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Rochester Institute of Technology

A Thesis Submitted to the Faculty of
The College of Imaging Arts and Sciences
in candidacy for the degree of
Master of Fine Arts

Promotional Interactive Compact Disc

by Arturo Maxwell

Monday April 24, 2000

Approvals

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Date: 8/2/00

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Date: 9.11.00

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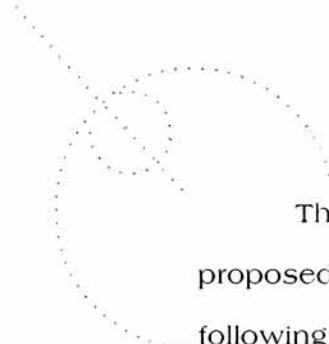
Date: 9-1-2000

Project Definition

The goal for this thesis project was to design and produce an a promotional interactive digital multimedia presentation for the College of Technology at Andrews University. The product of this thesis is to be implemented to attract new students into the department. The Technology Department currently uses brochures, Academic Guides, telemarketing, and student testimonials in their efforts to attract new students. The department administration believed that, though somewhat effective, these above mentioned recruiting efforts would be greatly enhanced if combined with presentations produced with current technologies. Given the appeal and influence that these technologies (animation, sound, video, WWW, interactivity) exert over our targeted audience, high school and college age students, the recruiting potential is enormous. It was also concluded that if the presentation was well designed and produced, a greater number of students could be served with more efficiency and at a lesser cost, due to the fact that it cost less to reproduce and mail a compact disc than it does an academic bulletin guide. Because of the multimedia nature of the planned project, it would appeal more to the young audience we intended to impact, since it would be a persuasive presentation without the need for an actual department representative to be there.



Visualize



The College of Technology administration planned to implement the proposed interactive multimedia presentation for recruiting purposes in the following ways:

- 1 • Compact Discs will be replicated and mailed to prospective students.
- 2 • Department recruiters will use the Compact discs in their laptops, with the help of an LCD projector, for small groups (10-200 students) presentations.
- 3 • The interactive presentation will be available so that it can be downloaded from the World Wide Web.

We purposed to design a logical, attractive, enticing, interactive multimedia presentation that would motivate prospective students to explore the many career possibilities available in the Department of technology at Andrews University.

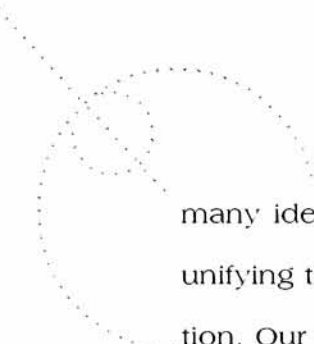
The main challenge we encountered, as we planned the design and production of the interactive promotional presentation, was to present seemingly unrelated areas in a unified manner.

Conceptualization

From the outset we generated several layout sketches and explored



Intuit



many ideas in our quest to arrive at a visual concept, design pattern, or unifying theme that would serve as the cohesive element in this presentation. Our inquiry led us to analyze the College mission statement, department slogans, landmarks, and previous design for print works that had been done throughout the years.

Several storyboards were drawn up to better visualize the flow of the presentation, and to ensure comfortable user navigation. The storyboards contained guidelines for location of buttons, navigation patterns, section breaks, continuity, audio sequences, color scheme, font usage, possible software implementation, text layout ideas, and other pertinent design and production information.

Unity in diversity

The College of Technology represented a special design challenge given the diverse, and some times apparently unrelated, areas of study offered. One could find areas such as auto mechanics housed in the same department as photography, construction, and computer graphics.

We endeavored to portray a sense of unity despite the diversity of subject matter. To solve this problem we



Construct

looked to find something that all departments within the college had in common, and emphasize this theme as a unifying icon or "umbrella" from which all departments could branch out. Departments could assume their own unique characteristics while being clearly identified as integral parts of a greater, diverse, but unified whole.

We also observed that the departments within the college all shared a related goal, that is, to produce a product. In constructions they build houses, Engineering ensures that the houses are structurally sound, the computer artist constructs scenes, the landscape designer produces plans for beautifying the exterior spaces, etc. So we determined that the theme to be used as an introduction for the presentation would be the College of Technology seal, and that the seal would be first introduced to the viewer by constructing it visually, using simple elements to build a more complex picture.

