Lucasfilms applies computer technology to film industry

Ware Myers, Contributing Editor

"Our charter is to bring digital technology into the film industry," Edwin Catmull, director of computer research and development at Lucasfilms, told a session at Comcon Spring 82 on computers in art and entertainment. His group now numbers about 25 people with backgrounds in computer science and electronic design. It has projects under way in five or six different areas, including film editing, audio editing, data-base management, and computer graphics.

Catmull is finding that bringing high technology to the movie industry involves reactions that are not unlike those accompanying its introduction into other industries. Some members of the industry are genuinely excited about the new tools and eager to use them. At the other end of the spectrum are those genuinely antagonistic to them and very much afraid of what may happen. Then there is a large group in the middle, he says, who are wondering and worrying a little.

Paint program. Typical was the reaction of the special-effects artists to a new computer graphics "paint" program for which Catmull's group recently completed the prototype system. The artists tacked an article on their bulletin board which quoted Jim Blinn—probably incorrectly—as saying that systems of this type would replace the artist. (Blinn is known for his work on Voyager at the Jet Propulsion Laboratory.) They circled this quote and drew an arrow pointing to a little stick figure that Blinn had presumably drawn, poking fun at its lack of artistic merit.

As the artists entered the computer laboratory to try out the prototype paint system, they joked that they would be shining shoes in two more years. One artist, who has done a lot of matte (background) painting, was in the antagonistic camp and was very vocal about his feelings. When they tried the system, however, "they were just amazed," Catmull said. Now they understood how a paint system could help the artist, not replace him. They had been scheduled to spend an hour on the system, but they stayed—entranced—for four hours.

Video editing. Catmull's people have built a prototype editor which duplicates the capabilities of existing video editing systems. Their goal is to design a system that is better suited to the work that film editors actually do than the present systems are. The number one problem is recordkeeping. "There is a huge amount of film, large numbers of logs, vast quantities of images," Catmull pointed out. He is trying to solve this problem by putting professional computer scientists on the task and having them apply the body of knowledge that has been built up in the computer industry. Another problem is that of converting between the frame rate of film, 24 per second, and that of television, 30 per second. A third project is to replace video tape with video disks. Disk image quality is better, and disks would give rapid access to large amounts of material. Unfortunately, producing a disk is time-consuming
—about two weeks’ turnaround—and costly—about $2500 for a half hour. 
Those are not acceptable parameters for day-to-day editing; they must be greatly reduced to make disk use practical.

Audio editing. The reason for developing a digital sound mixer is not just to get better quality, according to Catmull. The main reason is to be able to keep track of the vast array of sounds and to be able to change them for artistic purposes, even toward the end of the production process, which always seems rushed. Catmull described the current audio process in detail. Suffice it to say that it takes a number of people and some weeks of time. On the George Lucas film The Empire Strikes Back, there were 12 sound segments of 10 minutes each. The various kinds of background and foreground sound were contained on reels of magnetic-covered film, an average of 70 reels for each 10-minute segment. Half of these reels were stereo, for an average of 100 channels of sound for each segment. 

Now suppose the director or producer wants to make a change in the film. It takes “an army of people to make some simple change,” as Catmull put it—actually a half dozen men, but that is still expensive. The answer is a wholly digital audio mixer, which Lucasfilms is now building in cooperation with a group at Stanford University. The machine will mix 16 channels of audio in real time. It is to be an ECL machine capable of floating-point 24-bit add and multiply every 50 nanoseconds. A prototype has been built and debugged. The operating system has been designed and the final steps necessary to get the system working are now in progress.

In the finished film the images and sound go together, of course. In Hollywood, however, the industry is so structured, Catmull notes, that images are edited by one set of people and the result turned over to another set of people for sound editing. Catmull feels that both functions should be working from a common data base. Because of the unified nature of Lucasfilms, with all the staff groups trying to please only George Lucas, Catmull hopes to make some progress in this area.

Data-base management. Another project is the development of a data-base management system for Lucasfilms’ special-effects house. The problem here is keeping track of a lot of pieces of data. Catmull has found management, project leaders, and film coordinators interested in a computer-based system for this purpose.

Computer graphics. There are only three kinds of images, Catmull explained. One is live action—the actors. Then there are models and matte paintings. Finally there is computer graphics—the “new kid on the block.” The assumption that computers will replace models, matte paintings, or actors is “all nonsense,” Catmull said. Computer graphics is another way of making images, extending the repertoire of the people who make the artistic decisions. With computer graphics some of the images may be better than they would have been without it. But economics determines which route to take to make a particular image. “It’s a lot cheaper to make a model than it is to digitize it,” said Catmull. Also, it is easy to move models (or the camera) and faster than making images frame by frame.

