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Evaluating the presentation of dynamic maps and graphics on the Internet

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EVALUATING THE PRESENTATION OF DYNAMIC MAPS AND GRAPHICS ON THE INTERNET

A Thesis

Presented to

The Faculty of the Department of Geography

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Masters of Arts

by

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ABSTRACT

EVALUATING THE PRESENTATION OF DYNAMIC MAPS AND GRAPHICS ON THE INTERNET

by William A. Harmon

Dynamic maps and graphics can provide educational resources about certain places, processes, and periods of time. Use of the Internet, or World Wide Web, will now allow these subject materials to be presented within the context of "distance-learning." As these types of presentations grow in use, the means to create them becomes more accessible and much easier to use. Still fundamental techniques relating to how one can go about creating dynamic maps and graphics that are most effective for use on the Internet remain, for example, creating presentations that can be viewed well in a limited window space, interacted with easily through a graphical user interface, and efficient enough with regards to file-size when using the Internet as a platform. The objective of this paper is to evaluate the process of creating dynamic maps and graphics for the Internet using the multimedia software program known as Macromedia Director.

ACKNOWLEDGEMENTS

"How many graduate students does it take to change a light-bulb? Just one, but it may take them seven years to do it." With that said, much thanks goes out to those who have actually had patience with me in regards to finally "changing the light-bulb" (in five years time).

Thanks to Dr. Ellefsen who has inspired my curiosity and to Dr. Taketa who taught me ways to communicate these curiosities (and become employable). Thanks to my classmate John Falkowski – I hope that we learned that we can be in tune with our geography and share our knowledge and successes to make things better.

Thanks to family and friends, especially my Mom and friend Dave Lipnicke who both seem to believe more in me than I do myself on a good day. *Some things I may never learn...*

All praises to simplicity as well. While visualization for the purposes of explanation (the topic of the paper) has existed for as long as we have known it (maybe in the form of good story-telling, killer art, or a pretty sunset) some methods of communication have failed miserably from those trying too hard and expecting too much.

Peace.

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CHAPTER I

INTRODUCTION

The use of the Internet to present dynamic maps and graphics that can "communicate mental models" of geographic phenomena is very helpful, especially in the field of education (Fraser, 1999a). Much potential exists for student learning from educators who are able to create and distribute automated and animated diagrams on their own, but, until recently, the multimedia software used to create these types of presentations required a skill-set that many potential users were not able to attain. Also until quite recently, dynamic maps and graphics created with multimedia software programs were limited to storage and presentation via CD-ROM due to their large file sizes (Cartwright, 1994). This aspect further limited the ability to provide geographic information to potential viewers, such as students. However, with the increased use and sophistication of computer technology and concurrent growth of the Internet, the tools used to create these educational materials are becoming much more accessible and much easier to use. One of these tools is Macromedia Director, a multimedia software program that can assist in the creation of dynamic maps and graphics, and now allow these dynamic maps and graphics to be presented on the Internet in the file format known as Shockwave.

Still, with ease-of-use and accessibility issues becoming something of the past, merely using a sophisticated program such as Macromedia Director does not guarantee a

successful presentation. Some fundamental design guidelines relate how to use a multimedia software program, such as Director, to create dynamic maps and graphics that are most effective for presentation on the Internet. These design guidelines assist to create dynamic maps and graphics that:

- Fit well enough within the required (often minimal) presentation space.
- Can be understood and interacted with easily enough through the use of a graphical user interface.
- Will be efficient enough in terms of file-size while using the Internet as a platform.

The objective of this paper is to evaluate the use of the Director multimedia software program to present a series dynamic maps and graphics on the Internet. By illustration, this paper describes the various techniques and methods used to create a series of dynamic map and graphics of the California Mission period for presentation on the Internet to students. The paper then evaluates the techniques and methods that were used to create these presentations as related the set of design guidelines listed above. The conclusion addresses some of the more contemporary issues that can assist with design guideline issues in the future, for example, what can be expected, and whether or not fundamental techniques will remain despite the increasing capabilities of computer software to create and view dynamic maps and graphics.

Before describing, evaluating, and drawing conclusions from this project, however, a more detailed background and related research into the subject is given.

CHAPTER II

BACKGROUND AND RELATED RESEARCH

Contained in this chapter are the following descriptions and examples of dynamic maps and graphics used to present information of a geographic nature. First, the roots of dynamic map and graphic presentations (prior to the use of computers) are described. Then, the general techniques used to create and present dynamic maps and graphics on both computer and Internet platforms are discussed (including descriptions of some of the computer programs that are typically used). Each of these techniques and their associated programs are described by how well they correspond to the design guidelines mentioned earlier. Next, the actual use of the Director software to create a dynamic map and graphic presentation is highlighted. This section offers further definitions and descriptions of the Director program itself, and its capability to perform more functional techniques. Finally, an example in which the Shockwave export format was actually used to present dynamic maps and graphics on the Internet will be described. This section concludes with a discussion on that presentation's suggested use of design guidelines.

Roots of Dynamic Maps and Graphics

Anticipating the current state of dynamic maps and graphics created for use on the Internet, communication theorists of the 1940's imagined a time when "data communications, automation, and miniaturization would combine to aid thinkers in every area of study" (Peterson, 1995). However, at that time maps and graphics that exhibited

motion and/or change in fact already existed. Consider the combination of objects and images captured by individual frames of motion picture film to deliver information about World War II to a movie audience. For example, movie shorts in which bombers were superimposed, as if "in-flight" over a stationary map of Europe, dramatizing the damage that they inflicted (Hornbeck, 1997). Or, consider an example occurring some 20 years later in which a Pennsylvania State University meteorology professor used the technique of time-lapsed photography to show students the process of thunderheads building in the sky. In this instance, using motion picture film, a thunderhead is captured rising in the sky then later was edited to showing students a quicker and "more coherent model of the process" (Fraser, 1999b).

By comparison, the one thing lacking in the examples described so far is the ability to bring a greater sense of interactivity to a viewing audience through a graphical user-interface. The viewer had very little control over the content, short of starting, stopping, rewinding the film, leaving the classroom, or leaving the theater.

Now, multimedia computer software provides this missing user-interface in addition to allowing greater automation of the creative process. Furthermore, using the Internet as a platform increases accessibility to the information being presented. The viewer would not technically be required to visit a static setting such as a theater or classroom, but could view from more remote locations, such as home.

Despite these differences, techniques used to show WWII bombers in flight and thunderheads building in the sky are still analogous to their modern-day counterparts. No matter how complex the computer-based presentations appear, the fundamental

techniques of presenting dynamic maps and graphics (e.g., "flipbook" frame animation or the ability to superimpose and move objects over a stationary backdrop) remain.

Techniques for Creating Dynamic Maps and Graphics

Peterson (1995) described two general techniques of computer animation applicable to the creation of dynamic maps and graphics: frame-based and cast-based animation. This section discusses these techniques as well as the computer software programs usually associated with each technique. This section also discusses some of the design issues faced using each technique in relation to its ability to present files on the Internet. These techniques and their associations are also described in Table 2.1.

TABLE 2.1

TECHNIQUE, PROGRAM AND DESIGN ISSUE

Technique	Program	Design Issue
Frame Based/Slide-show	PowerPoint*, Director	Window size, scale, layout. Large file sizes.
Frame-Based/Frame Animation	GIF Builder*, QuickTime, Director	Window size and scale. Large file sizes. Viewer control (interactivity) is minimal.
Cast Based	Director, Director/Shockwave	Window size and scale. Creating interactivity is more complex. Files can still be affected by large image sizes.

*A variety of programs will actually create both "slide-show" and "frame animation" files. For this research, Microsoft's PowerPoint and a program called "GIF Builder" were reviewed.