This was done by first deconstructing the seal, then planning its visual reconstruction with the aid of animation, transitions, and sound effects.

Once the College seal was introduced in the presentation, we expected to have created a sense of organized building, a putting together of materials, images, audio and thoughts in a deliberately planned fashion, while encouraging the understanding that all content that was to follow reside under the umbrella of



Dissect

the College of Technology.

We also determined that in order to portray interdependence between departments, we should have a common design element throughout the presentation that would serve as a visual umbilical chord suggesting departments connectedness to each other yet integral members of the larger College of technology.

The unifying design theme we implemented was the user interface. Though the introduction to each department is different, all department introductions culminated in a graphical user interface which was the same as other sections in the presentation, ensuring ease of navigation and promoting continuity.

These many approaches, we believe, were effective in portraying an idea of unity despite the diverse areas presented in the promotional interactive multimedia presentation.

The Graphical User Interface

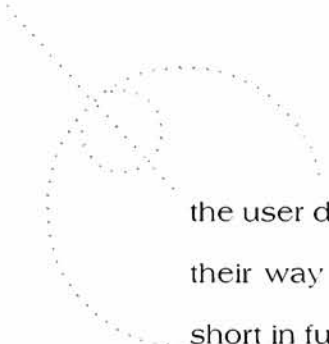
As we planned for the best Graphical User Interface (GUI), there were three criteria that we concluded needed to be met, they are:

- 1•Function
- 2•Aesthetics
- 3•Expand-ability & Update-ability

Function

No matter how aesthetically pleasing a graphical user interface is, if

Compose



the user does not feel comfortable navigating through the scenes, if finding their way around the interface is counter intuitive, then the interface falls short in function. In our quest to design a practical graphical user interface, we explored many possibilities, with the awareness that function is often enhanced by aesthetics, and vice versa.

After a period of inquiry and experimentation with different sketches, we chose the present user interface guided by the following rational:

- 1•The present user interface incorporates a large area to be used as the stage where main events will unfold; this enabled us to display larger, more appealing images.
- 2•The chosen interface facilitates user access to about ninety eight percent of navigational buttons while the presentation is running; placing the user fully in control at all times.
- 3•The layout of the chosen user interface nicely eliminated user "guess work" by giving them ample and clear visual clues for navigation information.

Aesthetics

Given the intended application of the presentation, we wanted to design a functional yet appealing graphical user interface. Because most of the user's time would, most likely, be spent navi-



Intellectualize

gating and exploring information about the degrees and courses of their interest, it was essential that the graphical user interface be attractive and entertaining. Rather than cluttering the negative spaces with button labels, we chose to display most button labels only when the mouse rolled over the buttons; this ensured a clean, comfortable, and more spacious look and feel. Because most of the action would be taking place within the large "stage area" we didn't want the GUI to attract too much of the user's attention. We wanted visual complementation, not aesthetic rivalry.

Since they would be used the most, and were few, the main buttons were designed to have voice feed back, in addition to visual clues, adding to the functionality and multisensorial nature of the presentation. Programming each of the smaller buttons with voice feedback would have been too time consuming and would have hindered performance due to the number of sound files to be loaded in and out of RAM; this would also have required more time and effort when updating information in the presentation .

The circular motif of the graphical user interface was chosen to mimic the shape of the logo used in the introduction. This same concept was also applied in the layout of the small navigational buttons. The round buttons were designed bearing in mind the same rationale. The placement of most buttons on the left side of the GUI was to accommodate or take advantage



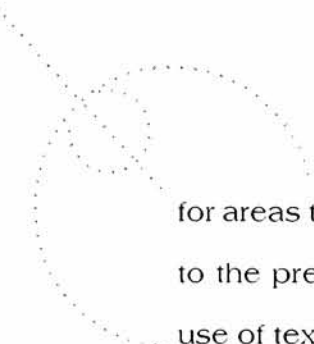
Simplify

of western reading styles, since most of us tend to read from the left side of the page to the right, the user might find it familiar to begin from the left of the GUI. The buttons on the upper right side of the GUI were placed there for both visual balance, and to provide for more negative space on the left side of the GUI.

Expand-ability & Update-ability

The curriculum of the College of Technology changes yearly. This meant that the multimedia presentation would have to be revised and, most likely, be expanded on a yearly basis. So we had to design a GUI that would accommodate future expansion and that, at the same time, would be fast and relatively easy to update. The solution was to minimize the need to move or manipulate graphic elements, which is one of the most time consuming tasks.

