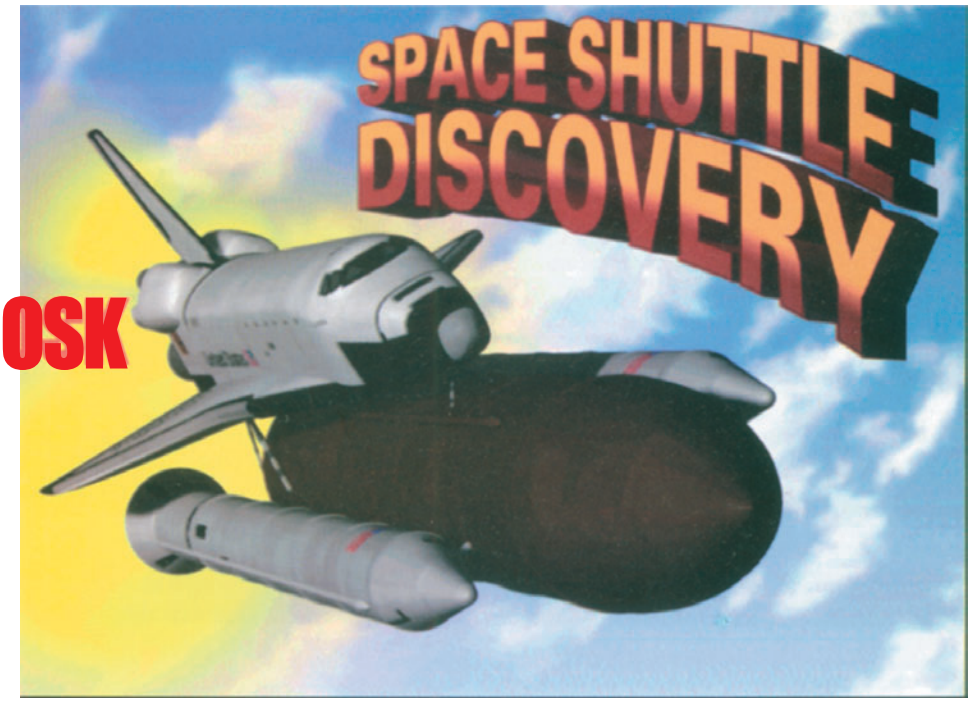
Success Story

Building A QuickTime Kiosk

Interactive Automated kiosks that incorporate video are big business. Here's how QuickTime enabled a Mac-based museum kiosk.

BY CHRIS ALLAIN



The opening splash screen of the Shuttle Simulator.

THIS PROJECT BEGAN in the Fall of 1992 when my company, Vidox Image & Data, landed a contract to create a simulation of a NASA space shuttle mission for a museum in Fort Lauderdale, Florida. The contractor, Exhibits, Etc., was building the space exhibits of which this project was a part. The Museum of Discovery and Science opened its doors in December of 1992. The center serves visitors of all ages in the South Florida area and includes exhibits in multiple areas of science. It also features an Imax theater and an ecology area.

The Specs

Exhibits, Etc., described the exhibit and provided a list of requirements. The shuttle simulation should support a player at each of two stations, the Shuttle Flyer and Mission Control. The target audience would be children eight to 11 years old. Each player should perform three or four actions to keep the mission on track. A visitor would probably fly only one mission and the entire event, including instruction, should run no longer than three to four minutes. The exhibit required a simple mission that a youngster could easily finish. Since the simulator would operate in a straight forward manner, and follow the general rules of shuttle missions, we wanted striking graphics to create as much interest as possible.

Exhibits, Etc. also asked that we select an alternate input device because neither mouse nor keyboard would survive the abuse that a children's exhibit would receive. The client also asked that we include video taped footage of stages of actual shuttle missions.

Planning and Designing the Simulator

The project called for video in a window so we looked at two options, QuickTime movies or a laserdisk with a video in a window board. A system using a video in a window board and a laserdisk offered better motion quality and could run on a lower cast CPU, but it would not be as mobile and would require the integration of more components. For desired performance we desired, a base system running QuickTime required a Quadra with about 20MB of RAM and a fast hard disk. The two alternatives ended up costing about the same for hardware, and we estimate no difference in software development cost. The client chose the QuickTime version.