Frame-Based Techniques

Frame-based animation techniques can be broken down into two sub-types. One, the type that is used to present "slide-shows" for presenting a series of individual images; and two, "frame animations" in which the speed of individual picture frames can be adjusted allowing for the appearance of motion.

Slide-show

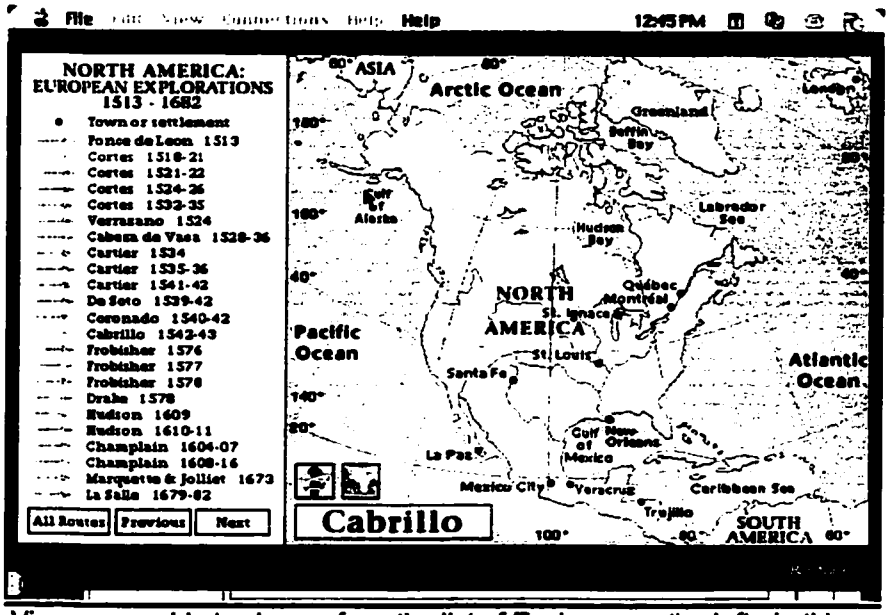
The presentation of individual graphics in a series of individual pictures or slides is known as the slide-show format. Usually, these presentations show images to a viewer one at a time. Map dynamism presented in this format can show change through time one slide, or, one frame at a time, although they remain largely static. Mark Monmonier described the ability to capture time correspondent shots from a GIS mapping program and then display these screen-shots in order as time-series maps (1996). The slide-show format is also used to present photo images of places. Yet another example of the slide-show technique described by Monmonier is in form of the "Electronic Atlas." In this environment (shown in Figure 2.1) the viewer can simply call up a map while reading an associated encyclopedia entry about a particular subject.

A common program for creating this type of presentation is Microsoft's PowerPoint. This program allows for the creation of separate slides by providing users the ability to import graphics or create them internally. It also provides the ability to create transitions or wipes between slides or frames, and can assist in creating a measure of control and interactivity for the viewer. Its uses are becoming more sophisticated as it allows certain objects to appear in motion through "custom animation." The PowerPoint

program also provides users with the ability to embed other file types, like *mpeg* (motion picture files) into the presentations that can show more animation or motion of subjects.

FIGURE 2.1

GROLLIER'S ENCYCLOPEDIA AS ELECTRONIC ATLAS (1996)



Viewers are able to choose from the list of Explorers on the left. In this example, the viewer chose to display "Cabrillo."

PowerPoint works very well locally and is predominantly used that way, however, these files can be viewed on the Internet in one of two ways. PowerPoint files can be downloaded and viewed from a web site (if the computer the viewer is using can read the format); and files can be exported directly into the HTML file format from the program.

Macromedia Director can also be used to create slide-show presentations. Much like PowerPoint, it maintains the ability to administer high quality viewer control through the use of its object-oriented programming language known as *lingo*. Common features

such as wipes and transitions can also be administered within the program. An example that readers may be familiar with is the multitude of "screen-saver" programs that have been created using Macromedia Director.

The following results can be noted when comparing *slide-show* file types and techniques to the design guidelines. First of all, in any given window space, these slide-show files are designed to be viewed in more of a landscape or "wide" format as opposed to portrait or "tall" windows which may be common in some instances. This can cause problems when changing viewing platforms, unless some sort of adjustment is made for the eventual presentation space. Secondly, creating the user interface is not of any great difficulty because the viewer really has only two choices: either to view the "next" or "previous" (forward and backward) slide. Lastly, the use of multiple images, or "frames," within a single file, can result in especially large file sizes and can be detrimental to a file's performance. Anticipating these performance results, PowerPoint will try to simplify the file's images in an effort to reduce the file size when exporting files to an HTML format. This effort has a negative effect on the quality of the images that are shown, as the images will appear more "blocky" than usual.

Given the expectations and results of using slide-show techniques, note that the HTML format can often stand alone to deliver presentations to viewers, both locally and, of course, through the Internet. In many cases, it becomes the simple solution to image size issues. Also, with the typical Internet viewer's familiarity with the HTML web browser and its "back," and "forward" buttons, the creation and use of interactivity for navigation is nearly rudimental. Furthermore, the HTML environment provides the

ability to view an open architecture, increasing the knowledge and understanding of how content is being shown to a viewer. Finally, as will be seen, the ability for the HTML format to embed or house a variety of dynamic map and graphic presentations (as was done in this research project) has grown considerably and is now crucial to the delivery of many of these presentations.

Frame-animation

The second type of frame-based technique can be described as the use of individual frames that are shown in a relatively quick sequence to depict motion. Frame animation programs allow for the creation or importation of individual pictures or frames that can be put together in a "flipbook" style, where the number of frames per second (fps) can be increased, thereby giving the appearance of dynamism. Recall that this presentation style was previously mentioned when early photographic and film animation was discussed.

Probably the file format most familiar is known as an *animated gif.* Peterson (1995) described the use of animated gifs to play loops of satellite imagery for predicting weather; now it is used to present that same information on the Internet. Other uses include the ability to create time-series and time-lapse animations that can depict a spatial phenomenon or change over time based on a series of pre-created maps (Monmonier, 1996). These portrayals tend to be almost entirely dynamic as they move from one frame to the next requiring almost no interactivity from the viewer.

More sophisticated frame-animation formats allow for the ability to provide a little more user-interactivity and accessibility. For example, the frame-animation

program QuickTime can work in an Internet capacity as well as locally. It also provides the viewer with a minimal set of controls such as *stop*, *start*, and *pause*, with individual frame advance control. However, these controls are usually part of every presentation and reside within the viewing window's frame space much like the back and forward buttons of an HTML document.

The following results can be noted when comparing the design guidelines to the frame-animation type of file. Considering the use of window space available, these files are often too small, a product of reducing the overall file size. A relationship exists between the appearance of an image's scale and the physical size of that image in kilobytes (since it is another form of frame animation). To mitigate this effort frames are sometimes skipped to reduce file size. This makes images appear jerky. Or, frame animations are often miniaturized therefore discouraging any great level of detail in graphics produced. Finally, as these files use a compilation of images, just like the slide-show presentation, animated gifs can also be of rather large file size. Here once again, additional frames will increase a file's size. The inability to create anything beyond minimal interactivity in these formats was mentioned previously.

Macromedia Director can create these types of frame animations while dealing with some of the same problems that have been described. Director can play sets of frame loops and the control of the speed can be governed through its main program control window, known as the "score" where all basic control of a Director file resides. Also, files can be constructed wherein a user can access an individual frame or frame loop by interacting with an object or item such as a control button. This type of

interaction can be considered as linking an individual object to a frame, much like the Electronic Atlas previously described. Once again, these functions can be tailored further by using the programming language known as *lingo*. While the functions described here are largely frame-based by association, it is where the Director program tends toward a greater level of functionality by using more cast-based techniques.