We accomplished this by displaying most text information in text fields, which can be easily and quickly edited without moving any of the graphic elements on stage. We also used lingo scripts to display text content in fields. These scripts can be quickly and easily updated by someone who is familiar with the Lingo programming language. Another approach we took to facilitate update-ability is that we used small, simple buttons as navigation "hot spots"



for areas that were most likely to change, additional buttons could be added to the presentation by just dragging them to the stage from the cast. The use of text generated in Photoshop was kept to a minimum bearing in mind that changing these text graphics is more time consuming when updating the presentation. Much of the text information that is displayed on stage is done via Lingo scripts. Information in the Lingo scripts is displayed in text fields as the user rolls the mouse over certain buttons. This means that information can be updated by only adjusting the Lingo scripts.

Multi-Platform Issues

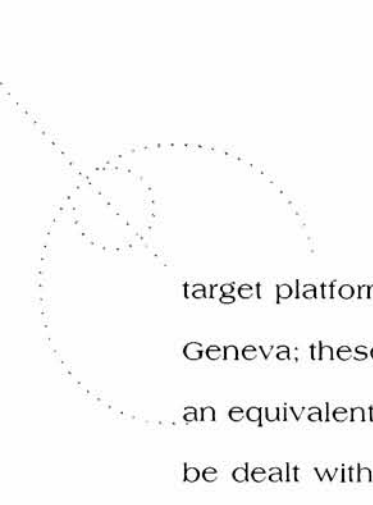
The client requested that the presentation be designed for playback on several computer platforms. This meant testing on all platforms for which the presentation was to be designed. Initial testing was done by creating a few frames and displaying them on the different platforms in order to be aware of differences we needed to take into consideration as we developed the presentation. The test frames contained graphic images, sound, and text files; the following sections explain our findings.

Text Matters

Because the presentation was to be designed for use on various computer platforms, it was imperative to use fonts that would display appropriately on all



Reshape



target platforms. The fonts we chose are Palatino, Times, Helvetica, and Geneva; these are common native Macintosh fonts that transfer well or have an equivalent font in the PC environment. There were other text issues to be dealt with such as: Punctuations and special characters differed from Macintosh to PC. Here is where the text editing capabilities of the Director software came in handy. To change all occurrence of a character we needed only to copy the character, paste it in the editing window, choose a replacement character, and select change. This eliminated a lot of tedious text editing. The equivalent of a Macintosh Times font on the PC was smaller, requiring less space; and the "scrollTop" Lingo command returns varying results in text fields; these issues were dealt with on a platform-by-platform basis.

It is also important to mention that it is essential to use field text windows when we plan to display text information that will be changing. That is, if we are planning to use the same field to display different information each time the user clicks on a different button. This is a tricky issue, because bitmap text windows and field text windows perform in similar ways during the authoring stage, but when a projector is made they can perform very differently. For instance, a bitmap text window will scroll, but you cannot change the information it contains once the projector is made; while a field text



Express

window will scroll, and the information in the field can also be altered by user intervention. Bear in mind also that Director does apply some antialiasing to bitmap text windows rendering them smoother looking, however, it doesn't with field text images.

It is also noteworthy that both bitmap and field text cast members are limited to a maximum of thirty two kilobytes of information. There is also much more formatting flexibility with bitmap text cast members than there is with fields, most formatting is lost when text from other programs is imported into a director text field, where as, the opposite is true with bitmap text windows.

Finally, the Director scroll bars for both bitmap and field text windows could use a lot of help, aesthetically speaking. To solve this problem we placed the scrolling field in a location on the stage where the scroll bar could be hidden offstage, and we designed our own scroll arrows to control the scrolling of the text in the field. This was accomplished by attaching a Lingo script to the arrows that would scroll the text up or down while the arrow was clicked. The script moved the scrolling text in increments of twenty pixels.

There were still some logistical problems to solve with the scrolling text fields. Once the user scrolled to view a certain location in the field then left that section of the movie, if they returned,

the field would be displaying information last accessed. We did not want this, we wanted the field to appear blank when the user left and returned to any given section. In order to ensure that this happened, we left the first six inches of the field (the height of the display area) blank, by pressing return several times and, in the frame before the field was displayed, we issued a Lingo command that showed the first line of the field at the top of the field (which was the first line of six inches of blank space) thereby displaying an apparently blank field any time a scrolling section was accessed. Using a scrolling field was the most efficient way to display about twenty four pages of text within an approximately four inch by six inch space. As the user clicked a given button the field automatically scrolled to the appropriate heading. The user then could use the scroll arrows to access information not visible in the allotted display area just by clicking the arrows.

