Magic Lens

Jeffrey Nichols
Graduate Design Studio
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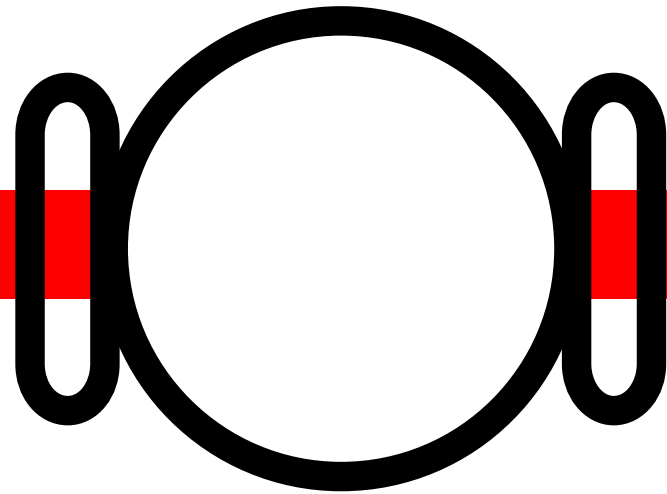
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Introduction

This process book describes my solution to visualizing an information space. The assignment was to take an artifact that our professor gave to us and visualize it in one of two media: a movie or an interactive system. My artifact is the web site of MetaDesign (*www.metadesign.com*): a prominent design firm with offices in San Francisco, Berlin, and Zurich.

This book describes how I arrived at my interactive solution to visualizing *www.metadesign.com*. First I discuss my exploration of the web site and my early attempts at brainstorming a workable idea. I touch on my brief thoughts of building a movie and my difficulty with that solution. Finally I discuss my solution, the magic lens, from its early development to the final product.
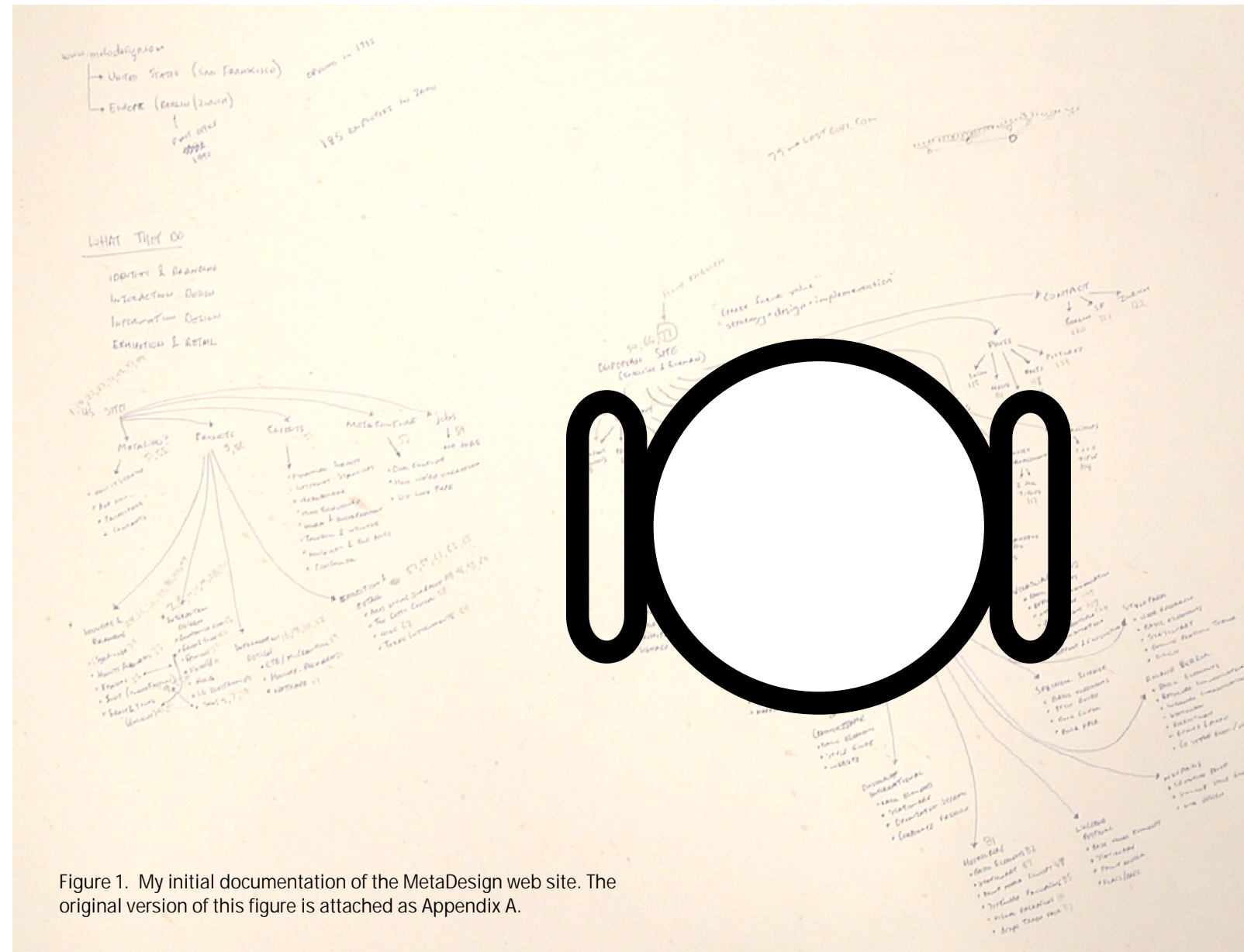
The Web Site