Cast-Based Techniques

Cast-based techniques and their associated programs yield much of the same functionality as frame-based techniques and programs; yet, according to Peterson (1995), a crucial distinction lies within a program's ability to use "multiple transparent sheets to form a complete frame." This technique is closer to the earlier example describing the presentation of WWII air-combat that superimposed items on top a static map. Imagine each bomber in flight as a member of the movie's "cast" which played upon a "stage" (a base map of Europe) while a succession of motion picture frames captured the scenes.

Cast-based animation in the computer environment allows for even greater control of cast members and "sprite" forms of them that pass across the stage "through the use of automated color manipulation and object metamorphosis" (Monmonier, 1996). Macromedia Director specifically enhances the ability to apply dynamism to individual cast members. Cast member objects can be transitioned in color, shape (morphing) and size as sprites for greater effect of animation.

Director's cast-based function also allows for viewer interaction with cast objects that affect changes to other objects, or transport a viewer to an entirely different location

within a presentation. Even more sophisticated interactivity can be created by using the previously mentioned lingo customization language.

Director can also utilize the previously described slide-show and frame-animation techniques while functioning primarily as a cast-based animation program. The program actually allows for a combination of the two techniques to occur within the same file, but Director functions best when utilizing a cast-based technique (Roberts, 1998).

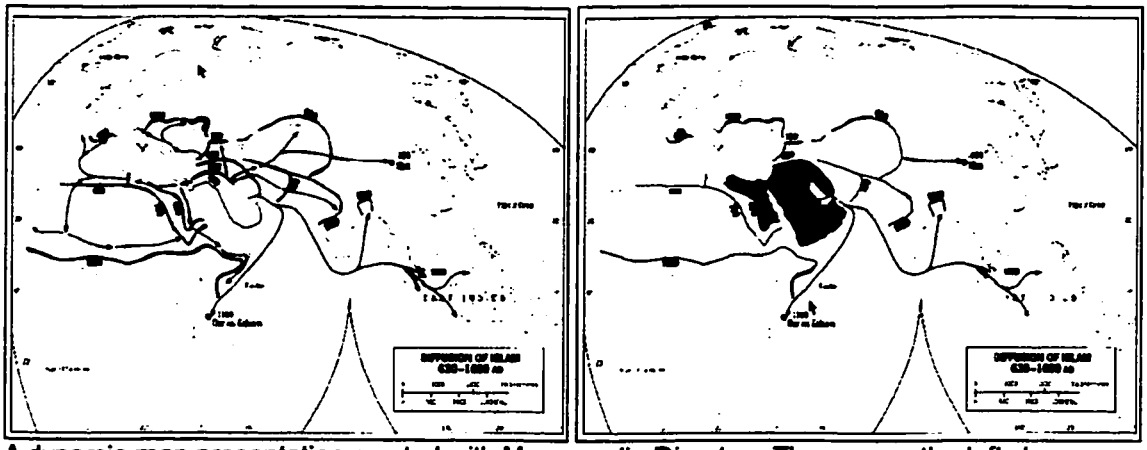
The following example of a dynamic map created in the Director program is a presentation entitled "Diffusion of Islam," by San Jose State University Professor Richard Taketa (1997). This presentation elaborates on a previously existing thematic map that appeared in a cultural geography textbook by the authors DeBlij and Muller (1994). Presenting the map in a dynamic form showed animated mapping to students and how different techniques can be used to display "time-series" maps.

Figure 2.2 shows that the map produced by DeBlij and Muller is a permanent feature of the presentation (the stage) upon which all other objects that depict the spread of Islam through time are overlaid. A closer look at the actual Director file reveals that the presentation runs through a series of time-correspondent frames. While the stage remains static, the cast-members come and go based on cues set in the program's score. The changes in cast members that correspond to the spread of Islam are then highlighted by use of a transition. These transitions use a morphing technique that can add to the appearance of dynamism or change. User interactivity guides the viewer to different frame locations or separate parts of the presentation. When presenting a time series

phenomenon, this method is often used to allow the viewer to examine the time period (a year perhaps) that corresponds to the frame.

FIGURE 2.2

DIFFUSION OF ISLAM



A dynamic map presentation created with Macromedia Director. The map on the left shows Islam in its early stages – roughly 630 A.D. A series of intermediate steps, highlighted by transitions eventually lead the dynamic map to 1600 A.D. The darker shades represent the longest established areas of the Islamic Religion.

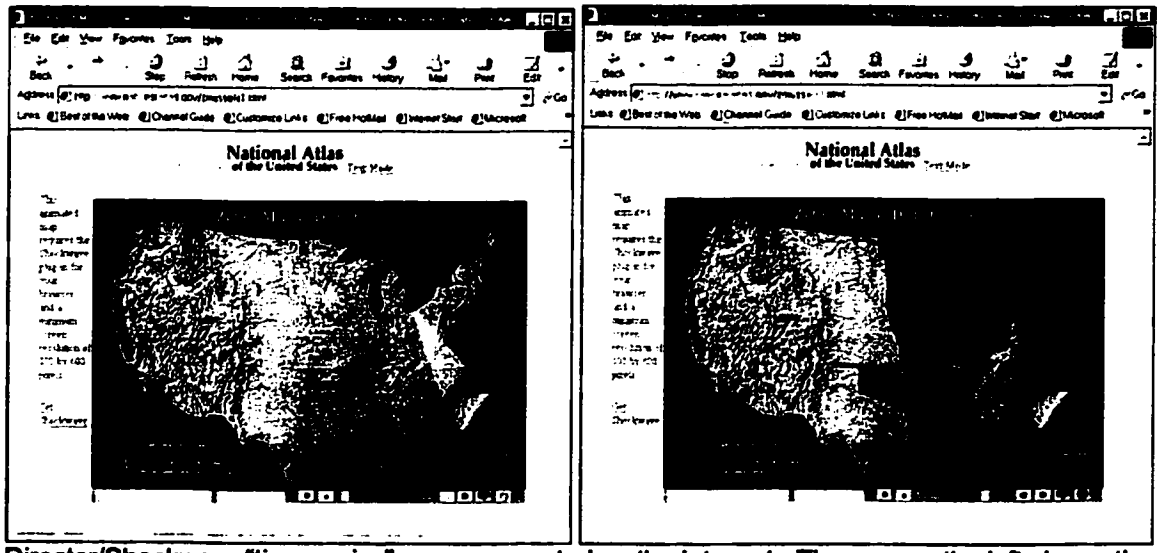
The "Spread of Islam" example shows Director being used to create a presentation that was intended for local viewing, but that same presentation can be viewed on the Internet. Macromedia Director exports files into a more suitable format called Shockwave. The presentation would have to be reformatted considerably, however, because it was not created directly for the Internet. Key elements of presenting Director files on the Internet are described in the following section.

Presenting Dynamic Maps and Graphics on the Internet

A very good example of using Director to create files for use on the Internet is the Zebra Mussel Distribution map presented by the United States Geologic Survey at their National Atlas web site (Figure 2.3). This Internet presentation features an animated map showing the distribution of the invasive Zebra Mussel through eastern and mid-western water transportation systems of the United States from 1988 to 1998.

FIGURE 2.3

ZEBRA MUSSEL DISTRIBUTION



Director/Shockwave "time-series" maps presented on the Internet. The map on the left shows the Zebra Mussel at its originally sighted location in 1988. The map on the right shows its distribution in 1995. Note the use of the controls in the lower right corner of each dynamic map. Not only do they function as controls for "stop," "start" and "pause," but they also function as a "temporal brush," corresponding the position to a particular time frame in the presentation.