Sound Matters

Because audio files can be large, memory wise, requiring more precious time to load into RAM (random access memory), and often causing unwanted interruptions (pauses) in the presentation, we decided to record most audio files at eight bit mono. This resolution and compression setting, though inferior in quality, resulted in files one fourth the size of that of sixteen bit stereo audio files. Preliminary testing



Restructurize

persuaded us to sacrifice some audio quality in favor of a more responsive presentation, since larger audio files decreased animation performance considerably and would require more RAM than our previously set limitations allowed. Extensive use of audio loops was implemented in order to keep the file size manageable and to keep RAM expenditure to a minimum. When recording the sound files we found that if the looped audio was more than ten seconds long, the user, being involved with other interactive portions of the presentation, was less likely to perceive the fact that the audio was repeating; shorter audio loops were often detected by the user.

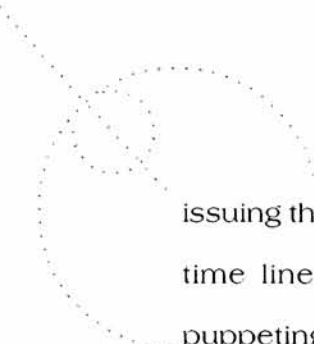
In all sections of the presentation we designed an attention arresting introduction which is composed of two and three dimensional animation, transitions, and many simultaneously playing audio files. All this action, including background audio, was purposefully brought to a subtle fade, in order to focus the viewer's attention on the "active" navigational elements to be displayed on stage next.

The navigational elements are displayed, one at a time, accompanied by audio, to alert the user that these elements are now "active," hence, removing most of the uncertainty as to what should be done next. Background sound is later gently faded-in.

In matters of sound we found that some PC's took longer to play "puppetted" sounds than their Macintosh equivalents. This matter was solved by



Inquisit



issuing the "puppetSound" Lingo command a few frames sooner in the movie time line than on the Macintosh. This approach was used only when puppeting small audio files, larger files were loaded into RAM before they were needed, using the "preloadMember" Lingo command. By "puppeting" the small audio files a few frames sooner, we allowed more time for the sound file to be loaded into RAM, ensuring better synchronization of audio and animation on stage.

Color Matters

During our preliminary multi-platform testing we noted that PCs used a different color palette from that of the Macintosh, resulting in slightly different color hues. This was not a problem for us since the colors we chose were closely matched on Macintosh and PC displays.

Hardware Requirements

Since the interactive presentation was to be distributed by mail and via the WWW, we had no way of knowing what type of computer would be used to view the presentation, or what the user's monitor settings or display abilities would be; hence, the following guidelines had to be established:

Note: A "readme" file is provided with the movie presentation to inform users of the following hardware requirements:



Concretize

Computer Speed/Platform

After studying the average computer Central Processing Unit (CPU) speed available to our target audience, by checking current and previous issues of computer sales magazines and surveying students within the age and socioeconomic brackets we intended to recruit, we determined to design the presentation for play back on computers with CPUs running at minimum speeds of 200MHZ or higher. Preliminary testing showed that these processor speeds were adequate for displaying the amount of animation and other sound and graphic manipulation we intended to implement in the presentation.

In order to keep the movie size manageable and to ensure acceptable playback, we have designed the presentation to run on Windows 95, Windows 98, Windows NT, and Power Macintosh stations. This decision was made based on the type of computers used by our targeted audience.

Monitor/Movie Size

The movie size was determined by choosing an acceptable, logical minimum common denominator. In other words, a movie size that could be displayed well by most computer monitors, yet, provide sufficient area and resolution to display the presentation well. The size we chose



Communicate

was 640x480 pixels. This was an ideal movie size for our purposes, since most LCD projectors can display this size, and most monitors (including laptop screens) can also display this size format. After some testing, by displaying several Photoshop images at different monitor resolution, we concluded that, for the response we wanted, at least a sixteen bit color monitor was essential for adequate playback, since using a lower monitor bit depth would not properly display the quality of graphics we intended to incorporate in the presentation. The presentation is programmed to adjust the user's monitor to the appropriate monitor resolution, providing they have the right hardware.

