A New Approach To Film Editing

By ROBERT DUFFY and JOSEPH ROIZEN

In a rapidly expanding world of technology, film editing still uses techniques developed several decades ago. There is, however, here a system that provides film editors with facilities previously only available to those working in videotape, while still allowing them to retain their familiar visual approach to creative editing.

This system offers a new approach to film picture and sound editing which is more applicable to the production requirements of the 80's. It combines both hardware and software components which make it possible to do a cleaner and better job of film editing or post-production by intermixing film and tape for editing.

The principal advantage of this editing technique may best be described as a film editing system which does not necessitate the actually cutting of the film into a lot of small rolls, as is normally done with traditional film editing. The system permits the compilation of a visual representation on videotape in as many versions as desired, each producing a unique negative matcher's "conforming" list that accurately defines the content agreed upon. It is a faster, cleaner process than has ever been available to a film editor. The electronically produced edit decision list, or the matcher's "conforming" list, gives the editor the exact details on how to cut the soundtracks, work print, and the original negative to create the master film for eventual release printing.

The benefits of this technique to the film producer and editor are speed and flexibility. Time savings from 30 percent to 40 percent can be achieved because the process allows for rapid previewing of any desired combination of scene sequences. It is typical that the "first cut" of an editing session is seldom agreed upon at the outset. With traditional film cutting techniques, the editor has to splice in different trims, add black spacing where timing has to be built up, or get a new work print if the first one is too worn for further use. All of this is time-consuming and costly. This electronic system eliminates much of the physical manipulation of film by providing a videotape that contains all of the workprint scenes in any multiple of combinations desired, all visible at the push of a button.

Another benefit of the system is the preview mode. While this is a quite common feature in videotape editing, it is nonexistent in film editing. With electronic film editing, the editor can see an edit before deciding to commit to it. Preview capability of an actual edit is a great advantage for the creative side of production.

The Hardware

The basic philosophy behind this electronic editing system is to make it fully compatible with most of the film and tape machines currently used in this field. The system configuration takes advantage of an existing device called an Intelligent Interface or I^2 unit (Fig. 1). The I^2 uses a programmed 16-bit microprocessor to control the operation of the videotape machine, and an operator's control console (Fig. 2) which houses an 8-bit microprocessor/supervisor for overall coordination and film transport control.

The film transport is compatible with equipment ranging from a low-cost, flatbed servo-type editing table, fitted with a simple camera attachment, to a device as advanced as the Rank Cintel flying spot scanner, or the latest Bosch/Fernseh CCD (charge-coupled device) telecine. Any servo-controlled film transport meeting DIN* specification 15573 can be interfaced to the system including Albrecht, Sondor and Perfectone, as well as Steenbeck and Kem editing tables. American film transports, such as Magnasync, Magnatech, Moviola, and Cinema Products, can also be used.

With the exception of the Rank Cintel (where an additional control board must be fitted to the servo section), little or no modifications are required for these film transports. In the videotape recorder (VTR) field, the recorders most adaptable are the helical scan machines which provide one field per head scan. These include the ¾-in videotape U-matic format, which is widely used for editing, and the newer one-inch machines. In the future, even smaller helical recorders, such as the Beta and VHS formats, may be adapted for operational economy.

The System Functions

Figure 3 shows a basic system diagram for editing. The two major components are the VTR Intelligence Interface and the

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* Deutsche Industrie-Normen (German Industrial Standards).

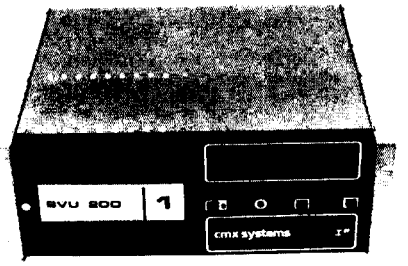

Figure 1. VTR Intelligent Interface (I^2).

