Chapter 5: Design for Cyberspace, Part One: What's so deep about 3D?

The Great Why Botherhood

So why bother? Now that you've learned all about how to load up a VRML browser, and you've gone to a few VRML sites, you're probably wondering why you should actually bother to master this language – why you should learn to speak Cyberspace. Sure, it might be cool – even fun – but what's all the fuss about? Where's this new frontier? It doesn't seem very science fiction, does it? More hologram than *Holodeck*…

But this is just the beginning.

Although virtual reality has been with us for about a decade, very little work was actually done – given the incredible hoopla that accompanied it. As exciting as it was, most of it was both incredibly expensive and too proprietary to be duplicated on any mass scale. Much of the work, once completed, lay unused – just a good example for future work, if anyone got to see it, but most work never spread broadly throughout the world, or even the VR community.

The failure of VR lay in just these two faults; first, anyone who came up with a good idea – on interface, or software, or almost anything else – hired a fleet of lawyers to patent protect their work. While a patent is a useful device to nurture innovation, they're often used as an offensive weapon, rather than a defensive protection. The *DataGlove* – which became one of the defining images of early Virtual Reality – also became one of the most fought-over patents in modern time, a three-way battle waged between VPL (who had adapted work from Tom Zimmerman, then patented it themselves), Mattel (who wanted to bring the *PowerGlove* to every kids' Nintendo), and AGE (a toy company and broker of the VPL/Mattel deal). Mattel did sell PowerGloves by the boatload – even though only one game supported it in any meaningful way – but the legal battles between the three kept VPL from seeing any revenues (spent in legal fees), kept any more games from being developed (Mattel, unsure of ownership, refused to fund developers), and kept any more products from the market (AGE, once burned, refused to do anymore VR toys).

If patents created a morass of problems, the proprietary nature of VR compounded the problem geometrically. Every inventor thought they had the "right" way to solve a problem and – without much thought toward mining the field for existing solutions – every product, created from the whole cloth, required its own computer, peripherals, software, consulting, maintenance, and so forth. All of this meant that VR remained very expensive, within the budgetary domain of only a few large universities and commercial organizations – never leaving the ivory towers of research. It also meant that no two pieces of VR would work together; you might have an incredible head-mounted display, and incredible image generator, but getting them to work together might take months or years of new engineering work. Few ever bothered to make the attempt.

For its first years, the universe of VR seemed more like a constellation of island kingdoms, fiefdoms, where each company acted as master of all they surveyed; but that never amounted to very much. So, even with all of the press and marketing hype that spoke of VR as "the next big thing", most people never saw a VR system, or – in the rare instance they did – ever got to use it more than once. Which meant that very few people knew the truth – that VR was clumsy, uncomfortable, under-performed, over-priced, and generally failed to live up to the epoch-changing predictions so often made for it. When someone did manage to create a singular work of VR – and we'll cover three of these in a later chapter – the cost of the equipment made it prohibitively expensive to show, further fueling frustrations.

So is it any wonder you're a bit under-whelmed? Not at all – in fact, I'd be surprised if you weren't. VRML has solved the twin problems of the free exchange of information and interoperability, but, in order to do this, the clock has been turned back to the beginnings of VR, back to very basic works. Once these perform well – as they now do – the stage has been set to recreate – to mine, if you will – the last decade's research in VR, and bring it into VRML. That's where we are now; learning to take what's already been done and bring it into VRML, a universal format that no one owns, is freely available, and designed to be as friendly as possible to both creators and computers. Now that's something to be excited about!

Sense and Sensibility

The key to the power of virtual reality is its ability to make information *sensual*. We don't normally think of numbers as possessing shape; yet imagine the difference between a thimble-full of water and gallon tank of it. When visualized, scale – which is one of the basic properties of number – becomes immediate and apparent. That's the essence of what we try to do with virtual reality – we try to make everything as immediate and apparent as is reasonably possible. That's sometimes very straightforward, but – more often than not – involves some intuitions and sensibilities which are more artistic than scientific, more aesthetic than rational. Princeton University professor Dr. Edward Tufte has written a series of books, including the recently published *Envisioning Information*, which deal directly with the different techniques that can be used to create a sensible, sensual mapping between information and representation. In Tufte's texts, scale, symbol, sign, location and orientation form atomic elements which recur in a wide array of different combinations to create effective visualizations. Think of the number of times you've gotten lost - because of poor signage - and you can quickly understand why it's important that anyone designing for cyberspace must have some understanding of the basics of informational design.