Memory Issues

Audio, video, and graphic images that are displayed on stage in a Macromedia Director movie, must be first loaded into RAM. This means that the play back rate is determined, in part, by the amount of memory available to the program, and the RAM management principles implemented during the authoring stages of the movie. Since our inquiries showed that most computers accessible to our target audience have thirty two megabytes of RAM or more, we chose to set 32MB as the maximum amount of memory to be consumed at any given time when the presentation is played.


Compose

RAM Management

We found that efficient management of random access memory is essential for proper performance of Director movies, especially in cases (like in ours) where the amount of RAM available is not likely to exceed 32MB. It is important to consider memory management procedures from the initial planning stages of the presentation movie. By doing so we can design for specific, logical sections within the movie where files can be pre-loaded into and unloaded out of RAM without interrupting the flow of the presentation. If proper RAM management is ignored, the first few sections of the movie could deplete all available RAM, resulting in possibly erratic, substandard movie performance for the remainder of the presentation. To avoid these unpredictable presentation pitfalls, we used Director's "Memory Inspector" to evaluate the presentation's memory consumption patterns, so that we could appropriately plan for efficient "memory recovery" methods.

By playing the movie as we observe the feedback of the "memory Inspector", we can detect specific locations where we should pre-load or unload files. Director's memory inspector also shows the total amount of RAM used for the movie, a very useful feature for determining the minimum amount of RAM required for the movie and approximate image RAM use.

Contextualize



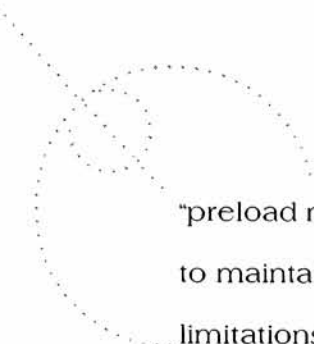
Files cannot be displayed on stage in a Director movie until they have been loaded into RAM. When loading or pre-loading large files into RAM, the presentation usually pauses as Director waits for the file to load. These pauses can be very distracting. Especially when they occur during animation sequences or video play back. Also, large files (audio, video) may load only partially due to the lack of proper amounts of RAM, resulting in an interrupted presentation as Director purges "old" information from memory and loads the remainder of the file.

By using Director's "preload member" Lingo command we loaded large files into RAM before they were needed on stage, but at a logical position in the movie where the presentation would pause anyway. When the pause required for loading files into RAM exceeded the time (approximately five seconds by our observations) the user would normally wait before expecting some action to occur on stage, we displayed a small "please wait, loading file" alert to decrease viewer anxiety or confusion. This approach assures the user of some action soon to take place.

Once the pre-loaded movie files performed their function on the stage, we issued Director's "unload member" Lingo command to purge the files from memory, enabling us to load images for the remaining scenes. By using the



Persuade



"preload member" and "unload member" Lingo combinations we were able to maintain the required RAM for our presentation within the previously set limitations (32MB), while delivering optimum movie performance.

Compact Disc Drive Speed

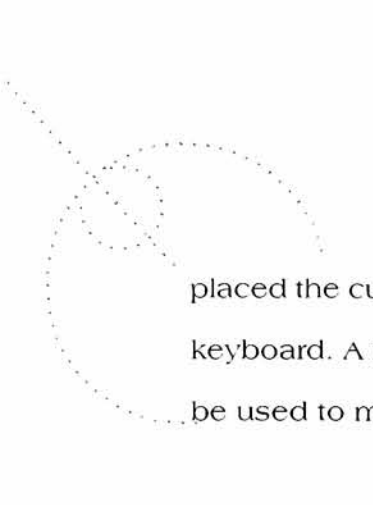
Compact Disc (CD's) speeds can vary from 4x to 32x and higher. The faster the CD drive, the more rapidly images can be accessed to be used by the movie. We recommend that a 12x or faster CD drive be used to run the presentation, but if the user does not have the appropriate hardware she can copy the projector to the computer hardrive then play the presentation.

The Message Window

The message window is a very useful Director tool to use for testing Lingo scripts, determining sprite location on stage, trouble shooting movies, determining the movie time setting, "scrollTop" settings, and more. We used the message window extensively when writing Lingo scripts for controlling the text fields that displayed the courses and programs offered in the different departments. For this we wrote a script in the message window that returned the current "scrollTop" number, then we played the movie, scrolled to the desired location in the field then made the message window active,



Model



placed the cursor at the end of the script, and pressed the return key on the keyboard. A number appeared in the message window, this number would be used to make the text in the field scroll to the current location.