We then began developing a flow chart with branches for various phases of the mission. Once approved by Exhibits, the flow chart provided an outline that described the components required for the simulator. Vidox staff members Scott Rachal and Tim Sullivan were responsible for creating most of the components for the Space Shuttle Discovery simulator. Rachal created most of the graphics in Electric Image and ColorStudio and Sullivan did the Lingo programming for the Director application.

The input device presented a special challenge. A standard, economical track ball sounded like a good solution, but Exhibits would have had to modify it and build it into the console to prevent removal of the ball. Also, a track ball requires some skill with a pointing device. The simulator design required shifting control from the shuttle flyer station to the mission control station as control alternated between the two players. Unfortunately, we were unable to easily transfer control from one ADB device to the other. We finally decided to use keystrokes for the interaction and designed a system using arcade style game buttons that triggered various keys. This way a child could pound on the buttons all day long, and if they failed, replacement would be simple. This solution offered another benefit, we could hide the cursor throughout the mission.

Components of the Interface

The components of the interface included the "Video" window, that displays footage of each phase of the shuttle mission. The "Status" window displays a wire frame representation of the shuttle action. The "Mode" window tells the user whether control belongs to the shuttle flyer or to mission control. A change in mode brings a change in three on-screen LEDs and their labels. In this way, the player sees LEDs and labels that match the labeling for the buttons on the kiosk console. The "Message" window provides constant information about the stage of the mission and the action requested of the player. The "Mission Timer" provides a countdown to take off and then counts elapsed mission time.

Building the QuickTime Movies

The first step in assembling the required QuickTime movies was to determine which NASA footage to use. We cap-

tured the selected segments using a single frame technique with a broadcast tape deck, MacVac animation software, and a NuVista board. We used the single frame technique because none of the boards available to us captured uncompressed, 240 by 180 pixel video at the desired frame rate of 10 frames per second. Next, we captured the associated audio and edited the sequential PICT files and the audio into QuickTime movies.

We were able to use NASA footage for all stages of the mission except two; the external tank separation and a satellite activation sequence. We created 3D animation and audio for these segments and converted them to QuickTime movies.

For the mission time window, we could have animated the numbers in Director alone, but the counter required accuracy and QuickTime deals more reliably with time-sensitive data. We created the numeric characters in ColorStudio, imported them into Director, and choreographed and positioned them. We defined the Director image size and exported the animation as a 64 by 30 pixel QuickTime movie that would play at a one frame-per-second rate.

The QuickTime files included over 250 movies with sound, and another 20 or so with audio only.

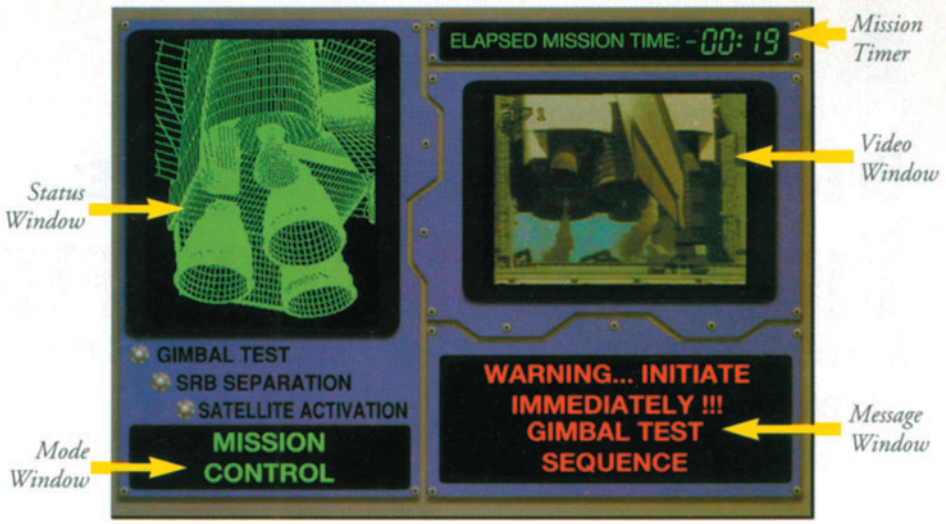
Creating the 3D Animation Sequences

The 3D animation required a good model of the space shuttle. Rather than building so intricate a model from scratch, we acquired the primary shuttle model from another firm, including most of the texture maps. We created additional texture maps and models including those of the external fuel tanks, the solid rocket boosters, our communications satellite, and various other detail items. We rendered the two 10 fps animations for the QuickTime window, the two full 640 by 480 pixel opening screens, and the wire frames required for the status window. Also, we created the main interface screen in Electric Image.