The methods of compilation used here are similar to the previous example that described the spread of Islam. For example, the use of a static base maps and a series of

overlain objects associated with the subject matter. However, this example shows that these animations can be converted into the Shockwave format for use on the Internet; and that, most importantly, this operation is not simply a push-button export of the file from Director, but is again a series of design issues that must be considered during the file's creation. Since the Internet is now being used as a presentation platform, guidelines that are related to map scale, graphic user interface, and the overall file size require attention.

Robert Deangelis, the creator of The Zebra Mussel Distribution Map, helped to establish the guidelines being used for this research project (1999). These are described below:

- Use a canvas, or, window area of 592 x 380 (pixels) while creating the Director file. Other *Atlas* functions (included within the HTML interface) [typically] suggest an 800 x 600 display. This gives room for browser tool bars and other information to be displayed.
- Create a consistent set of controls and information windows that can be used across applications. Either across the HTML/Shockwave Interface or among all animations, regardless of the file type that is being used.
- Create a small file size of 250 kilobytes or less to speed up downloads. Size will increase in the future as communication becomes faster and compression becomes more efficient.

These design guidelines demonstrate how important map scale and graphic user interface design are because a separate file will be embedded inside of another window for presentation. It must fit well and display specific content, but it must also have any associated interactivity well understood by the viewer across the different platforms. The

design guideline concerning file size is also very important. While Macromedia Director is able to utilize frame-based and cast-based techniques and functions together, when the more frame-based techniques are used, the resulting files do not to perform as well as when the cast-based techniques are used. Again, because of the use of multiple images that are associated with frame-based techniques, presentations can end up being rather large in terms of their file size. The use of any image, regardless of the technique used to produce the file, can have a negative impact on the outcome of the file to be presented. Maximizing the use of the cast-based techniques can be looked at as one of the ways possible to minimize file size and create more efficient files overall.

Given this background and related research, the case study demonstrates that (among the other issues listed, like window size and scale and the creation of decent interactivity), the file size issue alone is one of the most important considerations when exporting Director files to the Shockwave format for presentation on the Internet.

CHAPTER III

METHOD

This chapter describes the methods used to create a series of dynamic maps and graphics of the California Mission period for presentation on the Internet while using the Director program and its Shockwave export format. Sections of this chapter are:

- Base map Creation: The creation of a backdrop, or *stage*, and the assembly of individual objects or *cast members* to be used in the presentations.
- Creation of Multimedia: Using the Director program to compile the base map and various cast members, to create frame-based and/or cast-based presentations and to create the various type of interactivity.
- Presentation on the Internet: Creating Shockwave files and embedding the files into an HTML window or web browser.

The items created here are used to evaluate individual techniques and overall methods used against the established set of design guidelines and their effect on the outcome. The first guideline, once again, is the scale or size of the "stage" or window of the file. This is important because the file will actually be appearing within a web browser window. The next guideline for consideration is the graphical user interface of the file and whether or not this element can be understood while using the Internet as a platform. Finally, and most importantly, the overall size of the file as it is measured in kilobytes. This can have an effect on the file download time and the efficiency of the file when it is being viewed.

The individual items of this series of dynamic maps and graphics are described below, each one representing some form or variation of the previously described techniques:

TABLE 3.1

PRESENTATION AND TECHNIQUE

Presentation - Description	Technique Used
"El Camino" - Introduction and overview of the California mission period supported by a dynamic map that allows the user to view the establishment of missions chronologically.	*Frame-Based/Frame Animation*
"Sacred Expedition" - A presentation describing the beginnings of the mission period that utilizes an animated map to show the routes of explorers and missionaries to the region	*Frame - Cast Based (Combination)*
"Mission San Carlos" - Images of the individual missions presented in a slide-show format	*Frame Based/Slide-show*
"Mission, Presidio, Pueblo" - Interactive architectural layouts of a typical mission, presidio and pueblo	*Cast Based*

Base Map and Stage Creation

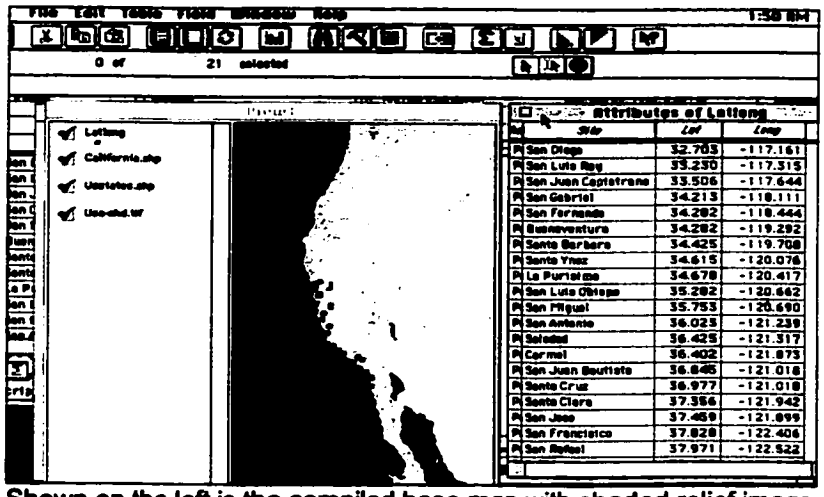
As defined in Chapter II of this paper, the base-map is the primary element for any dynamic map presentation. The base-map serves as a stage, or backdrop that all other elements or objects (cast members) are displayed upon, and it is also the surface upon which all of the individual objects can be constructed. An earlier example that portrayed the Spread of Islam showed the use of a static base map that served as the

background upon which all of the separate objects were originally drawn. For this project, a set of base-maps was created using both the ArcView GIS program and the Macromedia Freehand illustration program.

In the first step of this process, a Digital Elevation Model (DEM) shaded relief map of North America was loaded into the ArcView program.

FIGURE 3.1

BASE MAP CREATION IN ARCVIEW



Shown on the left is the compiled base map with shaded relief image, the locations of individual missions (with their coordinates shown on the right), and outline of the States.

All map items were geo-referenced and positioned so that other data sources could be viewed in location relative to what was known at the time as Mission California. Next, a text file containing the latitude and longitude coordinates of the 21 California Missions was loaded into the ArcView program. The data was then displayed geographically upon the computer screen (See Figure 3.1). This compilation map was

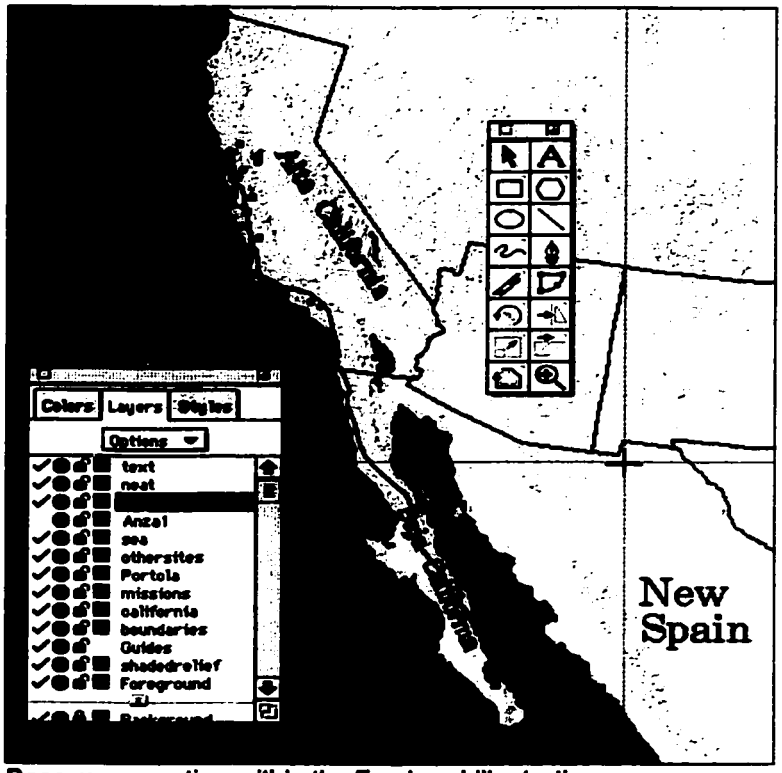
then exported to the Freehand illustration program to complete the next step of the process.

