

TECH NEWS

Electronic Effects

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Among the many advantages in producing programs on videotape the most impressive is the ability to create visual effects quickly and easily, and at no cost, by manipulating the electronic signals. This advantage is particularly attractive for production people with motion picture background and experience, where an effect cannot be seen until the film has been exposed, processed and projected.

Let us take, for example, a simple effect such as a fade between two scenes. In the production of a motion picture, the editor marks the workprint with grease pencil, indicating with an arrow the portion of each scene to be faded out and faded in. Common practice in 16mm. film production is to then assemble the original camera footage, scene by scene, into separate A&B rolls, interspersed with sections of black leader. As the A&B rolls are being printed, one after the other, from common start marks, a fader shutter in the printer controls the exposure of the release print material.

When the A&B rolls are being assembled for printing, a punched paper tape is prepared to control the printing operation. The control tape actuates the fader shutter as the end of the first scene in the A roll appears, gradually reducing the exposure to zero at the end of the scene. Then, as the B roll is being printed, the control tape gradually opens the shutter at the start of the next following scene, until the desired exposure level for that scene is reached.

A mix or dissolve is produced in a similar manner, except that, in preparing

the A&B rolls, the editor leaves additional footage at the end of the first scene, and the beginning of the next scene, to allow for the length of the dissolve. During printing, the exposures are gradually reduced and increased, just as in creating a fade, but now the exposures in these portions of the two scenes are overlapped or superimposed, the first one fading out while at the same time the next scene is being faded in. Of course, the exposure for the first scene is protected during printing of the B roll by a section of black leader the same length as the first scene in the A roll.

If this appears to be confusing, an excellent diagram and description of the A&B roll printing method can be found in Eastman Kodak Co.'s Videofilm Note, H-40-2, "Film Systems for Color Television" available from Kodak Canada.

Somewhat more complex is the production of a fade or dissolve for a 35mm. motion picture. Usually, the original camera footage for scenes in which effects are to appear is duplicated in an optical printer, and the duplicate negatives are then spliced into the edited originals in preparation for making release prints.

Television Fades and Dissolves.

To produce a fade between two scenes on videotape, two video sources are needed. These could be two live television cameras "looking at" two different scenes, or videotape recordings of the two scenes on machines running in the playback mode. These two video signals are carried by cables to the A and B inputs of a video switcher-mixer. Television picture monitors set up in front of the control console show the pictures as they appear at the A and B inputs, as well as the combined output of the switcher-mixer.

Two side-by-side levers in the switcher-mixer console control the amplitude of the signals at the A and B inputs. In preparation for the start of a fade, the lever for the A input should be in its fully

on position, while the B lever should be at the fully off position, reducing signal level to black. Then, at the bottom of the fade, the B lever is moved at a similar rate from its fully off to fully on position, raising the video level — and picture brightness — to normal. While these operations are taking place, the output of the switcher-mixer can be recorded on another videotape machine, and played back immediately, if desired, to check the effectiveness of the transition between the two scenes.

Putting in a dissolve between two scenes is accomplished in a similar manner, except that the A and B levers in the switcher-mixer are tied together and moved as a single unit, but connected to opposite ends of the A and B inputs. Then, as the A lever is moved from fully on to fully off, the first scene is being faded out, while simultaneously the B

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lever is moving from fully off to fully on, fading in the second scene.

More Complex Television Effects.

Methods for creating effects electronically were devised in the earlier days of television broadcasting, when the effects had to be put into programs "on the fly" as production was taking place in the studio. Besides simple transitions such as fades and dissolves, it was discovered that many novel effects could be obtained by making use of specially generated waveforms, such as sine wave, saw tooth, and various forms of rectangular waves at multiples of the television field and line rates. With these methods, a great variety of geometrical effects can be produced, including split screens, circles, venetian blind, inset squares adjustable in size and location, and many, many others.

Chroma-key is a particularly interesting and useful effect, widely used in the production of television programs and commercial advertising spots. This effect is seen every day in news broadcasts where the announcer appears to be seated in front of a large map or graphic display. A visitor to the studio would see only the announcer and a large blue panel as background. The map or graphic might be an 8x10-in. art card set up on a stand in front of a television camera, or a 2x2-in. color slide being reproduced in a telecine projector.

