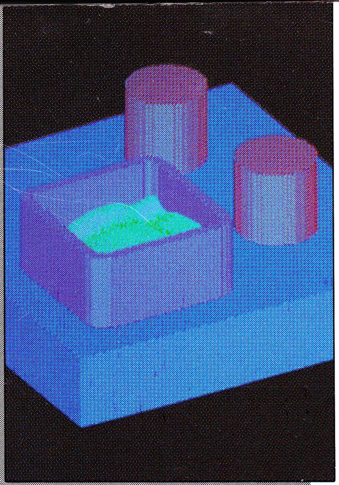
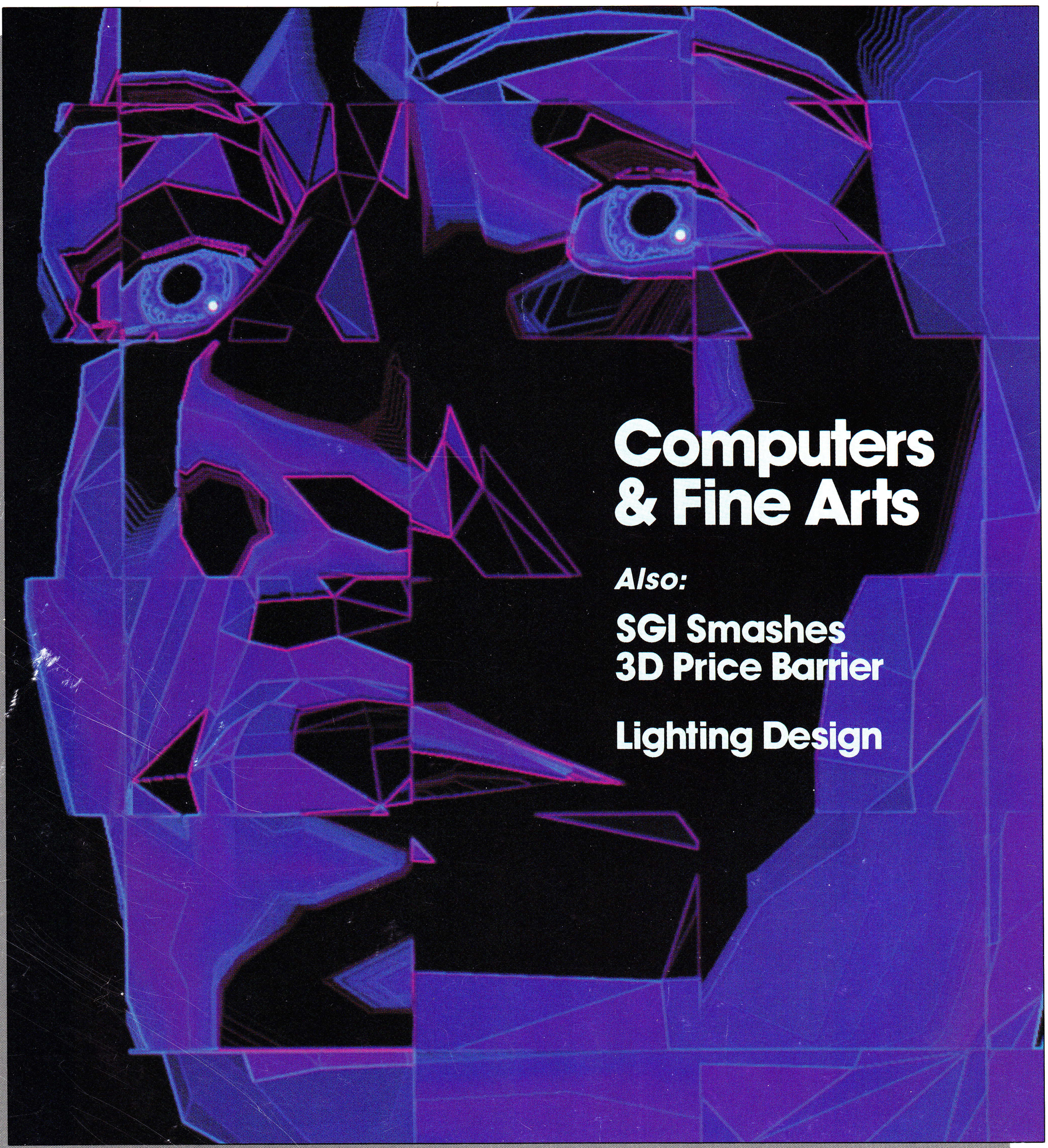
A PennWell Publication October 1988 $4.00

COMPUTER GRAPHICS WORLD



FOCUS:

Visions of CIM: Graphics plays a growing role in integrating manufacturing and design, p. 46



Computers & Fine Arts

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Lighting Design

late these dimensions into a graphical model to calculate additional characteristics for specific components of the helicopter.