The choice of file format for exporting the base map from ArcView to the illustration program is important. Exporting from ArcView was done with the PICT format because the Macintosh platform was used in this project. Exporting files in this format allowed for the various items like the shaded relief image and the mission locations to remain as separate objects when the base map was imported into the Freehand illustration program. Some additional work was done in Freehand, such as the creation of line information and other graphic interpretations based on the underlying shaded relief image that is shown in Figure 3.2.

Other stages, or backdrops, were created directly in the Freehand program. For example, sections of the presentation in which the layout of a typical mission, presidio, and pueblo are shown. Here, scanned images of building floor plans were imported directly into Freehand and then digitized upon and readied for transfer into the Director program. Once again, Freehand allowed for the creation and separation of objects within the drawing as shown in Figure 3.3. These individual objects eventually became cast members and sprites (dynamic elements) in the final multimedia presentation.

FIGURE 3.2

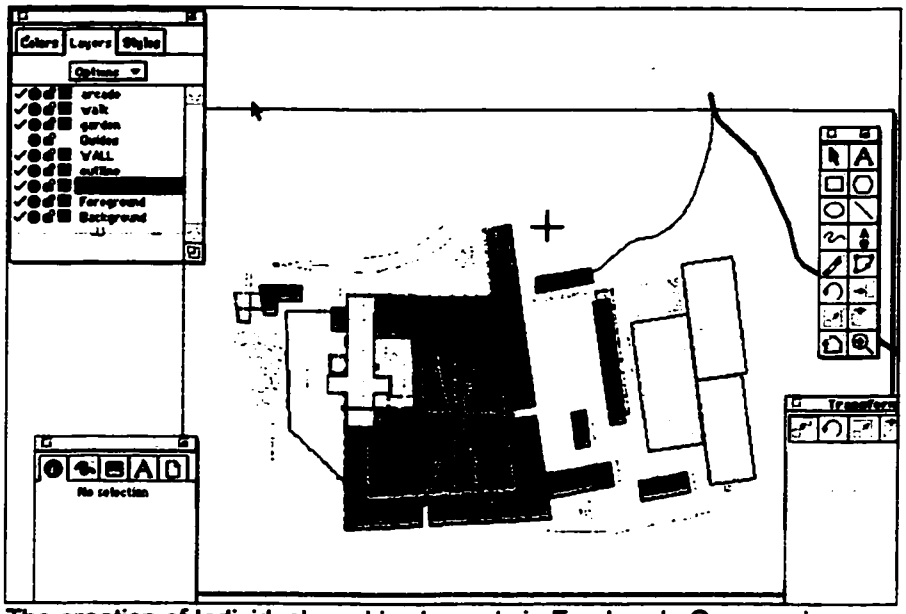
BASE MAP CREATION IN FREEHAND



Base map creation within the Freehand illustration program: Note the use of the registration point that is shown in the near right corner of the figure. This point serves as center stage within the Director program so that the individualized objects can maintain relative position.

FIGURE 3.3

CREATING INDIVIDUAL GRAPHIC ELEMENTS IN FREEHAND



The creation of individual graphic elements in Freehand: Once again, note the use of a registration point in the center of the drawing. Also note the size and scale of the layout features. The layout is drawn at the same window size and scale as the final presentation.

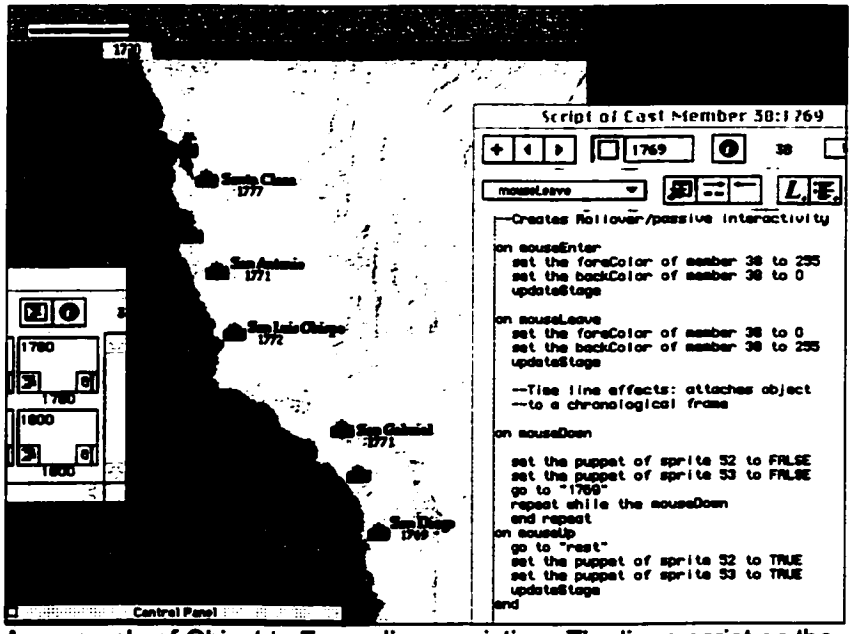
Creation of Multimedia

The base maps and the individual objects for each of the presentations were imported into the Director program as cast members. The shaded relief image became the "stage" and the other objects would appear above it as "sprites" where and when necessary based on various controls and commands submitted to the program's "score." The following describes the ways that the different techniques were used to create the types of dynamic map and graphic files for this project. Once again, these files are outlined in Table 3.1.

The first presentation is a time-series map that shows the viewer the chronological establishment of each mission. It can be viewed as a simple frame loop animation when the viewer chooses to "play movie." More importantly, the viewer can interact with a particular year that is included as a button on the time line. Time in years and the establishment individual missions are related to specific frames so that interaction with an object such as a date button will direct a viewer to the corresponding year. As shown in figure 3.4, the interactivity uses an "object-to-frame" form of *lingo* scripting. This

FIGURE 3.4

OBJECT-TO-FRAME LINGO SCRIPTING



An example of Object-to-Frame lingo scripting: The lingo script on the right of the figure allows the creation of interactivity for the viewer.

association makes this presentation considerably more frame-based than cast-based, even though the individual objects contain commands for viewer interactivity.

Another interactivity technique in this presentation is the use of rollover highlights to notify the viewer that an object can be chosen (a date button) and that this choice would result in an action; consistent with the design guideline regarding the creation of a user interface. This technique is also shown in Figure 3.4.