The effect is produced by inseting one picture into a "hole" created electronically in another picture. The output of the announcer's camera is adjusted to produce zero signal level while scanning the blue background. Another signal is generated with opposite polarity, and when the two signals have been suitably shaped, a pulse is produced that switches between the foreground picture (announcer) and the background (map or graphic).

Electronic keying is often used also to

superimpose titles and credits or product prices in commercials. A television camera can be set up to reproduce lettering from specially prepared art work. Sometimes 2x2-in. slides are made from the art work and placed in a telecine projector, ready to be called up as needed. In the past few years the use of electronic alpha-numerical character generators has become quite common. With this method letters and numbers in a great variety of styles and sizes can be created in a computer and inserted automatically into the television pictures. The running titles so often seen at the bottom of the pictures on home receivers are produced in this manner.

Digital Video Effects.

Many papers have been published in the SMPTE Journal describing methods for creating television effects. Up to the early 1970's most of these methods utilized various forms of video signal manipulation, including modifications of the picture geometry by superimposing different types of waveforms on the camera deflection circuits, combining picture signals and so on. But then, by the mid-1970's digital signal processing began to offer new possibilities for creating effects.

In the July 1975 issue of the Journal, there is a paper "A Primer on Digital Television" by David Howell, at that time a member of the Society's editorial staff, and now the Editor of the Journal. This paper was prepared in response to requests from filmmakers for background information on this new television technology. In the same issue there is another paper, "Principles of Digital Television Simplified" by E.S. Busby of the Ampex Corp., which gives the engineering background.

As a television camera scans a scene, a continuously varying or analog signal is generated, in which the transitions between scene elements produce a rise or fall in signal level. Conversion of these continuously varying analog signals into digital form is accomplished by a sampling and quantizing process in which the brightness of each picture element becomes a discrete step in the video waveform, the number of steps being sufficient to produce acceptable television pictures.

Digital video techniques made possible a new generation of special television effects, through the development of digital frame stores. A frame store consists of a "memory" capable of retaining all the information in an entire video frame. By combining microprocessors with digital frame stores, real-time video processing equipment has been developed, with the capability of producing an astonishing

variety of picture transformations from freeze frame, animation, size change and positioning, to re-entry or "hall-of-mirrors" effects and electrically generated video backgrounds. During the year 1978 the SMPTE Journal had five or six papers on these techniques.

Electronic Effects in Film Post-Production.

Most of the film programs for television are still being made with conventional motion picture methods, the effects being put in by A&B roll or optical printing. Release prints are then turned over to the broadcasters where, in many instances nowadays, the prints are transferred to videotape prior to on-air release. It should be possible to make substantial savings by assembling the camera originals on video tape in the first place, putting in the effects electronically.

In the post-production of television programs the source of the original videotape recordings is of practically no consequence. The recordings might have been obtained by transferring films from telecine, rather than from live television cameras. When the films are being transferred to tape it is customary to route the video signals through some type of correction or modification facility, not only to compensate for color and density variations in the camera originals, but also to alter the appearance of the pictures, as seen on a television monitor, in one way or another.

Once film footage has been transferred to videotape any of the electronic effects equipment available in the post-production centre can be used to still further modify the pictures. Recordings from live cameras can be combined with film transfers, as called for in the program production plan — the possibilities are endless.

Improvements in film transfer equipment in the last few years have made transfers from film equal to, and in many situations, better than the pictures from live television cameras. Original camera negatives transferred to videotape in a flying spot scanner give superlative color picture quality to the extent that film is rapidly becoming the preferred original recording medium.

Particularly interesting is the possibility for creating effects optically as films are being reproduced in telecine. L-W International of Woodland Hills, California, has put on the market a variable speed telecine projector with which slow motion effects can be produced, down to still frame. This company is now developing a computer control device that will enable A&B film rolls to be edited directly onto videotape while the transfers are taking place.

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