Figure 1. My initial documentation of the MetaDesign web site. The original version of this figure is attached as Appendix A.

I started my project by documenting the structure of the MetaDesign web site with a map that I drew as I went through the site (see Figure 1). The first thing I discovered was that the US and European offices have distinctly different web sites. I was told later that MetaDesign's San Francisco office is only partially owned by the European office, and although the offices use the same name, they are actually two different firms. The two different web sites share only the same color scheme and the same top-level page.

Initially I was only able to document the US site because the European site seemed to only be available in German. It was only on my second visit to the site that I discovered the button that allowed me to change the language of the site to English.

When I finished documenting the web site I had a map drawn on a piece of sketch paper that showed a very tree-like structure. There were a few interconnections deep in the US site, but otherwise the site structure was very simple and quite predictable.

The content, which I did not document, was also not very interesting. As I said in class, I felt like the site was mainly an advertisement for the company, just like many sites that do not provide a web-based service.

At this point I was quite worried, because I did not feel there was anything interesting about structure or content of the site. I was not sure how to proceed with my project.

Figure 2. A zoomed-in view of Figure 1, making the pencil-drawn numbers more apparent. These numbers represent the order in which a page was visited.
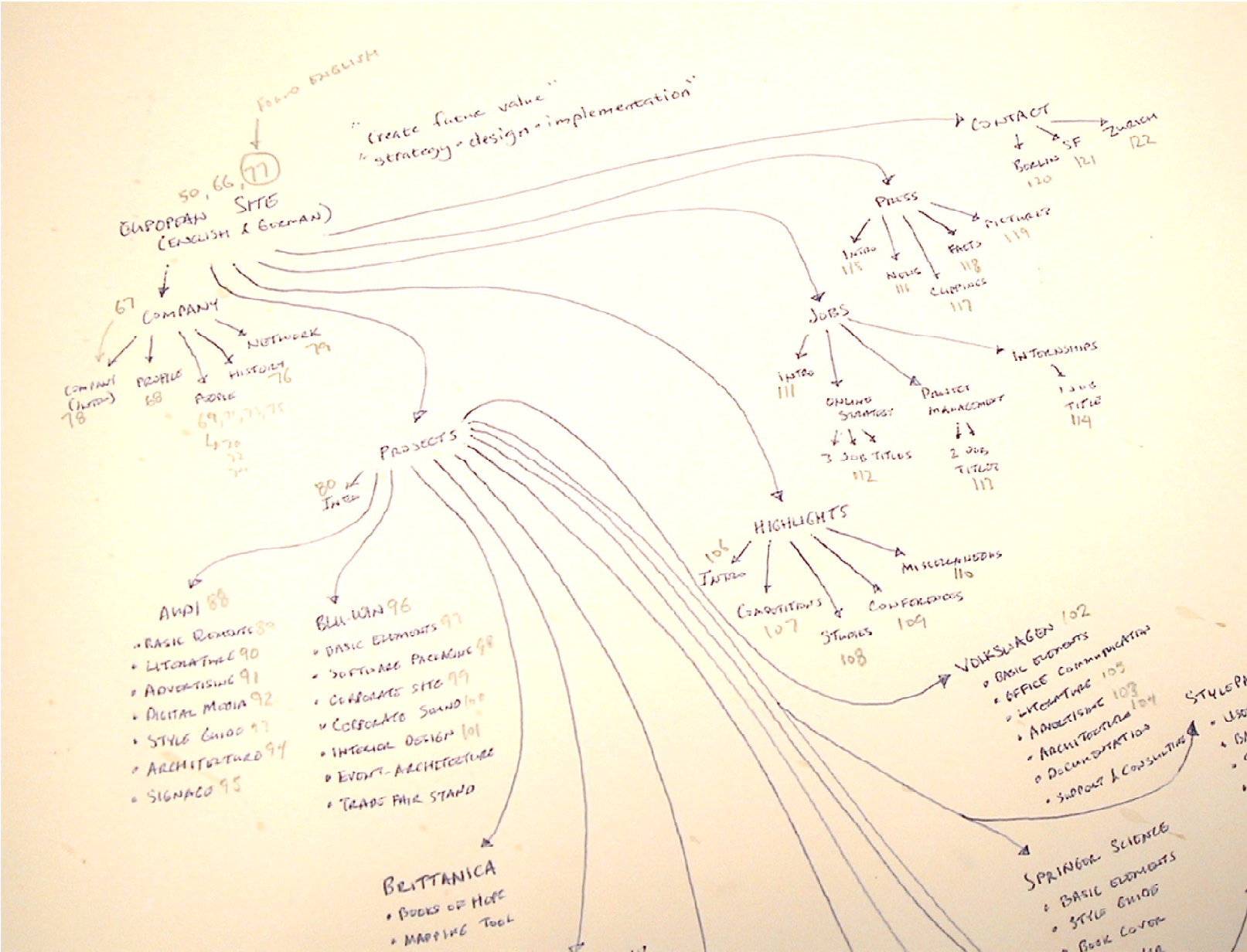
User "Study"

About a week came and went, and I still did not have any ideas about how to proceed with my project. After talking with my professor, we came upon an idea, which was to show the structure of the web site from the point of view of a new user coming to the site. The plan was to conduct a user "study," in which I would have a person sit down in front of the web site and I would document how they proceeded through the site.

I conducted this study with a close friend. I recorded his speech and kept track of the order in which he clicked links on the map I drew earlier (see Figure 2). While I did discover some links that were missing from my map, I did not discover anything interesting about how people traverse the web site. My friend navigated the site in an orderly fashion, choosing his path in a manner similar to what computer scientists would call a "depth-first search." He spoke infrequently.