Designing for sensibility means designing for the senses; sensuality is intimately linked with our ability to perceive. Perception – an entire field of study in itself – creates reality; in the virtual world this is even more true, because the qualities of perception can be minutely manipulated – tuned – to create a particular effect. Nothing is extraneous, nothing can be added in; it's all just exactly as you might wish to make it, almost like a

magic wand. The quality of your creations is determined solely by the dexterity with which you can cast your sensuous spells.

The main job of your senses is to represent something outside – some real-world event – to your mind, a mind that can only express itself through language, which, as we all know when we're "at a loss for words", isn't always up to the task. It's as if there are three worlds in the universe of perception: real-world events, the senses that perceive them, and the mind which interprets them. The senses themselves are essentially imperfect receivers and transmitters of experience, as two examples will show.

First, take the remote control from your TV set (or CD player or VCR or whatever) and point it at your eyes, and press a few buttons. What happens? Well – as far as your eyes are concerned – nothing. Nada. Big fat goose egg. But if you point this same remote control at the appropriate device, and press again – voila! – through some "magic", the device responds to the remote control. We "sophisticates" know that this magic is actually infrared light, that signals are being sent from the remote control to the device, and the device is interpreting the signal, then acting upon it. Human beings are not equipped to perceive infrared light – while some other animals, such as snakes, are – so although the remote control generates a real-world event, it gets "filtered" out by our senses.

Now, let's say that one day, while walking down the street, you see a spacecraft land before you, watch the hatch open, and see a little green man step out, onto the pavement. He walks over to you, sticks out his hand, and says, "*Watashi wa chisai no midori no hito desu*." You heard the words, you see the little green man, but all of what he said makes next to no sense to you – unless, of course, you happen to understand Japanese, in which case that "nonsense" would have sounded – to your ears – as, "I am a little green man." (I guess he thought he was landing in Tokyo!) Here the real-world event was correctly interpreted by your senses, but you didn't have any way to turn that sensory data into sensible information. In this case, the perception was "filtered" out as it passed from your senses to your mind.

In both of these examples there's something that you could do to augment or improve your ability to perceive the world around you. In the first case, you could purchase a pair of night-vision goggles, which take infrared information and convert it to human-visible light. Then you'd see the remote control flashing away. (Yes, it really works.) Or – in the second case – you could take a course in Japanese, and soon you'd be able to converse with any of the aliens who might happen to land. In both cases what you've done is to seek an appropriate remedy to "get the message across" – to span the gap between the real-world of events and the internal world of your own understanding. That's the point behind virtual reality; using visualization techniques, designers work to find ways to get the message across the barriers of the senses, using sensuality to foster sensibility.

Although though folks in VR often tend to use the word "visualization" as a catch-all, we'd be missing enormous opportunities if we presumed the eyes as the only gates into the mind. The ears, touch and vibration on the skin, even smell and taste can be used to

present information, so it's more proper to say that the goal of the cyberspace designer is to "perceptualize" information, rather than "visualize" it. After all, if you're designing for someone who is blind - which is easy to do in VRML – you can't exactly draw them a picture! Instead, you might create a sonic landscape, an aural space where sound could form the foreground of information perceptualized. Or maybe even give them "smell-o-vision", so they could understand data through an olfactory input. (Yes, this has been done.) VR's not just about pretty pictures – it's about getting the point across, crossing the barriers of the senses, and making an impression on someone's mind.