Some matte paintings are so well done that viewers of the completed movie are not aware that the background is really a painting. At best, however, paintings are two-dimensional. As an example, Catmull referred to the fight between Luke Skywalker and Darth Vader over a giant shaft in The Empire Strikes Back. The shaft was imaged by a matte painting, which didn’t convey a full impression of three-dimensionality. In this case, with so much action going on, few viewers would notice the slight lack of realism in the shaft. Still, it would be possible to enhance the scene by using three-dimensional computer graphics in place of the two-dimensional matte. A fight over what looked like a real hole would be “a gut grabber.”

The DEC VAX 11/780 currently used to generate pictures takes as much as one to two hours per frame. “We need about three orders of magnitude in increase in speed,” Catmull figured, “something like a Cray 1.” Unable to afford that, he has a small group of “highly talented” people building a machine. It will have a frame buffer, a large memory, and a processor. There are two kinds of functions for it. One is to scan in images and mix them together in the digital realm. The group is also building a laser film input scanner and an output scanner. The second function is to generate synthetic images, and the paint program fits in here.

For the good of the industry. Because George Lucas thinks of himself as a professional filmmaker, he does not plan to lock up the equipment or software systems that Catmull’s computer group develops. “We are going to sell them to other film companies,” Catmull insisted, “for the good of the industry.” Whatever direction advanced technology takes, he concluded, “it is our part to make it useful to filmmakers.”

Fifth Harvard Computer Graphics week

The fifth annual Harvard Computer Graphics Week will focus on computer mapping, image processing, graphic communication, and information resources. There will be presentations for professionals and for users with little or no experience.

The conference will be held at the Hyatt Regency Hotel in Cambridge, Massachusetts, July 25-30. Conference Chairman Allan Schmidt welcomes contributions of papers and posters. For more information, contact Ann Quenin, Laboratory for Computer Graphics and Spatial Analysis, 48 Quincy Street, Cambridge, MA 02138; (617) 495-2526.

NCGA ’82 program includes frontier research applications

New graphics techniques for advanced scientific research will be demonstrated and discussed in “Frontier Applications in Research,” the latest addition to the five-day program of this year’s National Computer Graphics Association conference and exposition at the Convention Center in Anaheim, California, June 13-17.

The session will cover such subjects as computer-aided engineering research, interactive computer graphics in reactor technology, and transliterated language display and processing.

The conference program also includes computer graphics animation, architectural and engineering CAD, business and technical data graphics, defense automation, device-independent graphics, electrical CAD/CAM, graphic arts and media, graphics for machine-mediated learning, mapping, and cartography, mechanical CAD/CAM, medical graphics, petrochemical graphics, statistical graphics, university graphics, video technology, and consumer computer graphics.

For further information contact NCGA, 2033 M St., NW, Suite 330, Washington, DC 20036; (202) 466-5895.
CAD/CAM earns $1 billion in '81, but growth slows

Although CAD/CAM manufacturing earned more than $1 billion in 1981, the industry's growth has slowed, reports Dataquest, Inc.'s industry service.

According to Timothy O'Dea Gauhan, vice-president and director of the service, turnkey revenues alone reached $682 million, 40 percent more than the $484 million of 1980.

"This would be impressive in some industries," said Gauhan, "but it is a sharp drop from the more than 60 percent growth of the CAD/CAM industry in the past several years. There is still enough latent demand out there to sustain the growth of previous years, but the industry has felt the impact of high interest rates and a slackening of investment in capital equipment."

The $1 billion figure also includes revenues from sales of CAD/CAM products by computer companies, and sales of software packages designed to run on general-purpose computers.

Another trend, Gauhan said, is a shift in market share among the major vendors. Computervision, the leading turnkey company, maintained its 40 percent market share, whereas Calma, acquired by General Electric in 1981, gained two percent and now has 15 percent of the turnkey market. Applicon and Intergraph each hold a 13 percent share.

"Now that Schlumberger's board of directors has approved the purchase of Applicon," Gauhan said, "1982 will be a very interesting year. We will see the giants, General Electric and Schlumberger, battling for market share with Computervision."

In 1981 computer companies, such as IBM, Digital Equipment Corporation, Prime Computer, and Perkin-Elmer, became increasingly important in the CAD/CAM marketplace, and Gauhan expects the trend to continue. He also predicts that most major computer companies will begin selling directly to the CAD/CAM market.

The integrated circuit design segment of the CAD/CAM market grew relatively little in 1981: less than 20 percent, compared to the 40 percent growth in the turnkey industry as a whole. Gauhan believes this indicates the depressed condition of the semiconductor industry.

