

# Caligari: Amiga Software For the Video Professional

*High-quality video animation  
used to require a system costing over  
\$60,000. Now, Caligari can do it  
at a fraction of the price.*

**By Stefan B. Lipson**

Caligari is the first Amiga-based software for three-dimensional animation and modeling. Developed by Octree Software of New York, it sets a new standard for three-dimensional video animation. Displayed in the Commodore booth at the August SIGGRAPH show in Dallas, the Caligari system attracted considerable praise, and with good reason: Taking advantage of the excellent graphics capabilities of the Amiga, Caligari can achieve the type of video animation that could previously be created only on workstations beginning at around \$60,000.

Not only does Caligari represent the most inexpensive professional system available, it is also probably the easiest to use. The software includes an interface that features pull-down menus and easily identified icons for accessing the various editing features.

## Shapes and Modes

Basic objects such as spheres, cubes and other assorted polyhedra can be selected from the Objects Menu. (For those of you who've forgotten, polyhedra are solid shapes bounded by polygons.) These shapes may be

altered and combined to create a library of objects to be used in future animations. Using the objects in the library, you then set up the scene in which the objects appear, specifying how and where the objects are to appear, the camera angles, the speed of animation and other script-related details. You can then preview the ani-

mation with the Preview Option and store the segment on videotape if you are satisfied with it.

Caligari takes full advantage of the Amiga's exceptional graphics, providing three different modes in which to work. The high-resolution mode provides 704 × 440-pixel resolution with any 16 colors displayed on the screen at once. (Normally the Amiga provides a resolution in hi-res mode of 640 × 400 pixels with a border around the image. This border is unacceptable in video animation since it also gets transferred to the videotape. In Caligari, the border has been removed, increasing the dimensions of the image to 704 × 440 pixels.) The medium-res mode gives the user 360 × 440-pixel resolution with up to 32 colors displayed simultaneously. The hold-and-modify mode is also a medium-resolution mode, but it allows for 4,096 colors on the screen at one time.

For smooth shading, Caligari uses the Gouraud Shading algorithm. This algorithm defines an object as a series of planar surfaces and then illuminates each plane's surface by specified light sources directed at them. The color intensity at the center point of each plane is calculated, the values are summed across the object, averaged, and then used to determine the color shading across the entire surface. This smooth shading option requires a wide range of colors and is therefore available in the hold-and-modify mode.

## System Components

The menus give the user access to the three basic modules of the software: an object-design module for creating and storing three-dimensional objects; a scene-design screen for designing the scene in which the objects are to appear; and a script-editing/video module for previewing a skeletal version of the scene and for sending the image to a video recorder. Brief descriptions follow.

1. *The Object-Design Module.* The object-design module





lets you create and store any number of three-dimensional objects, which can be used individually or pieced together to create more complex shapes. For example, a number of tetrahedra could be pieced together to create the name "AMIGA." The new shape may then be stored in the library for later use. Editing commands such as stretch, rotate, extrude and compress allow you to alter the objects in every way imaginable.

2. *The Scene-Design Module.* The scene-design module lets the user lay out the entire scene. The design screen initially appears on the monitor with a three-dimensional checkerboard receding into the distance. Distances are clearly marked along each of the three planes. Even the mouse crosshairs simulate three dimensions.

Menu options for the scene-design screen allow the user to traverse any of the axes and to view the scene from any specified angle and distance. The user may then call an object or group of objects up from the library and place them anywhere on the set. A wide range of editing commands allow you to move or change location of the objects. You can view the scene from any angle and from any axis with a quick press of a mouse button. Once complete, the scene is saved in much the same way that an object is saved in the object-design module.

3. *The Script-Editing/Video Module.* With the scene complete and the objects in place, the user can instruct the system to display an on-screen preview of the animation. For example, by selecting two points on the screen, Caligari will animate the scene as if the camera were moving from one point to the other, moving at user-defined intervals. The program takes care of all of the essentials, such as angles of rotation, perspective and hidden surfaces.

The Script Editor also allows you to enter commands in batch mode. This allows you to create a file containing all of the necessary commands to be run in

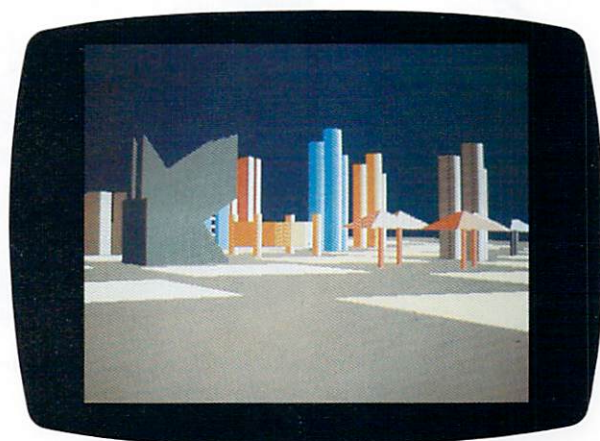
sequence. Written in a format similar to that of a move in the game Adventure, a command such as "Move from 0,0,0 to 10,10,10 in Arc" would simulate camera movement between the designated points following an arced path.

Caligari's Script Editor can even accommodate the placement of multiple light sources as well as diffuse and specular lighting. The system is flexible enough so that the user can, for example, revolve around a scene while simultaneously reducing the camera's angle to the horizontal and changing the location of any and all light sources.