Inside Information

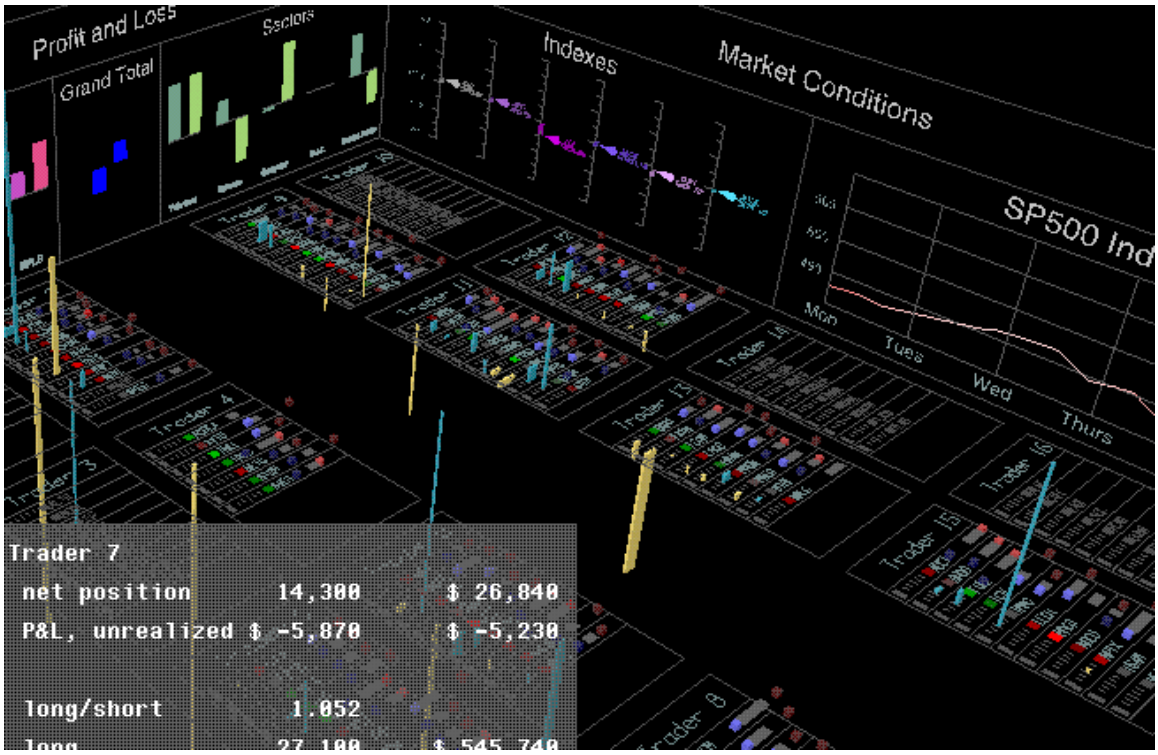
How practical is all of this talk about perception and sensuality? As practical as the wallet in your pocket.

One company in particular has been building a fair-sized empire in information visualization; Visible Decisions, Inc. is a Toronto-based firm specializing in visualization tools for the financial industry. Why, you ask, would a bunch of bankers need these kinds of tools? Because some of them are drowning in information.

A stock or bond trader is among the most info-overloaded people in the world. In a trading office, the trader is generally surrounded by monitors, displays, telephones, tickers, and so forth – basically wired into the world's financial networks. The better that trader is wired in, the more information they have to work with. More information means better decision making. And better decision making means that trader earns more money.

Seems pretty direct. More information equals more money. Brokerages do everything they can to envelop their traders in information. But there's a real limit to how much information you can bombard a person with before they overload – a feeling many of us are familiar with. How much reading, and interpreting and decision-making can any of us make in a day before we begin to feel burnt out? How much adrenaline has to course through our veins before we feel put-upon? All of this is true – in spades – for a trader; they're the locus of activity, the center point upon which everything depends. And they've reached the wall – because today we *can* load them up with more information than they could possibly use. We can overload them.

Yet, if we take a look at the kind of information a trader is presented with – rolling stock quotes, bond prices, and so forth, a roaring stream of information – while it's clear than while the information's being poured onto the trader, it's not always presented in an easy-to-digest form. Some of it is apparent and immediate, but some of it requires thought, thought that consumes precious time. That's where Visible Decisions comes in. Their entire product line centers on the fact that information can be presented in more digestible forms, and, if that's done, more information can be presented. Lots more. Take a look:



Here's a view of a tool known as *Head Trader*. In this visualization, the master trader on a trading floor can quickly grasp a comprehensive overview of the actvities of all traders working under the head trader, all trades made, the current condition of the market, and so forth, all in an immediate, direct, and intuitive visualization. Different viewpoints can provide close-ups on a single trader or the current state of the market.