Dataquest, Inc., in Cupertino, California, is a market-research subsidiary of the A.C. Nielsen Company, and provides advisory services to industry executives in engineering, marketing, planning, and production.
IBM plays small role in CRT and hard-copy graphics markets

IBM plays a minor role in both the CRT graphics terminal and hard-copy graphics markets, according to two recent studies by Venture Development Corporation. The CRT Graphics Terminal Industry: A Strategic Analysis credits IBM with only a 3.2 percent share of 1981 graphics terminal revenues. These sales were of the 3279 color raster scan terminal. IBM’s only other graphics display terminal, the 3250, is purchased on an OEM basis from Sanders Associates.

The Hard Copy Graphics Industry reports that IBM had less than one percent of 1981 hard-copy graphics revenues. However, their only entry in this market, the 3287 color graphics printer, makes IBM a leading company in the impact dot matrix segment of the industry. VDC expects this industry segment to grow at a compound annual rate exceeding 70 percent through 1986. Analyst Wendy Abramowitw said, “IBM will increase its share of the hard-copy graphics market, but will not be a threat to the leading pen plotter and electrostatic printer/plotter manufacturers.”

IBM did not enter the hard-copy graphics market until 1979, by which time it was dominated by CalComp, Tektronix, and Hewlett-Packard. Although IBM was one of the first companies in the CRT graphics terminal market in the mid-1960's, it was overtaken by Tektronix, which identified the need for low-cost graphics terminals and quickly became the leader.

Both VDC studies forecast shipments in units and dollars through 1986, provide installed base information, and profile the device user. Other discussions include technology, industry structure, and strategic recommendations for industry participants.

For further information, contact Wendy Abramowitz, Market Research Analyst, Venture Development Corporation, One Washington Street, Wellesley, MA 02181; (617) 237-5080.

---

E&S donates graphics systems to 16 universities

The Evans & Sutherland Computer Corporation has donated PS 300 graphics systems to 16 universities involved in computer graphics research and education. The research programs receiving the PS 300s are at the following institutions:

Brigham Young University, California Institute of Technology, Carnegie-Mellon University, Cornell University, Harvey Mudd College, Massachusetts Institute of Technology, Ohio State University, Rensselaer Polytechnic Institute, Stanford University, Texas A&M, University of California, Berkeley, University of California, San Francisco, University of Michigan, University of Texas, University of Utah, and West Coast University.
Overhead projection shortens meetings, improves credibility, study finds

Overhead projection can shorten business meetings and influence their dynamics and outcome, a new research study has found.

The study of the effectiveness of overhead transparencies was conducted by the Applied Research Center of the Wharton School, University of Pennsylvania, under a grant from the Audio Visual Division of 3M. It also showed that overhead projection affected the way meeting participants perceived the presenter, and helped the meeting leader reach a consensus.

Overhead projection reduces meeting time spent talking and increases time spent interacting, according to Lynn Oppenheim, a senior project manager at Wharton. "Communications experts generally believe that the less time spent in monolog, the more efficient the meeting because more interaction of ideas is allowed to take place," she noted.

The meetings using overhead projections were on average 28 percent shorter. According to 3M, this could save American business several billion dollars a year, and 42 working days a year for the average executive.

The study also showed that overhead projection

- Influenced the outcome of meetings.
- Improved credibility. When two opposing sides of an issue were presented, the presenter who used overhead projection was perceived as better prepared, more professional, more persuasive, more credible, and more interesting than the presenter who did not use overhead projection.
- Encouraged interaction among participants and increased understanding.
- Increased the frequency of agreement.

The six-month study involved 36 groups of MBA students from Wharton School and Drexel University who had business experience and/or exposure to marketing techniques.

Highlights of the study—"A Research Report on the Effects of the Use of Overhead Transparencies on Business Meetings"—may be obtained by writing to the Audio Visual Division, 3M, Box A-P, St. Paul, MN 55144, or by calling, toll-free, (800) 328-1371.

The Problem: Glare from CRT displays. Eye strain. Inefficiency. Loss of operator-hours. The ergonomic difficulties of interfacing man and CRT are growing. OCLI has the solution: HEA®—High Efficiency Antireflection Coating. HEA reduces glare by 94% while optimizing contrast. It improves the operator's visual efficiency and comfort. It's cost efficient. It's the solution. For more information write, phone, or telex: OCLI, Dept. 109-DE, 2789 Northpoint Parkway, Santa Rosa, CA 95401-7397. (707) 545-6440. Telex II 510-744-2083.