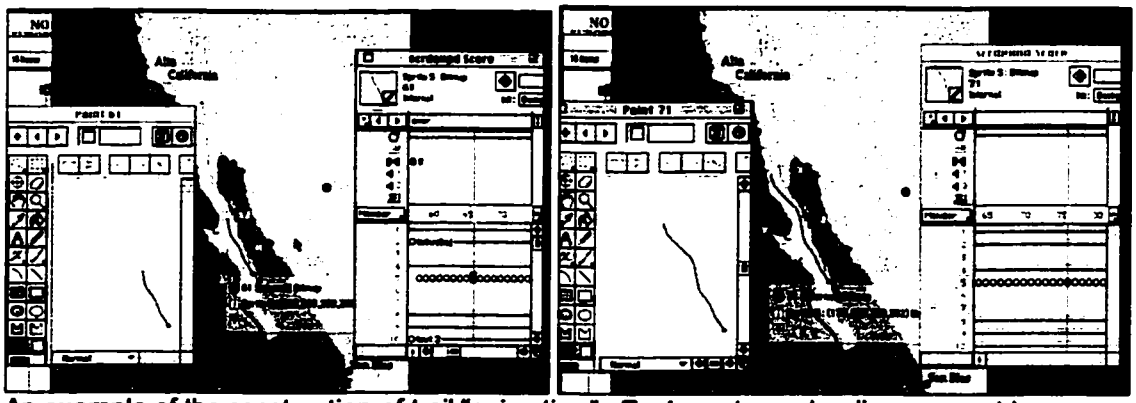
The second presentation uses an animated map to show the viewer routes of explorers and missionaries to the region. This presentation relies on the use of a trail that appears to draw itself, illustrating the route and direction of travel taken by early explorers. Seeking to exploit the combination frame-based and cast-based functions of Director, an idea that lifted heavily from the early roots of dynamic mapping was used to create this file. From the base map export (essentially a copy and paste operation), the entire trail object (shown in Figure 3.2) was copied and brought into Director as a cast member, then set in a registered space while its background was rendered transparent. This cast member was copied multiple times and each of these cast members were placed into individual frame cells that would correspond time and the distance traveled. The length of each cast member appeared shortened or lengthened based upon its placement in a row of frames. An example of this is shown in Figure 3.5. Despite the fact that "cast" members were used, the reliance on providing individual frames for each object qualified this presentation as more frame-based than cast-based.

The third presentation contains interactive architectural layouts and diagrams of a typical mission, presidio and pueblo. This presentation used many of the techniques described earlier, e.g., importing separate objects into the multimedia program and then associating a particular action to each of them. However, this presentation utilized a

different method of object interactivity than the other presentations. Instead of linking objects to frames, as was done earlier, this presentation links objects to objects. Only one

FIGURE 3.5

TRAIL ANIMATION



An example of the construction of trail "animation." Each cast member line segment is a copy of the original that has been edited to correspond to a particular frame that is associated time.

or two frames are used at maximum in each of these presentations as opposed to seventy or eighty, as in the last example. Therefore, using this technique can help create smaller files. Also, as individual cast members now appear, disappear, or change color in the same location instead of transferring to another frame. This way, more subtle variations in user interactivity can also be created with the use of "object-to-object" scripting. For example, in the *Typical Mission* presentation, the user merely rolls the mouse over an item on the list and will see that list item (button) highlighted along with the item in the layout as well. This is shown in Figure 3.6. When the viewers click on that list item, they are able to see a detailed description of that part of the mission, in this case, sending them to a single frame loop of a static picture.

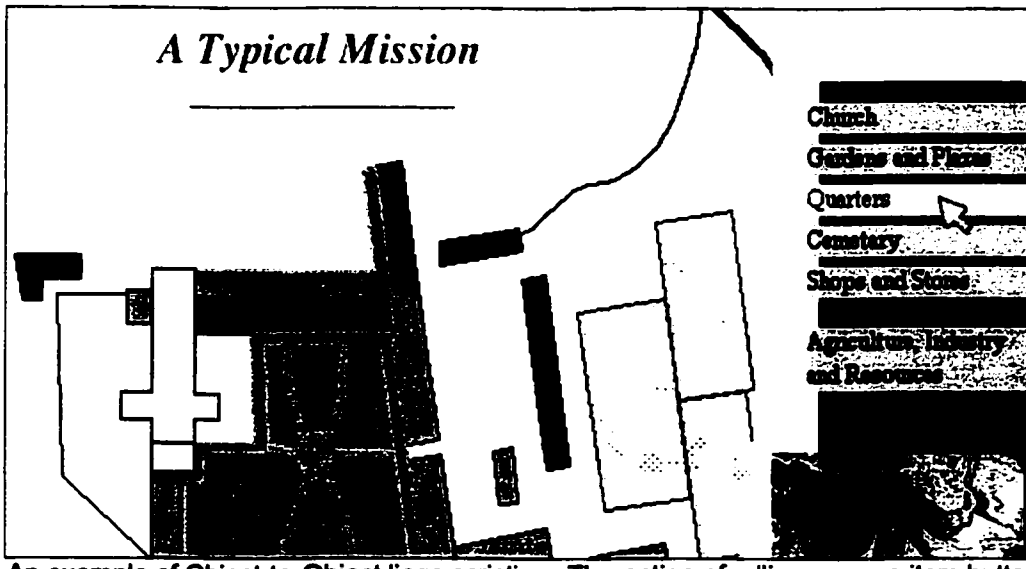
The fourth presentation explored the creation of slide shows of individual missions. In terms of scripting interactivity, the slide-show format is quite simple. Navigation buttons inform viewers that they can move forward or backward along of images. The lingo script used here reads as follows:

"on the event [a mouse click] ... go to the next frame"

The next frame is a loop that plays over and over until the viewer chooses t advance to the next frame. Although this was probably the easiest presentation tec in relation to the more traditional formats discussed earlier, it proved most challeng terms of dealing with the file-size problems that were encountered when preparing files for the Internet.

FIGURE 3.6

OBJECT-TO-OBJECT LINGO SCRIPTING



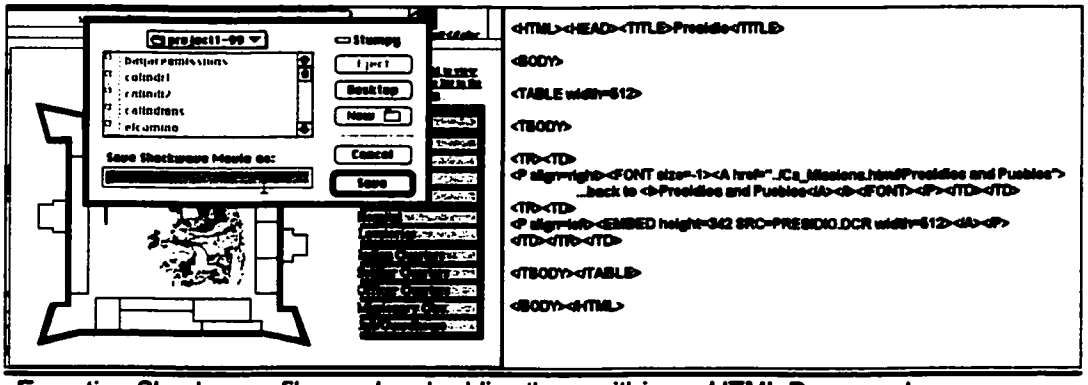
An example of Object-to-Object lingo scripting. The action of rolling over an item butto in the final presentation will change the highlight color of that particular item. The features for "Quarters" are shown in purple.

Presentation on the Internet

The primary function of this step is to export the individual Shockwave files from Director. This is followed by the creation of HTML documents through which the Shockwave files are viewed. Exporting a Shockwave file from Director and placing it inside of an HTML document is shown in Figure 3.7.