I was frustrated by this result, because I was hoping something interesting would come out of the user study that I could grasp to make a good presentation. Unfortunately, that did not happen. Furthermore, the result of the user study was so similar to the structure of the site itself, that it did not seem as if it would be useful to my work.
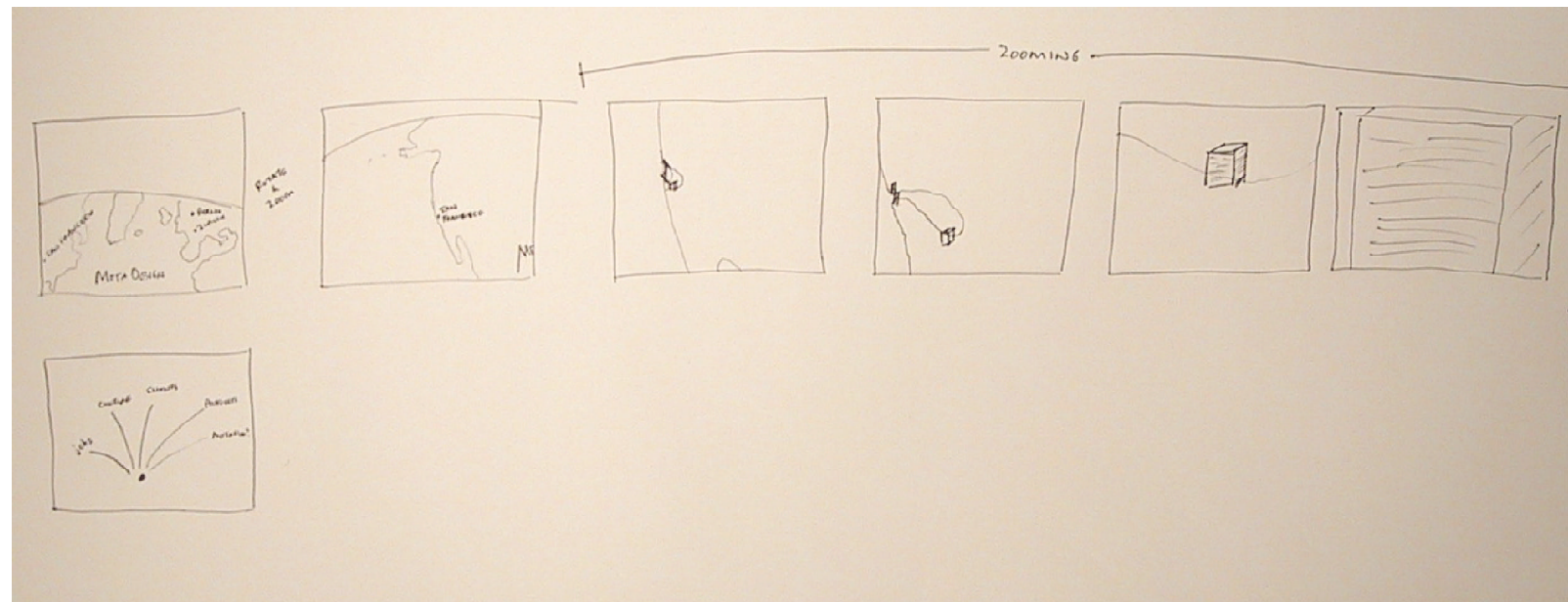
Linear Thoughts

Figure 3. My brief attempt at a storyboard, in which I was experimenting with three-dimensional zooming and panning to show the tree.

Despite my frustration at the uninteresting result of the user study, I continued to pursue the idea of using a first-time user as a basis for communicating the tree of the web site. I continued down this road for at least week, lacking any direction for what I would actually do.

Figure 3 shows the beginning of a storyboard that I created, experimenting with a three-dimensional real world space as the mechanism for showing the site. I also experimented with using 3D tunnels in some way.

None of these ideas caught my imagination. They all seemed too difficult for me to attempt…

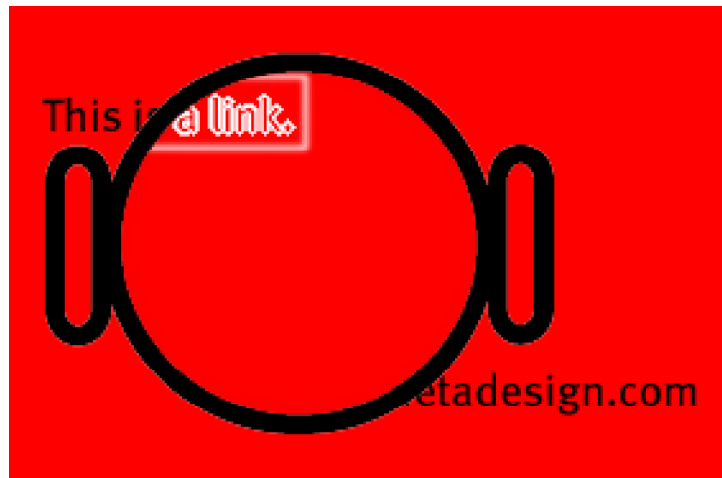Figure 4. The initial implementation of my lens in action.

Figure 5. The background image used in my initial lens implementation.

Figure 6. The link image used in my initial lens implementation. www.metadesign.com does not show in this image because it was not treated as link in this example.