"For HESCOMP to survive in today's more integrated design and manufacturing environment, it had to evolve into an interactive tool that would meet the requirements of rapid design cycles," says Myklebust. "By coupling the program to CADAM, we produced an integrated, application-specific design system.

"We retained the qualities of HESCOMP, allowing users to convert mission requirements into final design requirements, but added the capabilities of CADAM to provide fast graphical output as well as augment HESCOMP's engineering analysis functions."

The Route to CADAM

The CADAM Geometry Interface Module (GIM) provides the entry point for HESCOMP to share modeling data with the CADAM database. GIM allows CADAM Interactive Design to be interfaced to complementary products from other vendors, and also enables CADAM users to develop their own application-specific programs to extract and manipulate design data.

Explains Myklebust, "Other CAD/CAM systems have geometry interface tools, but they generally work best one way: Models developed through the CAD/CAM system can pass through the geometry interface to be analyzed by outside programs. With GIM, the outside program can directly and interactively modify the model. Information we enter into HESCOMP can pass through GIM to produce a readable model on CADAM."

To achieve this readable output, the VPI team created a translating interface, called HESCAD, that transforms the variables of HESCOMP's output into critical geometry points.

When coupled to CADAM through HESCAD, HESCOMP graphically displays the helicopter's design specifications on the CADAM workstation. The model can be updated on CADAM to show the layout, space available for modifications, and constraints of the helicopter. Then, as the designers modify the design, they can immediately examine the impact of their changes on the CADAM helicopter model.

Says Myklebust, "By linking HESCOMP to CADAM, we greatly reduced the time needed for a preliminary helicopter design cycle. HESCOMP has always been useful for defining the final design requirements needed to meet specific mission requirements, but its output was a terror from the standpoints of graphical translation and mass property analysis.

"With the interface to CADAM, we can immediately see the model, compute the mass properties of its components, calculate interference, measure interior volumes, and determine the moment of inertia requirements of added equipment . . . instead of examining these characteristics independently."

VPI researchers are also developing an expert system that "automatically" produces interfaces between engineering programs and a solid-modeling CAD/CAM package.

To generate an application-to-CAD/CAM interface using this system, a user need only create a generic model on a CAD/CAM system and respond to the expert system's queries as to which of the model's parameters will be determined by the application program. With this information, the expert system generates an interface that enables the application program to produce models. Then, by re-executing the application program with different input, the user is able to modify the model.

The VPI group has already created a prototype interfacing system using Cadam's Interactive Solids Design (ISD) program and IBM's Expert System Environment (ESE). To test the interfacing system, the VPI team linked Design, a test application program that evaluates mechanical parts for deflection and stress, to Cadam's ISD through a dialogue with the ESE-based expert system. So now, each time the user executes Design with new input, a modified version of the original model is generated and the new model's stress response is analyzed simultaneously.

Maximum Capabilities

"Manufacturing companies have only scratched the surface of their systems-integration potential," says Myklebust. "An interface-generator such as ours can be a key to maximizing the capabilities of CAD/CAM systems.

"Engineers often find themselves bogged down in redesigning models at each stage of the design and manufacturing process, creating a model on a CAD/CAM system and re-creating it in a batch-mode format for engineering applications. Once they analyze the model with an engineering program, they have to remodel it on the CAD/CAM system and the cycle continues. Our interface generator creates a two-way path between CADAM and engineering applications: CADAM design data can also be accessed and analyzed by an engineering program. With the results of this analysis, an engineer can alter the input to the 'external' program and thus directly refine the CADAM model." CGW

The Mystery of Asteroids

People say that Mark Trueblood has his head in the stars. But he doesn't mind. According to Trueblood, founder of the Winer Mobile Observatory, most of the people he meets harbor some fascination with the night sky. "Astronomy captures our imaginations about the mysteries of how we got here and where we're going," says Trueblood. "Astronomy, in its own way, tends to solve these mysteries."

With a small amount of federal funding and a strong commitment from a number of US businesses, Trueblood and his staff are preparing to search for some "astronomical" solutions of their own to these mysteries through the observation of asteroids. Since 1983, Trueblood and his staff have been developing the WMO computerized mobile observatory to observe and record asteroid occultations, a phenomenon that takes place when an asteroid moving in its orbit seems—from Earth's vantage point—to cover up a distant star.