FIGURE 3.7

EXPORTING AND EMBEDDING SHOCKWAVE FILES



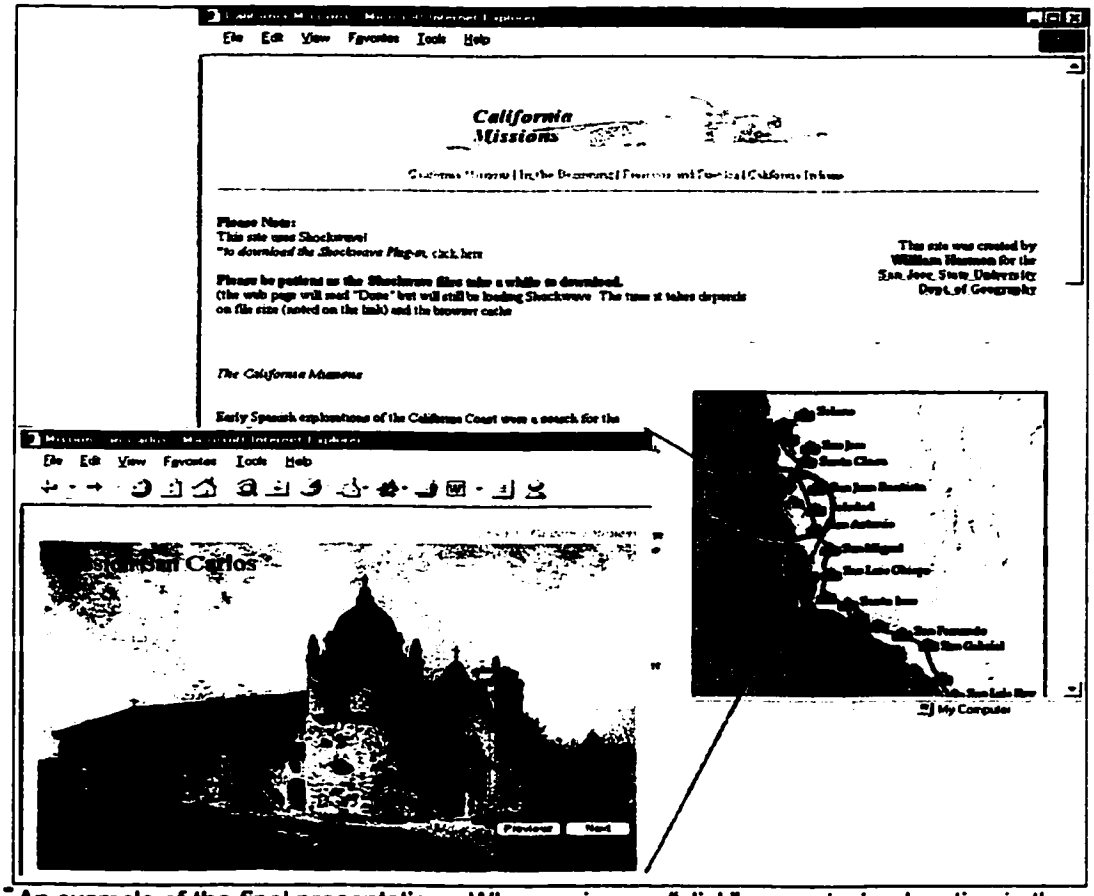
Exporting Shockwave files and embedding them within an HTML Document.

Shockwave files are viewable on the Internet without having been placed inside of an HTML document, but, using HTML for this project allows viewers greater access to the individual Shockwave files, and the use of HTML provided an introduction and outline aspect to the subject matter being presented. Also, using HTML to introduce the file, viewers can decide whether or not they want to download a particular file. For example, viewers may not have available the plug-in required to view Shockwave files, or, they may not wish to endure the time downloading a file may take if they are at a

slower speed Internet connection, and are aware that the file may be too large. Finally, presenting the files within an HTML document provides viewers with a sense of interactivity that they are perhaps most familiar with. An example of this presentation is shown in Figure 3.8.

FIGURE 3.8

EXAMPLE OF FINAL PRESENTATION



An example of the final presentation – When a viewers "click" on a mission location in the image-map, they are able to then view a "slide-show" of that mission location in the Shockwave file format. Note the use of a web browser to present the files.

In the introductory chapter of this paper, recall that the process of creating dynamic maps and graphics is not just a simple single export step. Several considerations need to be taken prior to creating the individual Shockwave files for presentation on the Internet. The concepts and issues described throughout this paper as design guidelines are most important. These steps are better suited to discussion in the Evaluation chapter.

CHAPTER IV

EVALUATION

This chapter evaluates the techniques and methods used to create the individual dynamic map and graphic presentations relative to the design guidelines that were established earlier in this paper.

Once again, the creation of successful or useful Shockwave files goes beyond simply exporting and then placing these files within an HTML document. Fundamental design issues need to be addressed in the steps prior to exporting files from the Director program if they have not been dealt with earlier in the process. A common theme is to "begin with the end in mind," so these considerations often need to be made in the steps in which a presentation is initially conceived. Some of these issues directly reflect the list of guidelines that Deangelis described, but they have been adapted to this project and are described as follows:

- The establishment of a maximum window and illustration size for the Director/Shockwave files since they will be appearing inside of another window or web browser.
- The creation of controls and interactivity that work well between the HTML interface and the Director/Shockwave Interface.
- The importance of making the Director/Shockwave files as small as possible since these files are to be transferred across the Internet and downloaded by the viewer. Also, that file size is directly related to a file's efficiency and will have an effect on how well the file responds to user interactivity.

Window Size

The first guideline for evaluation with this case study is the establishment of an acceptable window dimension for each of the Director/Shockwave files. Noting the visual size constraints that the individual Director/Shockwave presentations will have is very important. Especially when the platform used for presentation (a web browser) typically has window size constraints of its own. Imagining how a stage object and all of its associated cast members will appear in a final presentation is very important. This issue should be acknowledged when a presentation is young, during the storyboard and prototype steps. During these steps, presentation items and objects can be assessed on how they will be perceived in the finished product. For example, a good question to ask is, "what are the objects that will have to be scaled differently or generalized so that they will appear clearly at in the final presentation?"

Once the window sizes and objects are better conceptualized, the various programs used to create the base maps (stages) and cast-members can assist in the design process. Also, creating uniform window dimensions is a good way to manage presentations in terms of their eventual file size, an issue to be evaluated. The window size, also known as canvas size, can be adjusted within the Director program as well as within the Freehand (or any illustration program) to match the window or stage dimensions of the final presentation. The sooner that this window size is adopted in the process, the better, because a great deal of the illustration work is typically done in programs outside of Director. If completing illustrations outside of the program, a requirement is that the objects drawn are able to come and go from the illustration

program to the multimedia program without having to change the scale or size of these objects. In the case of a project like this, the desired result is that all of the items that appear as a final presentation within an HTML document can be viewed without having to scroll up and down a computer screen. In this series of presentations, there is one violation of this guideline. In the presentation "El Camino," initial designs and early steps in the creative process overestimated available window space. Testing the appearance of this file on a small (14") monitor screen (to imagine all possible viewers) revealed that the file did not entirely fit into the given window space forcing the viewer to scroll down, or close some toolbars on the web browser to be able to view the entire stage.

User Interactivity

The second item for evaluation is the creation of controls and interactivity that work well across both the HTML and Director/Shockwave Interfaces. Since the Director/Shockwave file will be appearing on the Internet embedded inside of an HTML document, it should reflect that fact. Interactive controls inside of each Director/Shockwave file should mimic what is most common or most familiar to viewers on the Internet. This project, for example, used different rollover techniques to alert viewers to the objects with which they could interact (illustrated in Figure 3.4). Lingo scripting was used here to invert the color of the date buttons when the viewer enacted the "on mouseEnter" command. While this particular version of the multimedia program (Director 6) did not allow for the creation of the "hand references" (a cursor change occurring when a viewer rolls the mouse over an interactive object), later versions of the

program have incorporated this ability. This helps to create an interface for the Shockwave files that is most familiar to users of the Internet. With this concept in mind, the real challenge in creating Director/Shockwave files for the Internet is to create a file in which viewers cannot tell that they are viewing what is actually an external file, or a file that might even require a "plug-in" for use. The ability to create this type of file goes beyond the creation of a user-interface that fools the viewer. For example, if a file is small enough (once again in terms of size and subsequent transfer rates), the viewer will not have to wait for the file to download and therefore will not even notice that another program is operating inside of the Web browser.