The Magic Lens

At some point, I came across the idea of making a "magic lens." Magic lens is a term used by researchers in human-computer interaction for a visualization method that allows the user to see *through* an interface to pick out particular details. A nice example of this interface is an architectural tool. The regular view simply shows the walls, doors, etc. Suppose that an electrician, a plumber, and a architect want to examine the plans simultaneously. Instead of cycling through views of the walls, the electrical lines, and the pipes, the interface might provide several virtual lenses. The plumber's lens would show the pipes within the walls, whereas the electrician's lens would show the wiring. These lenses could also be "composable." In other words, when the plumbing lens is placed on top of the electrical lens, the pipes and the wires would be visible at the same time.

I thought of creating a magic lens for the web. The lens would show the links in the web page, and allow people to visualize how much content there is behind a particular link. I thought this visualization would simply be a tree shown behind the link. Although the concept of this tool is general purpose, the lens is particular useful for the Meta-Design web site because of its tree-like structure. This means that the layout of the links is relatively easy because there are few inter-connections.

I was very happy with this idea because I thought it would be interesting. I was worried that it would not be implementable in Director. Fortunately, it turned out that Director had exactly the features that I needed.

I chose to implement my lens using two images: a background image that would show the web page and a lens image that would show the links. As the lens moved over the surface of the background image, it would show within itself the corresponding section of the lens image. This was a simple way to get the lens effect without doing any processing within Director. To test whether this idea was implementable, I made a Director movie that contained two full screen images and the cast members for the lens. Figure 4 shows my initial implementation of the lens tool in action. The background image shows some arbitrary text (see Figure 5) and the lens image (see Figure 6) contains a highlight for only one segment of the text.
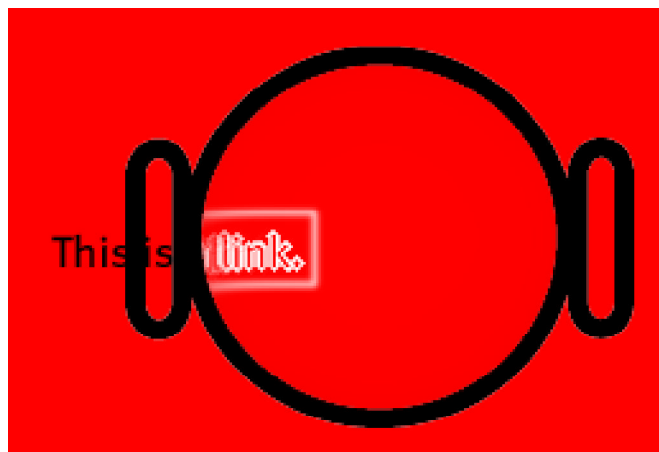
The Lens Effect

Figure 7. The original lens effect. An odd distortion effect occurs when the lens is moved over the top of a link (unfortunately, this effect is invisible in screenshots). See the lenstest.dir project on the included CD to see this distortion.
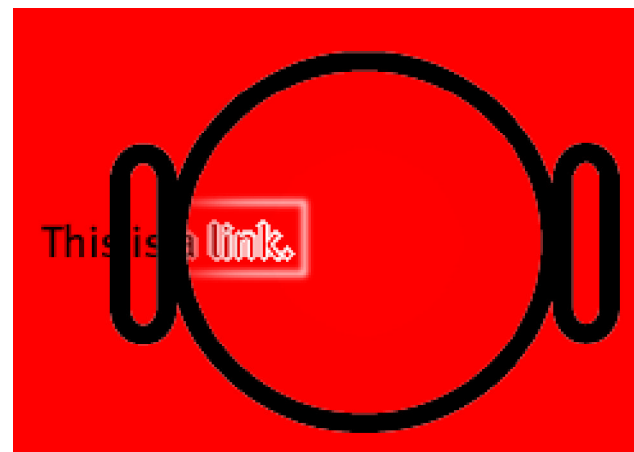

Figure 8. The new lens effect which uses a masked sprite. The background shows through at the edge. In this example, which uses outlined text, you can see an interesting effect where the outline of the link image overlaps with the solid text of the background.

One of the problems that I ran into immediately with my lens implementation was creating a noticeable "lensing" effect. There is no ready-made image distortion code in Director and I did not want to write any specifically for this project, especially if I had to do it in Lingo. In my initial attempt I tried to simulate the lens effect by using a circular white-to-black gradient mask when painting from the lens image to the lens sprite (see Figure 7). This had an interesting effect, but did not fully convey the idea of a lens.