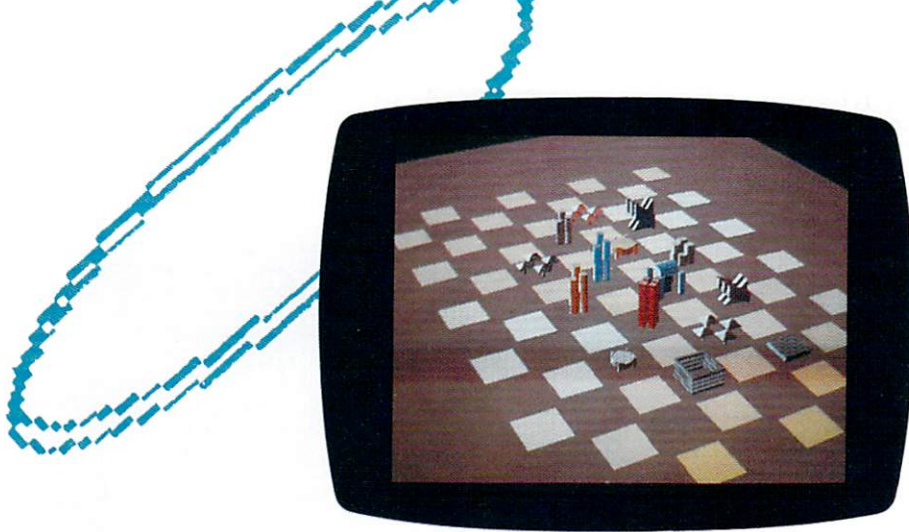
### Real-time Animation Previewing

Complex layouts with elaborate animation routines have in the past required an inordinate amount of computing time, making it difficult to construct individual images quickly enough to provide a sense of animation. To address this, Caligari has employed a unique preview system that shows only a skeletal sequence where the objects appear to be built out of wire frames. If fully rendered, each image would otherwise take from one to sixty seconds to realize. By drawing only the wire frames, the user can see a facsimile of how the animated segment will appear without getting bogged down by computing time.

Once satisfied, the user can send the sequence of images to the video recorder in a fully automated sense: The sequence of images and scenes are "queued up," or listed in order of creation. The machine draws one, the single-frame video controller transfers the drawn image to the videotape, the next image is drawn ►







and transferred, and so on until the entire sequence is saved on tape.

### Image Reproduction and Format

Due to the complexity of the images, Caligari would require enormous amounts of memory if conventional storage and data-retrieval techniques were used. The problems surrounding disk storage and retrieval have been circumvented by employing a unique three-dimensional database in which the elementary components of the objects are stored in hierarchical fashion. With the database concept, the images to appear on the screen are not actually stored on disk, but are instead fetched and assembled from the database. This approach makes the creation and composition of each screen much faster because the database is very compact, and disk access (which slows down processing time) is eliminated. The database approach also allows multiple users to share full libraries (i.e., a database of objects that you have created) without having to copy and reload numerous disks.

Caligari will also allow you to store the scene to disk if so specified. Using IFF format, the image may then be transferred and altered using any of the Amiga graphics packages. This also allows you to output hard-copy excerpts of your videotape animation.

### In the Right Place

Who's interested in a product like this? Everyone who ever wanted to get involved in video animation, of course, but the system requires the patience of an individual who can put in several hours of work to produce a high-quality segment that has a short running time. Several advertising agencies have already inquired about Caligari as a means of creating in-house animation mock ups. Art schools and television studios also stand to benefit tremendously from a system that offers so much for so little. In fact, Roy Kissin, co-producer of Bruce Dern's recent movie, *On The Edge*, has made inquiries into Caligari for his own use.

### Hardware Requirements

In order to animate the images and capture them on videotape, you must also have a *single frame controller*, a piece of hardware used to transfer the image created by Caligari onto the videotape. Any of the available frame

controllers work with the Octree software, and they range in price from \$750 to about \$3,500. The system can work with a variety of video recorders as well as a variety of formats. To operate the system, the video recorder is plugged into the frame controller and the frame controller is plugged into the serial port of the Amiga. For professional applications, Octree recommends using 1.5 megabytes of RAM. Although the cost for the hardware and software may seem high for the home user, it is extraordinarily low for the professional who is in need of such a tool.

### Caligari for the Home

Caligari was originally conceived for the professional video market, but a second version of the Caligari system will also be made available at a reduced price for home users. The low-end version of the software will require 512K and act primarily as a three-dimensional modeling system. It will offer the same editing features as the professional version, including the smooth shading option. Interestingly enough, the Caligari video demo *We Built A City*, shown in the New York SIG-GRAPH video show in June, was created on an Amiga with 512K.

The home version will not include the modules for scripting and video interfacing, and so it will not allow you to animate your three-dimensional images or send the images to videotape. Instead, the home version will allow you to create the image and store the completed product on disk. Because of its modular design, you will be able to purchase an upgrade to bring the home version up to the professional level.

The price for the software had not been determined as of this writing, but the underlying philosophy at Octree is firm: to deliver what no microcomputer has delivered thus far and at a fraction of the cost of presently available graphics-animation workstations.

"We're really very excited about Caligari," says Roman Ormandy, President of Octree Software. "Our field is analogous to the field of desktop publishing; the market for low-cost, high-quality graphics animation software is mushrooming beyond our wildest dreams. Caligari is the first system that allows the user to create video animation previously unobtainable without a system priced over \$60,000. Our system costs a fraction of that." So far, the response of everyone who has seen Caligari has confirmed this excitement. ■

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