Another limitation (perhaps with the use of this particular version of Director) is that Shockwave files do not communicate from one to another like regular Director files can. Shockwave files can only link one file to another via the HTML file location (or URL) inside of which they have been embedded. The entire series of presentations relied heavily on the use of a web browser as a shell to house and provide navigation through these files. This is also shown in Figure 3.8.

File Size

The final and perhaps most important item for evaluation is the need to make the Director/Shockwave files as small as possible. Since these files are to be transferred across the Internet, they should be small enough to minimize the time spent downloading files. The file size can also affect the performance of the file; the larger files tended to hesitate during their presentation.

The following list describes some of the methods used to achieve smaller and more efficient files in the case study:

- Duplicate and unused objects were removed.
- All image files were converted to 8-bit (256 colors) size.
- More cast-based techniques were used (when possible).

One of the simplest ways to reduce file size is to remove unnecessary objects in the individual Director files before they are exported to the Shockwave format. While the Shockwave export format will compress the file considerably, it will do so only in relation to the size of the Director file from which it was exported. A quick check through a Director file will sometimes reveal a cast-member that is not being used, or an extra frame that contains data but will never be seen by the viewer.

Another method used to create smaller files is to convert all image files from highly defined 16 and sometimes 32-bit color formats, to 8-bit formats that use fewer colors resulting in much smaller images. While this method of simplification was implemented during the final steps of this project, it is another technique that should actually be addressed much earlier in the project. Just as the maximum allowable window and image size issues, the image color and resolution issues can be addressed in the steps in which base maps and other images are created prior to their introduction to the Director program. Some typical questions to ask are: one, "what will the images look like when they are simplified?" and two, "is there a better way to optimize the images knowing that this is a constraint?"

While the resolution and color simplification did not have significant effect on the map and layout graphics, they most certainly affected the quality of the photo images that were used in the slide shows of the individual missions and in the other presentations where photos were used. For example, each photo image was reduced in an effort to reduce the file sizes of the slide show presentations.

FIGURE 4.1

IMAGE SIMPLIFICATION IN DIRECTOR

Simplification of images within Director and the results: The image on the left is at "16-bit" color, the image on the right (the one that was used), is set to 8-bit (a smaller files size). Notice the difference in quality between the two, especially in the lower-left portion of each image.

While this technique had a positive effect on the Shockwave file's size, it did not appear worth the effect that it had on the quality of the individual photo images. This is illustrated in Figure 4.1. Perhaps the best approach for creating the slide show files of the individual missions would have been using the HTML document and web browser alone, avoiding the Shockwave format altogether.

TABLE 4.1

PRESENTATION, TECHNIQUE AND OUTCOME (IN FILE SIZE)

File Name	Technique Used	File Size	Images
"El Camino"	Frame-Based/Frame Animation	175k	no
"Sacred Expedition"	Frame Based (hybrid)	340k	no
"Mission San Carlos"	Frame Based/Slide-show	440k	yes
"Mission"	Cast Based	260k	yes*
"Presidio"	Cast Based	60k	no*

Note that the inclusion of images to a file, regardless of the technique used to create it (cast based files are underlined) can also affect the size of the resulting file.

The relationship between the techniques, methods, and even programs used to construct a file in Director and their effect on the size of the exported Shockwave file has been discussed throughout this document. Many different file construction techniques were used to create the Shockwave files for this case study. The relationship between the type of file and the technique used to create it also had an effect on how it was perceived and interacted with by the viewer. For example, one file utilized a technique in which interactive objects (date buttons) would take the viewer to another *frame* within the file. Yet, one design issue is that the file will increase in size with every frame added to a file. To counter this effect, Deangelis (1999) described the technique of using "fewer frames and more scripts" to construct Director/Shockwave files. The case study chapter of this paper also described this technique and its further uses to create more interactivity for the viewer. Drawing from the case study, is the presentation entitled "Presidio." Lingo

scripting was used to bring cast-members objects in and out of the presentation in a single frame loop within the score. The use of this technique yielded the following results: the object-to-frame presentation (shown in Figure 3.4) resulted in a file size of 175k, while the smallest object-to-object file (shown in Figure 3.6) was only 60k in size. These results are summarized in Table 4.1. Note, however, that the files compared here were files that contained no photo-images at all. As described earlier, the introduction of photo-images into the Director files has a negative impact on the resulting size of the output Shockwave file. This is also described in Table 4.1.

Overall, the creation of files for presentation on the Internet was successful, in that a usable product appears as the final result. However, after completing this series of presentations, a sense exists that, if it were to be done all over again, it would be done differently and that a better series of presentations would result. In addition to the knowledge gained about fundamental techniques through use, many "tricks" to achieving the best possible outcomes appear through the experience of using the software. Advanced knowledge of the limitations of the software used can be helpful so that creative adaptations to these shortcomings can be pursued. As time passes, however, newer versions of Director and variations on it have overcome many of the limitations that were described in the evaluation of this project. Also, the same advances in technology that continually make the software that much more accessible is addressing these same issues. In the final chapter, these concepts are examined as they may affect the outcome of projects like this in the future.

CHAPTER V

CONCLUSION

The creation of dynamic maps and graphics in a program like Director may seem rather complicated, especially after a case study description such as the one presented here. Yet, as stated in the beginning of this paper, with time, the software used to create the dynamic map and graphics presentations like these is becoming much more accessible and easier to use. Along with an increase in the fundamental knowledge and use of multimedia software, technological gains are also attending to some of the issues encountered during the process. In fact, many of the design guideline issues are related to wider reaching computer technology and Internet communications issues.

The first guideline issue examined the idea that a minimal window size was something to be considered throughout the entire design process (from compilation to creation to publication.) However, a general increase in monitor sizes relative to price is addressing those issues. Despite the ease in availability through lower costs, however, accessibility to information in all possible circumstances is still important. Ironically, as technology allows for larger screens to be produced at lower costs, the ability to access information on the Internet through smaller devices is also occurring. This will certainly have an impact on the outcome of any dynamic map and graphic presentations, once again creating more design issues.

The second design guideline, the creation of a decent user interface, is becoming much easier to accomplish with the increasing accessibility of the software. Newer releases of the program have incorporated user-interface tools that assist in the creation of user-interface tools. These releases also allow for the creation of interactivity specific to the Internet; for example, the ability to create rollover hand references as described earlier. Instead of having to write elaborate scripts to highlight user interactivity (as was the case with this presentation), advanced toolboxes with guides and "wizards" will simply direct creators through all options possible. Also, the ability to create better illustrations within the Director program is occurring through later releases of the program. This eliminates the need to be able to work across different illustration programs before ever creating an actual multimedia presentation.

In consideration of the issues related to file size is the increase in bandwidth and delivery systems. These plus an increase in processor speeds will help in the delivery of presentations over a medium such as the Internet. Again, however, contemporary issues dictate that not all viewers would have access to the most advanced Internet connections and fastest processing speeds. Despite this increase, it is still important to recognize that creating smaller files will always result in greater file efficiency, which should always be an important consideration.

Finally, even more sophisticated formats to present dynamic maps and graphics on the Internet now appear, such as Macromedia Flash. This format is actually a response to many of the issues faced when presenting items like these dynamic maps and

graphics on the Internet. Images are presented clearly and photo edges are smooth, interactivity devices constructed mimic those of the Internet, and files are rendered small. Still even more sophistication of the Internet and newer formats (e.g., XML, VRML) will allow for the creation of map dynamism and interactivity all within one platform. This advancement may bring users even closer to the objective of using the Internet to present dynamic maps and graphics in the first place, namely, providing access to information. It may even eliminate altogether the need for using programs like Director and the Shockwave export to present dynamic maps and graphics on the Internet.

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