Play and Play done

A particular challenge that we faced, occurred when laying out the “quit” stick man sequence of the movie. Everything worked perfectly until Director encountered the “halt” Lingo command; the movie always flashed the last screen from the section where the “play” was issued. We tried several possible solutions to no avail, until it occurred to us to attach a Lingo script to the frame (which displayed no images on stage) right before the playback head encountered the “halt” command. This Lingo script sent another “play” command which told Director to play the marker where the halt command was located. By doing so, when the playback head encountered the “halt” command it would still flash the last frame where a play command was issued, which is the blank (black) frame.

2D & 3D Animation

One of the many factors that make the presentation interesting is the movement and manipulation of images on stage. These special effects were achieved using two and three dimensional animation techniques.



Animate

Two Dimensional Animation

Many of the two dimensional (2D) effects used in the presentation were done with the Adobe Photoshop software. The side to side stage light animation on the aviation label, at the beginning of the Aviation animation introduction sequence, was accomplished by creating the bold text on the foreground layer and the blue background on a second layer. The lens flare filter was then applied to the second layer only giving the impression that the light was glowing behind the text. Beginning from the right side and gradually moving the lens flare effect to the left we created the illusion of movement. For each movement, of the lens flare effect, a new file was generated, resulting in a sequence of fifteen images having the lens flare effect at different locations on each image. When the images were displayed on screen in Director, in a successive sequential manner, the user perceived a glowing lens flare which moved side to side on the label. A slightly similar procedure was used to achieve the glowing computer chip effect used in the introduction portion of the Engineering section.

Many other two dimensional visual effects were created right in the Director software. The subtle fade in and fading out of images on stage, the moving of images from one location on stage to another, and many transitional wipes

and pixel fades were all a result of the implementation of Macromedia Director's tools. We noted that most of the ink effects that can be used to "hide" unwanted image backgrounds were ineffective when the image was to be blended also. For instance, Director easily hides the white background of an image created in Photoshop when the "background transparent" ink effect is applied to the sprite. However, if a blend is applied to the same image, the background transparent ink effect is lost, and the white unwanted background will be visible. The way we dealt with this software flaw is that we used the blend effect on images whose background we wanted to be visible, or we blended images when their background was the same color as the stage or the same color as the background image onto which they were superimposed; in which case the background did not show anyway.

Another place in the presentation where 2D animation was used in Director is the small-green, glowing light that moves up and down mimicking the circumference of the main stage area. These glowing lights would, later on, become the small navigational buttons the user would click to display information in the four text fields, made to display title, heading, description, and other degree information.

This animation was achieved by using Director's "keyframing" animation feature. The sprite was key-framed in all fifteen frames enabling us to move or animate these small "glowing lights"



Illuminate

independently in every frame. In the first frame the sprite was located at the bottom most end, where we wanted the animation to begin, and in each subsequent frame the sprite was moved up to a different position. A copy of this animation sequence was pasted in the frames immediately after and the animation sequence was reversed to make the glowing light seem to reverse its course once it reached its topmost position. We programmed a loop sequence so that the play back head would move back and forth until the user made a choice by clicking a button. This animation loop enabled us to effectively use the area where the glowing light appeared both as part of an attract screen, and later-on as a navigation portion of the GUI.

Three Dimensional Animation

Three dimensional animation (3D) was more challenging, time consuming, and memory intensive than 2D animation, but it was more rewarding in most cases. The airplane that appears at the beginning of the introduction in the Aviation section was formed using NewTek's Lightwave software. The airplane was first modeled in Modeler by using bevel, inset and other editing settings to roughly shape the polygons. The polygonal frame was then turned into a MetaNurb object which enabled us to further reshape and fine tune the form of the aircraft by moving points on a mesh formed of bezier-like



Entertain

curbs. The completed MetaNurb object was transformed back into a polygonal shape and saved. The resulting model was imported into Lightwave (the animation portion of the software) where surface attributes, lighting effects, and viewing angle were determined. The image was then rendered at twenty four bits with low anti-alias settings, then resampled in Photoshop so it would conform to the sixteen bit image resolution we had previously established for the presentation.