Explains Trueblood, "Very little

is known about asteroids, especially the smaller ones discovered in the last 20 years. We're not sure of their composition, their size and shape, or what relationship they hold with the rest of the solar system. We believe that learning more about these things will eventually help us move further toward understanding how our solar system was formed."

Although astronomers generally know when an occultation will occur, it isn't until two to three days before the event that they can precisely pinpoint the best location from which to view the full occultation. This is where the mobile observatory comes in.

Following the Stars

Stationed inside a Ford Econoline van, which tows a trailer-mounted telescope, the WMO includes an electric power generator, power conditioning equipment, a high-accuracy LORAN-C navigation receiver, and two racks of equipment.

At the heart of the system is a MicroVAX II, which controls telescope positioning and tracking, stores data from the photometer (an instrument used for measuring light), and helps the astronomers analyze the data back at the WMO's home base in Potomac, Maryland. The CPU, memory, and peripheral boards are mounted in a ruggedized chassis, which contains a shelf for a 72M CDC Wren II Winchester disk and two 5¼-inch floppy drives and holds an eight-line serial port, a DMA interface for the photometer, a disk controller, a Data Translation DT2651/2658 image-processing system, and a CalComp CGS-4600 graphics board.

A CalComp high-resolution color monitor displays the video generated on the graphics board, while a Conrac Model 7111 color monitor displays the output of the image-processing boards. A CalComp keyboard and mouse round out the user interface. All major system components are attached to the van's floor by Aeroflex shock mounts.

The main advantage to this system, says Trueblood, is power. "We decided on the CalComp CGS 4600 display subsystem because it's a lot faster than anything else we looked into. For example, we can put up 100 displays in under 12 seconds, which translates to eight displays per second. And since it has a powerful CPU on the graphics board, the CalComp system does its work with minimum use of the VAX CPU so we can use the CPU for other tasks while we're doing graphics."

The computer's database is organized into "pages," which contain information on the telescope and photometer operations and on factors such as the temperature and humidity at the telescope site and inside the computer chassis. Other pages contain data on the object being tracked, the aperture and filter wheel positions on the photometer, and software operation.

By using the CGS-4600, Trueblood and his team have found it possible to build an "active" star atlas that's even more useful than a printed atlas. "As part of a trip's preparation," explains Trueblood, "we'll load onto the MicroVAX disk a catalog of stars, including very faint ones, in the vicinity of the target star. This catalog contains each star's sky coordinates and brightness. The eight bit planes in graphics memory are used to represent various star brightness levels, with each star being displayed on the bit plane corresponding to its brightness. The bit planes are turned on and off until the pattern represents what one actually sees for a given scope and sky transparency."

Once the field observer is satisfied that he's looking at the correct star and that the telescope is tracking it properly, the operator centers the target star in the photometer's view field and records the asteroid's occultation.

During the event, the operator monitors the on-screen atlas and calls up information in the console's screen to oversee the system's performance. Up-to-the-second data on how well the telescope is tracking the asteroid and whether the photometer is lined up accurately appears on the screens as status pages so the operator can tell at a glance whether the system is gathering the correct data for that particular event. When the WMO has returned to home base, data is entered into the computer and plotted for event times and observer locations using an interactive analysis and plotting program developed by Trueblood.

Stars of the Future

Trueblood believes the WMO will be ready to observe and record its first occultation within the next few months. "I hope what we're doing here will be a springboard for the formation of other small observatories like the WMO," he says. "The larger observatories need backup field information for events such as these—astronomical occurances which observers at larger observatories can't record due to the event's location.

"The technology is definitely available for this kind of field work," he continues. "It's exciting to discover how many applications there are for this type of graphics equipment." CGW

Forest Preservation

"Our goal is to provide the knowledge and technology necessary to improve the management, protection, and use of the forests and rangelands of the Intermountain West," says Mark Rubey, a computer programmer analyst involved in the Forest Survey Project of the Intermountain Research Station. This Ogden, Utah-based group of researchers and analysts is responsible for gathering and analyzing data that will help serve as a basis for forming forest policies and programs for the orderly development and use of forest resources.

Rubey and others involved in the project use SAS/Graph software (SAS Institute Inc., Cary, NC) to present the results of their research, which appear in various publications and are used in workshops and training sessions.

"In general, once we get our data into the SAS system, we produce various displays of the data at different points in time," he says. "We use graphics through various stages of the modeling process by