Some time later, I realized that it might be interesting if the lens sprite itself was masked on the stage. This created a better effect, because the lens was see-through at the edges but not in the middle (see Figure 8). This turned out to work even better when combined with transparency effects between the background and lens images, which I will discuss later.
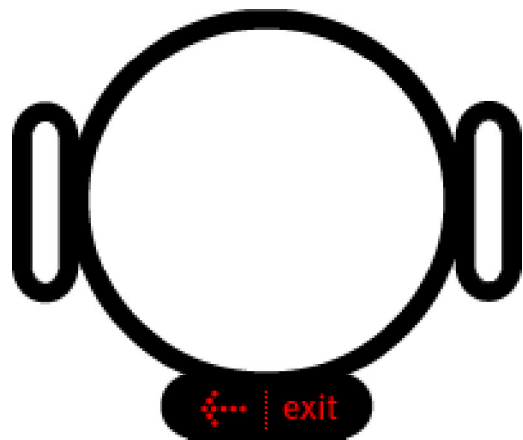
Not a Web Browser

Figure 9. The lens object with navigation controls added to a "tray" at the bottom.

With the framework in place, there were still many issues to deal with. The most critical was how to deal with the fact that Director is not a web browser. Certain interactions that are commonplace in a browser are not common in Director and have no natural affordance. The three interactions that concerned me most were: going back, exiting, and scrolling to see more content.

The easiest and least palatable option was simply to mimic the frame of a web browser within Director. Regular web users would be familiar with the interface, but I would have to implement more browser functionality than I needed (going forward, reload, stop, etc). My next thought was to place the "back" and "exit" buttons in a global location on the screen. This would have been incongruous with the background however, because exit buttons are not commonly seen on web pages and MetaDesign does not have a convention for placing "back" links on their pages.

After spending some time thinking about the problem, I decided to disallow scrolling and place the "back" and "exit" buttons into a special tray on the lens itself (see Figure 9). The decision to disallow scrolling was difficult, because it meant that I would no longer be able to show all of the MetaDesign web site. While this did cut down on the work, it had the disadvantage of making the Director presentation inconsistent with the number of links on the actual site. I chose to have my presentation show the actual number of links, even if it later turned out that there were fewer links on the resulting page (see Figure 10).
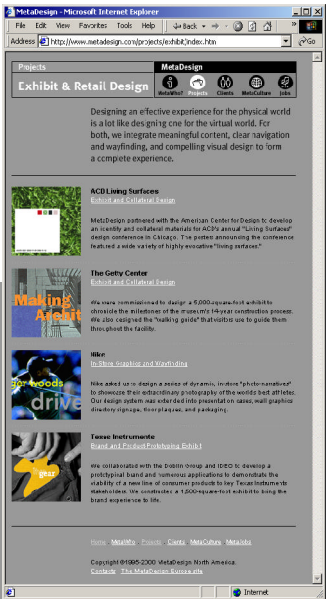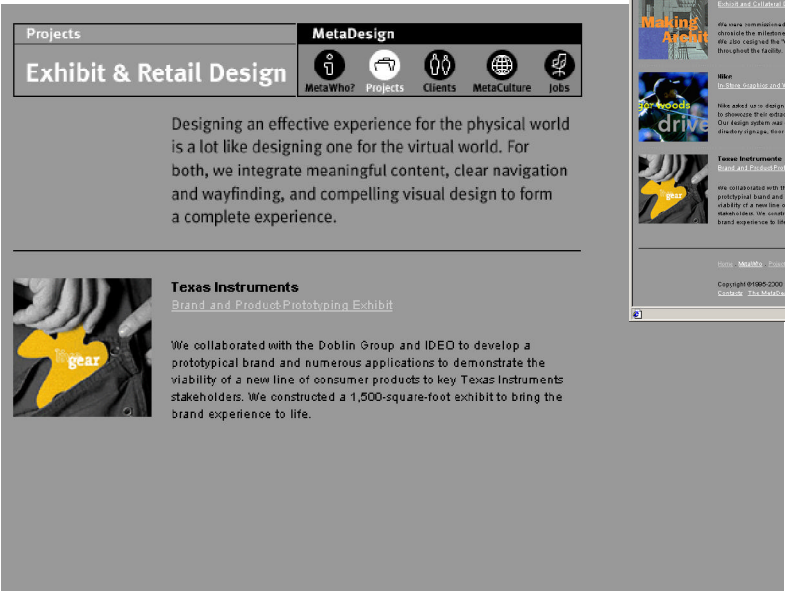

Figure 10. The original web page (above) and the same screen used in my project. Only one exhibit is shown to prevent the need to scroll on the small Director screen.

