrop theme of simulated stock input, displayed on the vertical part of the desk. DataRain drips gently into charts, each trade represented by a drop. This was inspired by a lovely work done by Natalie Jeremijenko while artist in residence at Xerox Parc in 1995: the "Dangling String." She attached an eight-foot piece of plastic "spaghetti" to a stepper motor "so that each bit of information that goes past causes a tiny twitch of the motor." [http://www.ubiq.com/weiser/calmtech/calmtech.htm] On a day that the network has little traffic it turns slowly, but when there's a lot of activity the string whips around, making a noise characteristic to that level of network traffic. This work later became a focus for Marc Weiser's discussions of "Calm Technology."

Data Rain has the calm computing characteristics of easy foreground/background reassignment, peripheral awareness enhancement, and creation of a sense of place. It sits just out of the usual gaze space, letting the owner of the stocks habituate to the activity in the various stocks, whether heavy or light. But on the semantic level DataRain attempts even more: to make the representation evoke some of the meaning inherent in the domain. When there's a dip in activity for a stock that's usually traded a lot that part of the desk may feel "funny," causing one to look more closely. This maps to the (not accidental or intentionally lyrical!) parlance of the market "the liquidity for that stock has dried up," making it harder to trade in large quantities. When the slowly-dripping stock suddenly displays a torrent of transactions, I'd suggest that rush of interest is better shown as a downpour than a color-coded spot on a fixed-position display. It carries more meaningful context and allows the stock owner to more easily invoke the mental reference frame needed to deal with the issue.