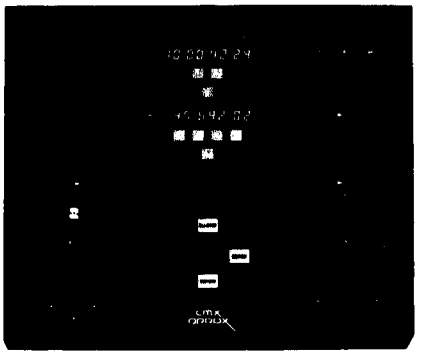

Figure 2. Operator's control console.

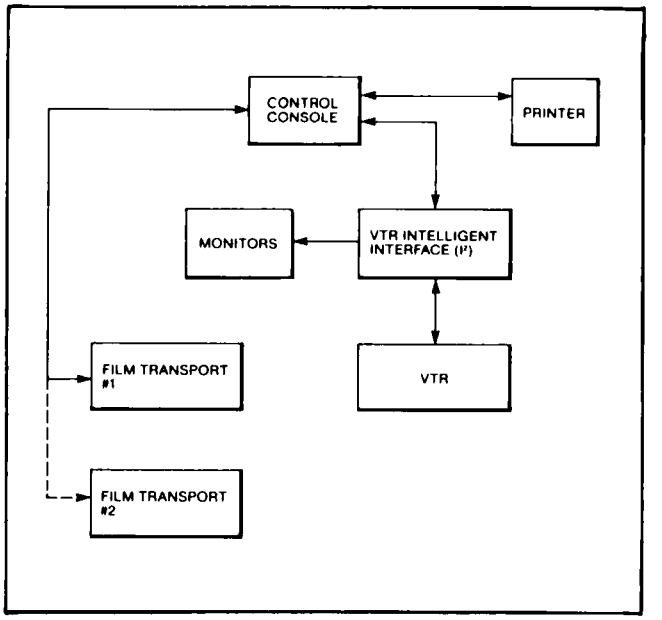

Figure 3. Basic diagram of the electronic film editing system.

control console. The VTR Intelligent Interface (I^2) houses the power supply, the VTR control computer, the time-code reader, and the video/dual audio preview switcher. For a new installation where no video equipment exists, there is a sync generation module which strips sync from incoming video and provides new, clean sync for the I^2 unit. This arrangement eliminates the need to install separate television synchronizing generators. There is also a built-in audio monitoring amplifier, which only needs a speaker to be attached.

A control console, an aluminum housing approximately the size of a briefcase, has rotary controls to activate the film transports and VTR, two LED (light-emitting diode) displays, a small numeric keypad, and other control buttons. It houses a microsupervisor which interfaces to the I^2, and a universal film transport control driver, which can be "jumped" to the particular parameters of the film transport in use.

The microsupervisor keeps track of all communication with the I^2 unit, SMPTE or EBU* time code information, and the film/tape frame relationship. It also controls all of the automatic cuing, previewing, and editing functions.

One of the problems encountered in 60-field TV countries is the difference between frame rates. The microsupervisor software program deals with this by keeping accurate track of the film and VTR image sequence relationship, and selecting the correct video field on which to perform an edit. Film speed is also monitored, and the film movement is correlated to the ballistic requirement of the film mass. Obviously, it is not possible to move large, heavy reels of film instantaneously, so this factor is taken into account when the operational commands are given, and the system automatically compensates for the physical limitations imposed.

The Edit Decision List

As the editing session proceeds, the microsupervisor outputs valid edit decisions to a line printer connected to the control

* European Broadcasting Union.

console. A typical list is shown in Fig. 4, and the information provided, reading from left to right, is as follows:

The first three digits, i.e., 001, 002, etc., are the edit or event numbers.

The next three columns, i.e., P (picture), A1 (sound track No. 1), and A2 (sound track No. 2), are the actual tracks edited or cut in that event.

The last two groups of numbers, up to eight digits each, are the footage and frame or edge number and frame, where the actual splice takes place. The first group is the "out" point, and the second is the "in" point.

The last two groups correspond accurately by frame to a physical point on the original film, and can thus be translated by an assistant or negative matcher to allow conforming of the film to exactly match the videotape representation.