A Lucky Break

Figure 11. The crop mark highlighting technique. The marks are so large that they do not fit entirely within the lens.

Figure 12. The semi-transparent and opaque highlight effect. The top view shows the link when the mouse is not over it. The bottom shows the view when the mouse is over the link.

Figure 13. An attempt at showing the shimmering effect. Notice how "North America" becomes brighter near the edge of the lens.

Another difficulty that I had was deciding on the appearance of links when they appeared inside the lens. My initial concept was to show the bounding box of the link and an outline of the link text (see Figure 4 and 6 above). This proved to be difficult to engineer however, because readable outlines could not be created with the very small text. I also found that attractive bounding boxes were difficult to create. There were two intermediary steps between my initial conception and the final solution.

1. I stuck with outline text, but used Illustrator's crop-mark feature to create an interesting out line that was not a bounding box (see Figure 11). This had an interesting effect, but I found it loud and space consuming. I did not think it would fit in areas where many links are close to each other.

2. Instead of using the crop marks in every picture of each link, I chose to have a highlight effect. When the user moved their mouse over a link, the crop marks would appear, making it clear whether a link was selected. This was a nicer effect than previously, but the crop marks were still too loud an obnoxious.

At this point I had an interesting idea, which turned out to work much better than I expected. I removed the crop marks and other marking from around the link text. Instead of showing outlined text, I elected to make the link text semi-transparent normally, but make it completely opaque when the user moved their mouse over a link (see Figure 12). This turned out to create a very nice shimmering effect when combined with the lens trick described above. The lens actually looked even more like a lens (see Figure 13), solving the problem of making the lens effect intuitive that I had been struggling with for some time.
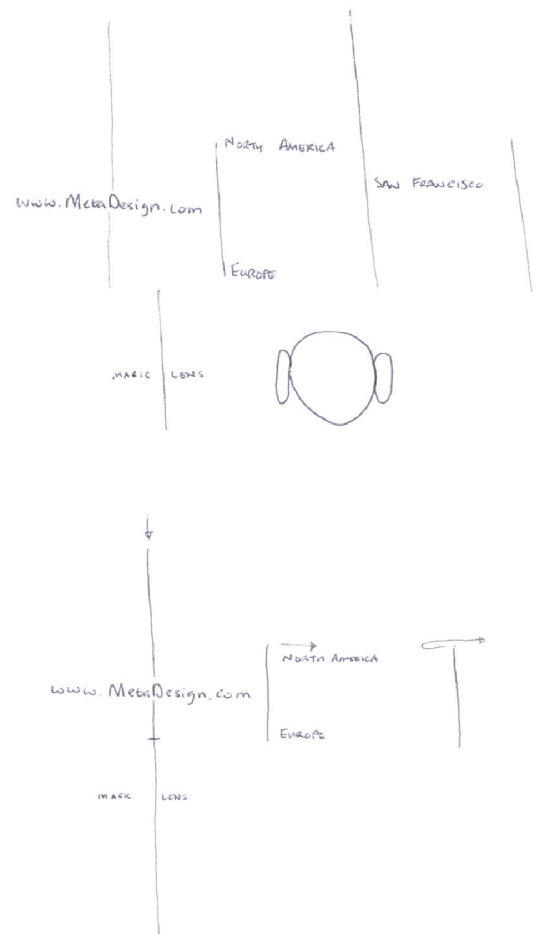
Intro. Sequence

