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Macintosh: Desktop Media & the Making of Pencil Test (2 of 2)

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Article Change History

02/12/93 - UPDATED
- MacroMind-Paracomp now MacroMedia.

Pencil Test was modeled with Super3D from Silicon Beach Software (now Aldus Consumer Division). These 3D models were animated using MacTwixt, a Macintosh version of the public-domain animation package Twixt, developed at the University of Ohio by Dr. Julian Gomez.

Apple's Advanced Technology Graphics Group developed custom, 3D-rendering applications to render each frame of the film, adding material properties, like color, texture, smoothness, specularity, and shininess, to the geometric models (illuminated by one to four light sources and shaded by the method of Gouraud or Phong). A 24-bit Z-buffer was used to resolve the hidden surfaces. Digital bitmaps of the wood grain on the desktop, the cartoon on the mug, and the computer screen were texture-mapped onto the objects. In one scene, temporal anti-aliasing was used to create the effect of camera motion blurring.

The frames were rendered as 24-bit images at a resolution of 2160 x 1458. Each image was decimated by a factor of 3 in each dimension, using a windowed-sinc filter to reduce aliasing artifacts, to the target resolution of 720 x 486. This was then gamma-corrected and converted to (Y, R-Y, B-Y) in the CCIR-601 digital format.

Each of the approximately 5,000 frames took an average of 30 minutes to render, for a total rendering time of 2,500 hours, or 104 days. A distributed rendering program was used to produce this in parallel in a period of four days of elapsed time on a network of 25 Macintosh II computers over the EtherTalk network.

A master program parceled rendering jobs to available machines and collected and compressed the finished frames. The finished frames, totalling 3 minutes

and 10 seconds, occupied 1.4 gigabytes of a 2.5-gigabyte SCSI disk drive attached to a Macintosh II acting as an AppleShare File Server. The frames were then decompressed and transferred to an Abekas A60 digital sequence store. A Sony D-1 digital component video recorder was used to record the final video sequence off of the Abekas.

Along with the high-resolution digital video version, a Macintosh II version of Pencil Test was created by filtering every other 720 x 486 frame by a factor of 2 in each dimension with a windowed-sinc function to a target resolution of 360 x 243 (24-bit RGB). A custom-written application can replay the compressed 75MB animation in near real-time from an Apple HD80 SC SCSI hard disk on any 32-bit Macintosh II graphic interface card. The sound track for the video was created using Macintosh computers connected to music synthesizers via the Apple MIDI interface.

The score was composed and sequenced using the Performer application from Mark of the Unicorn. The sound effects were edited on the Macintosh using Sound Designer from digidesign and Opcode Patch Librarian from Opcode Systems. The effects were then cued to the video using digidesign's Cue Sheet. During final mixdown, two Macintosh computers were synchronized to the Sony D-1 digital video recorder using two Opcode Systems' SMPTE Timecode machines. One of the Macintosh systems controlled a Roland S-330 sampling instrument that played the score, while the other Macintosh controlled two E-Mu Systems' Emax sampling instruments playing the sound effects. The soundtrack was mastered directly back onto the Sony D-1.

As a comparison, the opening sequence of Steven Spielberg's television show, Amazing Stories, used a crew of 60 people. They spent 60 16-hour days working with a Cray supercomputer to produce 30 seconds of animation, or 6.5 man-years of work. We have no information on other animation programs for the Macintosh II. However, in addition to MacroMind, two companies to watch are Aegis Development Inc. and Byte by Byte.

With the general overview of Macintosh animation covered, here are some plausible, low-cost to state-of-the-art systems:

1) Super 3D and/or Swivel 3D, MacroMind's Director, one of the above-mentioned 8-bit color video card with NTSC and GenLock, and a high-quality VHS VCR.

2) Any graphics program that produces PICT2 or PICS files, TapeOp, Color-Space II, Color-Space II F/X, and a Betacam BVW-XX VTR.

3) Any graphics application that produces PICT2 or PICS file formats, TapeOp, Macintosh II Video Card with RAM expansion kit, RGB Technology's RGB/Videolink 400 (or 1400 or 1400A), and Sony Umatic BVW-XXX VTR.

4) Any graphics application, Macintosh II Video Card with RAM expansion kit, and GigaPix tape hardware system.

Starting with the first system, animation in this environment is 8-bit color running in real time. Productions created with this setup can be done relatively quick and easy. The images are created in a 3D graphics application

or in Director. If Swivel 3D or Super 3D 2.0 are used, then the 3D-image series can be moved to Director via a Scrapbook file or PICS, respectively. Once in Director, the animation is recorded in real time to video tape, or, as the animation is played back in Director, it is recorded to tape. Most production time is spent creating the artwork and creating the animation.

Either system 2 or 3 lets you do production in a frame-by-frame manner. This is the more traditional method of animation and is especially helpful when animating complex images. Complex images may slow the real-time animation process to the point of customer dissatisfaction. Using a frame-by-frame technique allows the complex images to be drawn at whatever speed is necessary for the computer, and then placed one frame at a time on the video tape. Graphics are produced in any Macintosh graphics applications. The graphics needs to be saved in either PICT2 or PICS file formats.

The TapeOp application reads either file format and records the single frame graphics image to the video recorder for the specified number of frames. This is an automated process; the TapeOp application can be started in the evening and left to work through the night.

The system 4 method for creating animation is similar to the technique used for Pencil Test. Again, a frame-by-frame technique is used. The images are created in your choice of applications. Genius provides FKEYs for saving the images in the GigaPix format. Once each of the frames for the animation has been stored to the GigaPix tape, the tape is sent to a GigaPix service bureau for transfer to an Abekas digital frame storage device. A Sony D-1 digital component video recorder records the final sequence from the Abekas. From the Sony D-1 recorder, the animation is transferred to the appropriate video format: 1-inch, Betacam, Super-VHS, or regular VHS.

Vendors of video and animation hardware and software include:

- Genius, Inc.
- Macromind-Paracomp, Inc. (now MacroMedia)
- Silicon Beach Software (now Aldus Consumer Division)
- Aegis Development, Inc.
- Master Digital, Inc.
- RGB Technology
- Mass-Micro
- RasterOps
- ComputerFriends
- TrueVision

To locate a vendors address and phone numbers, use the vendor's name as a search string.

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