Live Computer Animation

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The array of general purpose graphics workstations typically used for computer aided design, scientific computation, visual simulation, and film special effects have become so sophisticated in their ability to generate high-quality, real-time computer animation that they can be used for live creation of graphics and effects for television broadcast. Although the field typically is dominated by special-purpose video processing hardware, these machines are beginning to show up in a variety of innovative applications.

This panel will present some of those innovative applications, talk about the advantages and difficulties of using general-purpose computers for television, discuss their views of the technical and business issues in these applications, and prognosticate about future directions in the art. Undoubtedly, numerous disagreements will arise as to what is and is not an effective and valuable use of this technology. Attendees will be invited to ask questions and share their own views of the industry.

Ken Fuhrman

Broadcasters have just begun to examine the benefits of switching to general purpose graphics workstations from the "black box" solutions currently in use. Computers offer increased flexibility in the look and behavior of the graphics, the ability to network several graphics workstations together, and the opportunity to share one piece of computer graphics hardware between many different graphics applications. Along with these benefits are questions such as how to maintain the high quality standards of the look of the graphics required for network broadcast, how to manage using external data feeds to automatically generate text and images, and how to manage the creation of graphics and put these powerful and complex new tools into the hands of artists.

Developers of new graphics applications are continually facing the inertia of industry "standards." Broadcasters have a set of tools and production methods which are understood and widely available. Unions and the availability of artists with specific skills impose other limits on how graphics can be created. However, broadcasters are beginning to see the possibilities and benefits of using computers, and are starting to bite the bullet and undertake the challenges of using the new technologies.

An important benefit of using computers is the ability to exchange data between a wide range of applications and platforms. EVT has put considerable effort into being able to easily import imagery from several sources, computers as well as video equipment and tools, and from different graphics standards such as EPS. This effort matches the growth of demand for networked systems.

A new question raised by the use of graphics workstations is how to manage what can be done in real time at 60 fps. The typical piece of black box video equipment has a narrow range of capabilities, but can always be relied upon to do its work without dropping fields. Computers offer an unlimited amount of flexibility, but as the complexity increases, so does the calculation time. In traditional non-realtime computer animation this is not a problem, since the computation of each frame just takes a little longer, but in broadcast applications, exceeding the 1/60 second mark has serious implications on the look. There is no simple formula for understanding the limits of a particular computer's capabilities, and the use of tools to monitor performance and detect problems appears to be an unavoidable part of the design process. This is an important part of the education process for broadcasters trying to understand the implications of using the new tools.

The increasing pace of education and raised expectations of broadcasters, combined with the continuing pace of improvements in technology and price, will make this an area of explosive growth over the next few years.

Chuck Molyneaux

There are real day-to-day benefits to be gained by the use of live computer graphics in broadcast. For example, election coverage has always been limited by how quickly changing information could be collected, assembled, and presented. Computers allow much of the process to be done by one device and automated, while at the same time providing flexibility in how the data are to be presented.

Among the difficulties in making use of computers is the technical expertise currently required. To gain real acceptance, these systems must be usable by the artists who currently operate the paint boxes and character generators. Even the process of turning on and logging in to a graphics computer can be daunting. Also, it is necessary to address the special support, repair, and training issues which arise as well.

We are in a period where producers are looking for novelty value, using graphics animation for its "gee-whiz" impact. They are also being driven by fear of falling behind, of being perceived to be outclassed by competing stations. The effect is that producers are making huge leaps to implement complex new systems without the opportunity to evolve into them—to understand their use and value, and to gradually introduce viewers to new concepts and to have a chance to react to the responses of viewers. Many things are making it to air before the question of "is this useful?" has had a chance to be answered.

There is a danger that the quantity and complexity of graphics may overwhelm viewers. Most network news and sports shows are already hugely complex in the number and type of elements used; computers make it easy to generate even more. At what point does it become too much, and begin to diminish the value of the information conveyed to the home?

Virtual sets are currently generating great interest and excitement. The emphasis is on multimillion dollar systems with extensive effects and full virtual worlds. In time, however, the excitement will wear off, and Virtual Sets will need to justify their existence on mostly economic reasons. There are many ways parts of this technology can improve a wide range of shows – live out-the-window imagery inserted into stage shows, for example – and the technology has the possibility of becoming yet another tool in the producer's shop.

Use of computers in broadcast is poised for a real breakthrough in the next few years, brought on by:

- The advent of a low cost computer capable of broadcast-quality graphics and video processing.

- The existence of a range of easy-to-use applications that all can run together on a shared machine.

- The evolution of the business model – distribution, training, and support – to enable widespread use.

As this happens, use of computers to generate graphics will become an economic necessity for every television presenter – local, cable, and network – and a core piece of the production process, not just a novelty for the privileged few.

Tim Heidmann

We have begun to see excitement from broadcasters in having graphics computers fill the traditional roles of "black boxes" – character generators, compositors, video effects generators, and in a few very specific applications, such as Virtual Sets. The excitement is growing, because broadcasters are starting to see the benefits of using general purpose workstations:

- The flexibility of applications in news, sports, and entertainment is virtually unlimited.

- Complex data can be gathered automatically and presented visually.

- One piece of hardware can be used for several applications simply with the acquisition of additional software.

- The amount of computer and graphics power and its configuration can grow modularly with the choice of different machines or by adding more machines to the network.

- Several people can be working simultaneously on one graphic or animation, each on their own workstation connected by a network and tied into databases or communication lines.

All these features have tremendous impact on such traditional uses of television graphics as character generation and creation of moving graphics, but we have only begun to explore the possibilities of how graphics can be used in conjunction with live video.

Computer animation is a valuable educational tool. It can be used to illustrate news events, such as plane crashes or developments in a civil war, for which video is unavailable or impossible. In sports, football plays or sailing maneuvers can be illustrated from any point of view. The ability to create the animation quickly, with high quality, and to present it live is necessary for this tool to be usable in a live broadcast environment.

We have also begun to see the possibilities of how computers can be used live to enhance the video presentation. FoxTrax uses a very simple highlight to make it easier for a hockey viewer to follow a tiny black puck as it speeds over the white ice. The data collection, communication, and calculation necessary to achieve that result in real time are substantial, but the graphic itself must be subtle or risk obscuring or distracting from the live action. The inclusion of a virtual athlete in a foot race – a simple marker or a synthetic image of a person – running at the world-record pace can make a race in which the lead runner is far ahead interesting by allowing the broadcaster to concentrate on the real story: how close the athlete is to breaking the record.

The current trend in graphics is to present more information more often, since more data and statistics are available. By making the information visual in the form of a picture, its possible to present more data which can be understood more easily by the viewer, actually simplifying the process.

Live animated graphics, if done well, can also have great entertainment value. Arresting visuals and complex motion can be a great complement to the video alone, can make a show more fun to watch, and can set it apart from its competition.

The biggest problems facing the use of live graphics in broadcast are in helping the broadcaster understand the opportunities and limitations of the technology, and in getting the tools into the hands of the artists in a way that gives them the freedom to independently explore new things. The current approach to making a system usable is to present the operator with a monolithic application, which prevents them from getting into trouble, but which also places severe limits on flexibility and creativity. The tools must continue to evolve to be more open, simple, and powerful.