So much information comes up in a single display – as many as 3,500 values – that the head trader can *instantaneously* grasp the health of the market, the sensibility of the trades, and the sanity of the traders. It's far beyond anything ever available to traders before, and – in the best cases – it can improve their ability to absorb information by a *thousand* times. That's right, information correctly presented – perceptualized – can be absorbed by individuals as much as a thousand times faster.

Consider the spreadsheet – still the bedrock of business computing. Imagine a medium-sized sheet with thirty rows by 100 columns, say the financial plans of a company for the next four years. Imagine trying to comprehend at that entire spreadsheet, as a whole, understanding the meaning *and* value in every cell. It's practically impossible. Now imagine that you could have a forest of shapes, colors and movements, which sensibly map the meanings and values into intuitive forms. That wouldn't be so hard to digest; as a matter of fact, you'd probably come to understand it quite quickly. That's the incredible – and barely touched - power of information design.

Searching for Clues

You don't have to be a bond trader to be a victim of information overload. It's a lot easier than that. If you want an example, just go to *AltaVista* (at http://altavista.digital.com/), type "VRML" as the search query, hit return, and wait a moment. It'll show you the first 20 of more than **50,000** documents.

Fifty thousand documents, you say? How do you expect me to find anything in that?

Welcome to information overload. The trouble with the Web is that it's become too successful – a victim of its own growth. Where once – a few years ago – it was pretty easy to find most anything (after all, there wasn't a lot to have to look through), these days there's so much there there that finding anything at all means having to winnow through lots of information that's at best only marginally meaningful.

What if – through some magic of visualization – you could sort through many of these documents without ever having to read them? What if they could "sort themselves", based on age, length, author, and so forth, so that you could select a few and keep them around – for closer observation – and discard the rest? Wouldn't that make this needle-in-a-haystack problem a whole lot easier to deal with?

Bingo.

This idea occurred a few years ago to a very bright gentleman named Bill Gross. Bill's smart enough to have been chief scientist at Lotus Development Corporation for a few years, and then went on to found Knowledge Adventure, a highly successful educational software company. In his spare time (!) Bill solves big problems for the rest of us – one of them, how to find document needles in data haystacks.

After giving it some thought – and asking his employees some very specific questions – Bill figured that any document could have about 20 types of *meta-information* associated with it. Meta-information is information about information; that is, how old is this information, who created it, what period of time does it concern itself with, what language is it in, etc. This meta-information, he surmised, could be used to "scatter" the documents in three dimensions – that is, lay them out in space. He could "weight" each of the meta-data types, and that weighting could be used to "clump" the documents together, if they were somehow similar. In this way, all the documents created by me might clump together just *here*, while all the documents created by Bill might clump together *somewhere else*. All of a sudden, you'd have a big leg up on winnowing through those documents; the important ones (mine, of course!) would be clumped together and ready for your examination – the others could be ignored.

Better than that, Bill made it possible to re-scatter the documents, in real-time, by pulling on scroll-bars, one for every type of meta-data content. So, you could switch from clumping by document author to clumping by document age; then all the year-old documents might clump together on the left, while all the week-old documents might clump together on the right. Or, you could tweak the scroll-bars again, and combine the

various meta-data types, so that you might get all of the documents that I wrote a year ago on the left side of the screen, while all of the documents I wrote would clump on the right side of the screen. Or…

Well, you get the picture. With this kind of tool – Bill calls it *Visual Search* – it's like having a big, fat magnet to look for that needle in a haystack. Once again it's perceptualization multiplying your ability to absorb information by hundreds or even thousands of times.

Scratching the Itch

We've barely scratched the surface of information design; just as graphic design was a growth field in the 1980's and 1990's, information design will be an important part of the design arts in the twenty-first century – and far more important than graphic design ever was. Without good information design, we'll literally drown in facts, without any understanding. Good design will provide a framework for meaning, working from sensuality to sensibility, and multiplying our ability to survive in an era rich in information like no era before.

Brenda Laurel – one of the goddesses of VR – once said that the goal of VR was to require, "no training, no metaphors, and no f___ing interface!" Her ribald sentiment frames the hopes of everyone in this field – to work toward a day when the computer disappears as an instrument, when it's all just seamless communication, from person to person, of any and every idea.