For the introduction of the Technology Education section we wanted to inspire in the user a futuristic outlook, a sense of space and exploration. So we chose to model an otherworldly spacecraft that would be animated on stage. The spacecraft was modeled with Lightwave, Newtek's Modeler, beginning with a spherical primitive shape then manipulating polygons to arrive at the present form. Surfaces were named and attributed some characteristics in the modelling software. The model then was given additional surface attributes, such as reflectivity, specularity, diffusion and others, in Lightwave's "Layout" animation software. The surreal head that appears after the ship has "announced" its arrival was modeled and rendered using similar techniques used in the modelling of the airplane, described earlier. The humanoid shape was given lens flares eyes and a highly reflective chrome-like surface to heighten the alien, futuristic intent of the scene.

Digital sound effects were later synchronized with the animation in Director. The background of the 3D models was rendered as black so that when the scene was animated on a black stage there would be no need to apply special ink effects in Director to remove the background. We want to remind the reader that the most animation efficient Director ink effect is copy (the default), all other ink settings will require more RAM; taking more time to execute which results in slower animation sequences.

The "sneak" stick man animation sequence used in the quit section was created using Poser 3, a character animation software. The basic shape was selected then an animation path was assigned to it. The sequence was rendered in individual frames. The frames were then imported into Director's cast window and a film loop of the animation was made. The first image in the animation sequence was placed on stage while the film loop and the other images in the animation sequence remained in the cast. A couple of Lingo scripts were written so that when the user rolled the mouse cursor over the "yes" or the "no" button, the single image that was on stage is replaced with the film loop animation, making the "stick" figure appear to walk in place.

In Retrospect

We are pleased with the product of our effort. However, as we reassess the project, having the benefit of hind



Mystify

sight, and having acquired much experience during this process, there are a few improvements that we would implement in the future to render this project an even better one.

1• We believe that the presentation could have been enhanced with the implementation of video clips, maybe showing a few views depicting on-campus life or students projects.

2• A three hundred and sixty degree view of laboratories and other on-campus areas of interest could have been incorporated into the presentation, to give users a more complete experience of the physical campus.

3• Though the user is prompted to contact the University in several occasions throughout the presentation, given the purpose of the project, the last thing the viewer should see is an invitation to contact the College of Technology soon. This, surely, will be included in the quit section.

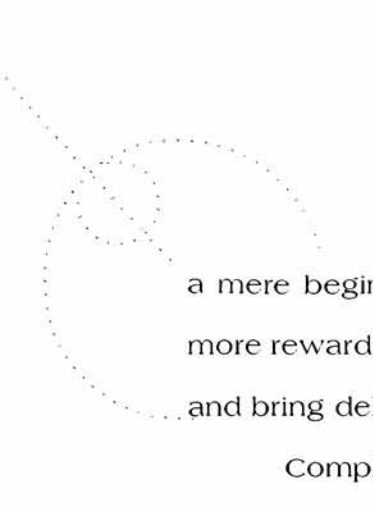
We will attempt to incorporate these observations at a later date, but as for the present we strive toward perfection, recognizing our limitations and, at times, somewhat comforted by the fact that if there is no room for improvement then there is little incentive to aspire for anything greater.

In Conclusion

Now that we have reached the end of this journey, we conclude this chapter of our lives bearing in mind that the end of this task is nothing more than



Motivate



a mere beginning, an introduction to greater, more challenging and ever more rewarding enterprises that will serve to develop time-tested character and bring delightful, lasting pleasure.

Completing this project has been challenging, rewarding, some times frustrating, but often, inspiring. During the past few months of intensive work we have learned new techniques in 3D modelling, efficient memory management, implementation of design principles, good communication with clients, Lingo scripting, hybrid compact disc authoring, multi-platform concerns, and how to better express thoughts and processes in words others can understand. We have improved our ability to visualize concepts, and effectively apply these ideas in aesthetically functional ways. No doubt, our problem solving skills have been enhanced and, most importantly, we have adapted an attitude of viewing every difficulty as a challenge, an opportunity to learn or discover something new daily.

Especially during the difficult moments of this project we have developed the skill to perceive the invisible, to materialize the conceptual, to listen to what is implied, and to express a thousand ideas without uttering a single word.

Through these few months of hard work we have come to the conclusion that perfection is a goal worthy of pursuit so long as the pursuer can differentiate obsession from dedication.



Aspire