Audio Features

Additional capabilities came about as a spinoff from this system. In many European studios, sound cutting and editing is, to a large degree, still done motion-picture style. Typically, after video editing has been done, a monochrome kinescope of the videotape is made with the single audio track intact. This is given to the "film style" audio department, where individual tracks are cut conventionally on editing tables. From these, the composite soundtrack is then built up with dubs, mix downs, etc., until the final audio master is made. This final audio master is then rerecorded on the videotape as the program soundtrack which will be used for distribution copies of the program. All of the foregoing is usually done with sprocketed mag equipment, which runs synchronously and is coupled to the monochrome kinescope. While the procedure seems involved, it does have the advantage of producing good quality soundtracks that accompany the VTR images. For years, European television viewers have enjoyed better audio with their video than have American television audiences because of the use of this procedure.

The kinescope approach has been costly, time-consuming, and of inferior visual quality. However, there is a major capital investment in "film style" editing, and a large human investment in creative individuals with the skills needed to operate this equipment. This new equipment permits the use of the existing skills, but transposes them to videotape, where an interlocked film transport and VTR using SMPTE or EBU time code provides a color television image instead of a monochrome kinescope. For the human editor, the "feel" is like film, the "look" is like tape. The soundtracks are built up with more than just the familiar synchronizer interlocks, which provide picture and synchronous sound only at play speeds. Close tracking is maintained from ±5 times normal speed,

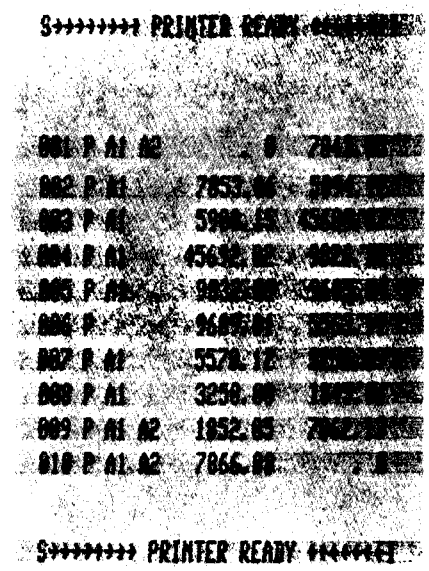

Figure 4. A typical edit decision list computer printout.

to $\frac{1}{20}$ normal speed with linear time code, or at "0" (still-frame) with vertical interval time code. This provides a continuous and accurate relationship between the separate picture and sound sources. In essence, the various speed capabilities of the videocassette recorder are now being duplicated in the sprocketed film machinery that is interlocked with it. For the purpose of dubbing from a number of decks, each of which is carrying a separate set of audio tracks, the decks can be slaved to the system in order to create the final mixed-down soundtrack. The editor sees the videotaped images while he simultaneously hears the soundtracks as they are being overlaid for the composite result. For European operators, these requirements meet their basic needs.

Summary

The system described here is a relatively inexpensive add-on to existing equipment. It can be installed easily, and it also can be expanded or modified in order to suit the requirements of new film transports or VTRs that may be acquired by the user.

As such, it represents a very flexible device that enhances film editing and sound post-production through the addition of sophisticated electronics. At the same time, however, it retains the familiar "picture and sound" aspects associated with creative program production. A number of such systems have already come into use in the United States.

One of the goals in developing this electronic film editing system was to move the film editors, who are among the most creative individuals, toward newer technology in graduated steps. It was felt that putting film editors in front of a modern computer-assisted VTR editing system with a complex keyboard and forcing them to deal with time code numbers is an intimidating experience. This system is designed to take advantage of the tactile and visual experience film editors already have. It provides controls which are familiar and understandable. In/out edit decisions are made for picture and sound as before, but the initiation of an edit has been changed from making a mark on the film with a china pencil to pushing a button. The response from most of the film people who have tried using the system has been very favorable, and it is expected that continued day-to-day use will increase the desirability of using this new approach to film sound and picture editing.