Building The Director Application

Creating the initial Director application was challenging, but refining and debugging it took forever.

To begin assembling the Director application, we imported the pieces, which included all the video window QuickTime movies, the audio QuickTime files, the mission timer QuickTime files, the main interface screen, the two startup screens, all the wire frame images and a host of miscellaneous components.



A typical Simulator screen, with all the elements of the interface marked.

Several weeks of Lingo programming and debugging followed. We faced a big problem in synchronization of the multiple, simultaneous, animated components and audio. QuickTime is time sensitive, but Director varies in speed depending on the CPU, the drive and other variables. We had to adjust the final timing using the same equipment installed in the museum.

Another problem we had was eliminating the cursor. It flashed at several points in the mission while waiting for QuickTime movies and sounds to play even though we set it to invisible. Eventually we developed custom scripts that took care of the problem.

Apple's release of QuickTime 1.5 halfway through the project helped improve the simulator's speed and performance. However, the compressed video suffered a substantial loss in image quality when

Resources

Abbate Video
83 Main Street
Norfolk, MA 02056-1416
Tel: 800-283-5553
For more info circle free lit #39

Adobe Systems
1585 Charleston Road
P.O. Box 7900
Mountain View, CA 94039
Tel: 415-961-4400
For more info circle free lit #40

Advance Digital Imaging
22 Rocky Knoll
Irvine, CA 92715
Tel: (714) 725-0154
For more info circle free lit #41

Aldus
411 First Avenue South
Seattle, WA 98014-2871
Tel: 206-628-2320
For more info circle free lit #42

Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
Tel: 800-776-2333
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Body Cello
7434 Trade Street #210
San Diego, CA 92121
Tel: (800) 922-3556
For more info circle free lit #44

Bonobo Productions
712 Wilshire Boulevard #8
Santa Monica, CA 90401
Tel: (310) 452-5613
For more info circle free lit #45

Compression Labs
2860 Junction Avenue
San Jose, CA 95134
Tel: 800-225-5254
For more info circle free lit #46

CoSA
14 Imperial Pl., Suite 203
Providence, RI 02903
Tel: 401 831-2672
For more info circle free lit #47

DiVA Corporation
222 Third St.,Suite 3332
Cambridge, MA 02142
Tel: 617-491-4147
For more info circle free lit #48

FWB
2040 Polk Street #215
San Francisco, CA 94109
Tel: (415) 474-8055
For more info circle free lit #49

Gryphon
3298 Governor Drive
P.O. Box 221075
San Diego, CA 92122-1075
Tel: 619-454-56836
For more info circle free lit #50

Hatnet
20440 Town Center Lane #4A
Cupertino, CA 95015
Tel: (408) 725-2810
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Intelligent Resources
3030 Salt Creek Lane #100
Arlington Heights, IL 6005
Tel: (708) 670-9388
For more info circle free lit #52

Interactive Solutions
4655 Old Ironsides Dr. #270
Santa Clara, CA 95054
Tel: 408-986-8228
For more info circle free lit #53

JVC Information Products
19900 Beach Blvd #1
Huntington Beach, CA 92648
Tel: (714) 965-2610
For more info circle free lit #54

Macromedia
600 Townsend
San Francisco, CA 94103
Tel: 415-442-0200
For more info circle free lit #55

MASS Microsystems, Inc.
810 W. Maude Ave.
Sunnyvale, CA 94086
Tel: 408-522-1200
For more info circle free lit #56

Media-Pedia Video Clips
22 Fisher Avenue
Wellesley, MA 02181
Tel: 617-235-5617
For more info circle free lit #57

Mega Drive
489 S. Robertson Blvd
Beverly Hills, CA 90211
Tel: (310) 247-0006
For more info circle free lit #58

MicroNet
20 Mason
Irvine, CA 92718
Tel: (714) 837-6033
For more info circle free lit #59

Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399
Tel: 206-882-8080
For more info circle free lit #60

New Video Corporation
1526 Cloverfield Boulevard
Santa Monica, CA 90404
Tel: 310-449-7000
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Northern Telecom
200 Athens Way
Nashville, TN 37228
Tel: (800) NORTHERN
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Nuts
8 Plaza; 8 Sunning Road; Fl. 12
Causeway Bay; Hong Kong
Tel: (852) 881-6360
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Pantechnicon
P.O. Box 738
Santa Cruz, CA 95061-0738
Tel: (408) 427-1687
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Passport
100 Stone Pine Road
Half Moon Bay, CA 94019
Tel: 415-726-0280
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Pixar
1001 West Cutting
Richmond, CA 94804
Tel: (510) 236-4000
For more info circle free lit #66

PLI
47421 Bayside Avenue
Fremont, CA 94538
Tel: (800) 288-8754
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Radius, Inc.
1710 Fortune Drive
San Jose, CA 95131
Tel: 408-424-1010
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RasterOps
2500 Walsh Avenue
Santa Clara, CA 95051
Tel: 408-562-4200
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ShareVision
2951 Zanker Road
San Jose, CA 95134
Tel: (408) 428-0330
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Silicon Graphics
P.O. Box 7311
Mountain View, CA 94039
Tel: 415-960-1980
For more info circle free lit #71

Sony Corp. of America
655 River Oaks Parkway
San Jose, CA 95134-1997
Tel: 800-352-7669
For more info circle free lit #72

Storage Dimensions
1656 McCarthy Blvd.
Milpitas, CA 95035
Tel: (408) 954-0710
For more info circle free lit #73

SuperMac Technology
485 Portrero Ave.
Sunnyvale, CA 94608
Tel: 408-245-2202
For more info circle free lit #74

Truevision
7340 Shadeland Station
Indianapolis, IN 46256-3919
Tel: 317-841-0332
For more info circle free lit #75

Valis Group
P.O. Box 422
Pt. Richmond, CA 94807-0422
Tel: (510) 236-4124
For more info circle free lit #76

VideoFusion
1722 Indian Wood Circle St. H
Maumee, OH 43537
Tel: 800-638-5253
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we compressed it again using QuickTime 1.5's new Compact Video codec. Unfortunately, we had discarded the original uncompressed captures. To get the best image quality we had to recapture all the frames using the single frame technique described above.

We implemented timing tweaks and other fixes continuously over the following weeks. A long string of minor bugs presented other problems, like a negative sign that sometimes reappeared on the mission timer after the launch.

We created an animated instruction sequence with audio, along with scripts to implement a single player version. A player starts a game by pushing any button at the Shuttle Flyer kiosk. The system then requests the player at Mission Control to push any button to confirm that Mission Control is manned. If a Mission Control player responds, a normal two-player game follows. When there is no response, the system plays that portion of the game automatically.

After more timing and tweaking we converted the file to a Director Runtime application for final testing. During testing we discovered that unexplained crashes occurred after 12 to 20 consecutive games.

Additional tests pointed to the use of too many QuickTime files, so we converted the audio QuickTime segments and imported them into Director as sound resources. After this change, we found that it still crashed after a dozen games.

After several calls to MacroMedia and many hours of testing, they felt that we had come across a bug in QuickTime (of course Apple may have felt they had found a problem in Director – Ed.). MacroMedia thought that QuickTime was leaving locked memory blocks in the application memory causing fragmentation. After a couple of hours of operation, Director could not find enough contiguous memory to load required data.

With assistance from MacroMedia the solution we developed was to break the project into two different files. A small launching file containing the last frame of the project sends Director to the second file. The system briefly loads this launching file after each play, cleaning out the memory in the process. Since the simulator remains in a continuous loop throughout a full day's operation, players notice only a brief pause between games. Throughout the day the simulator remains on the startup splash screen broadcasting a simulated weather report until a player initiates a game.

The product we created pleased Exhibits, Etc. They commented that the caliber of the graphics was much better than similar projects that they had seen. We enjoyed the project and if hadn't taken an extra month to debug, we probably would have made a profit as well.

Chris Allain and Vidox do their techno-magic in Lafayette, Louisiana.