Figure 14. A storyboard sketch that I made of the introductory sequence. The final sequence differed somewhat from the sketch shown here.
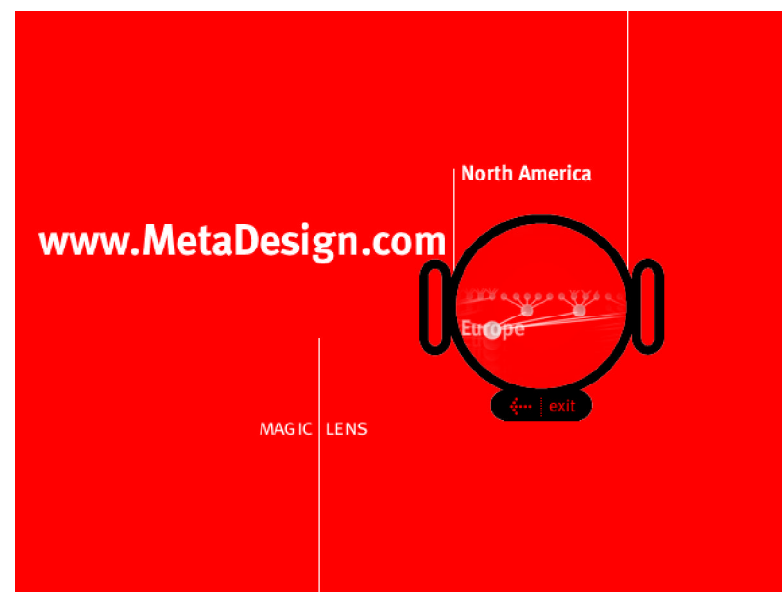

Figure 15. A screenshot taken near the end of the introductory sequence. The lens is moving downward, passing over the North America and Europe links. When it stops near the bottom, the Magic Lens title will slide across the screen to the right and pass under the lens. In the lens the words "Play with me!" are seen, instead of the title.

At this point, the main concept of my presentation was determined, but I did not want to simply have my concept isolated in a Director presentation with no explanation. At the same time, I did not want to make an introductory screen that was full of text describing how to use my tool. Instead, I chose to make an introductory movie that introduced the space, provided some brief text about the subject matter, and gave the users an indicator of what they could manipulate.

This introductory sequence emerged over the course of a day or so. I decided to mimic the introductory Flash sequence that MetaDesign already used on their web page. I used the same effects, but simplified the text and integrated my lens sprite into the sequence. Figure 14 shows some of my initial storyboard sketches.

There are two critical pieces of the introduction sequence that are designed to invite users in. First, the lens sprite enters the screen and then passes over several links (see Figure 15). In this way the lens effect and hopefully an idea of the lens' functionality is introduced to the users. Second, the "Magic Lens" title text exits the screen and passes under the lens. The lens changes the text to say "Play with me!" and pauses underneath the lens long enough to be read. The hope was that this hint would tell users that the lens sprite was inter-active and invite them to grab it. In practice, both of these mechanisms seemed to work. Unfortunately, users would usually try to grab portions of the lens that were not draggable.

Conclusions

The result of this project was an interesting concept for improving web navigation, particularly in sites like MetaDesign's, where the sites architecture is easy to depict. Unfortunately, it is my opinion that such a generalized tool would be difficult or impossible to create for the entire web. The main issue is the design and placement of the objects that represent the deeper links. These appear as trees in this presentation, but would have to be more like a directed graph for a general web site because of the inter-connected nature of the web. It is also unlikely that such trees could be created with the immediacy that would be required from real users. Many pages would have to be pre-fetched to determine the structure of the graph, and this would likely take a lot of time.

There is also a question of how useful this information really is. In the MetaDesign web site, the pages that contain the most links actually have the most information about the company and what they do. On many sites, this is less likely to be the case. Some people have a page for links they find interesting. This would create a large tree in my current system, which might indicate to the user that a lot of good content is available by following that link. It would not be a true indicator for someone trying to find more information about that person from his or her web page however, because a links page is unlikely to have much personal content.

If I had to do this project again, there are some things I would do differently. The most important would be to solve the problem of good dragging handles. As described above, users often had problems discovering what portion of the lens was draggable. Redesigning the shape of the lens or perhaps adding new interface logic to allow the center of the lens to be draggable might be acceptable solutions. I would also have liked to make the lens minimizable, so that users could have unobstructed views of the web page when they were not using the lens. Finally, I would have liked to make the link representations interactive, so that users could have skipped further down into the tree if they wanted to view only one particular page. The interactive ramifications of this feature would also be important to consider, because there is not space within the lens to label the distant links. Text might need to appear outside of the lens.