TECH NEWS

by Rodger J. Ross

IMAGE TRANSFORM: HOW THE PROCESS WORKS

The methods used to make transfers from videotape to color film by the Image Transform process have been a well kept secret. But now, in the August 1977 issue of SMPTE *Journal,* there is a description of the process by Pete Comandini which discloses most of the information needed to understand how the transfers are made.

Transferring television pictures and sound to film used to be called kinescope recording. In the old days before videotape this was the only way to capture and retain the video signals for later use. The term "kinescope recording" had its origin in the method used to make the recordings – a film camera was set up in front of a television picture tube, which was given the name "kinescope" in the early days of television. Millions of feet of film were used to make kinerecordings for delayed telecast, and often for direct screen projection as well, but in spite of the most strenuous efforts, the quality of the recordings was usually only fair to poor. Some people blamed the film process for the unsatisfactory results, while others insisted the television pictures were at fault, being excessively variable in appearance.

When videotape recorders began to arrive in television stations in the late 1950's, pictures played back from the tapes were almost indistinguishable from the pictures produced by studio cameras. This, almost everyone agreed, would soon put an end to kinerecording. But some people in the industry were convinced there would be a continuing need for film copies of videotape recordings. One of these was John Lowry of Toronto, who set to work to develop a process that would produce pictures from tape suitable for showing on large theatre screens. This process, given the name Image Transfer, moved to Hollywood in 1972, with Mr. Lowry as vice-president, and quickly gained a world-wide reputation as the best method for transfering videotape to film. It is an expensive method, but the results are outstanding compared with other transfer methods.

Television people with a knowledge of the principles of image transfer have assumed that Image Transform's secret of success must be in the area of video signal processing. This has now been confirmed with Mr. Comandini's disclosures.

It is only necessary to look at an old kinerecording to see where major improvements need to be made. First of all, the 30 per second television frame rate has to be converted to the standard motion picture rate of 24 per second. This can be accomplished by dropping out portions of the television frames, or entire television fields. Image Transform has devised a much more sophisticated method of frame rate conversion. At the same time, another major problem has to be corrected – noise must be reduced. (Video noise has an appearance similar to excessively grainy film pictures).

Noise is reduced in the Image Transform process by combining four adjacent frames. All picture elements that are similar in the four frames come out with unity gain, while picture elements that are not the same are reduced in level by 75 percent. Since video noise is random modulation, the effect is to reduce the noise in the pictures to a quarter of its original level.

This technique is extremely effective until something in the picture moves, but with the aid of a computer, moving patterns can be differentiated from random noise, and a continuous switch or mix is performed in the four frames being processed. This rather complicated technique has distinct advantages over other methods of noise reduction, and it has some other very attractive features as well. As the computer is always manipulating a series of four adjacent frames, it only has to be instructed as to the input rate and the desired output rate to achieve frame rate conversion. The frame rate change is accomplished by recomposing the combined frames in a different series. This eliminates the need to discard entire frames or fields, and overcomes a major disadvantage of the ordinary kinerecording process.

Electronic signals are subject to distortion at all points from origination to display. Some of the most common are smearing and ringing, and horizontal timing errors between chrominance and luminance signals. An even more serious problem in any transfer process is poor resolution – lack of sharpness – in the film pictures.

Smearing can be corrected by generating an identical effect opposite in polarity and combining the two signals, but ringing is far more difficult to remove. Sharpness of the pictures can be improved by a process known as image enhancement where the risetime at the edges of picture elements is amplified. The Image Transform enhancement system is frequency selective, treating separately the low, medium and high frequency signal elements. The medium and high frequency risetime amplification is most important for visual sharpness. This enhancement is applied in the luminance channel only.

The transfer system has adjustments for gamma, gain and pedestal in each of the three primary color channels, as well as color phase and saturation. When a transfer is being made, needed corrections are determined during an initial preview run. These corrections are stored in the computer memory. The color balance

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Long time Supervisor of Technical Film Operations at the programming centre of the CBC, Mr. Ross is the author of two books, ***Television Film Engineering*** *and* ***Color Film for Color Television,*** *has won the Agfa-Gevaert Gold Medal, awarded by the Society of Motion Picture and Television Engineers, and is presently chairman of the SMPTE Board of Editors.*

of successive scenes can be checked by freezing the scene in the computer and stopping the VTR. Another command backs up the VTR to the previous scene and automatically replays each scene with corrections.

A basic incompatibility between television and film is to be found in the area of colorimetry. The NTSC television system utilizes narrow band light emissions from phosphors. When these colors are reproduced on film, colorimetry errors occur due to the differences in spectral distributions of the tube phosphors and the film dyes. These errors can be compensated for by a form of signal predistortion known as masking.

If, for example, a yellow color in the television picture reproduces in the film as dark yellow-orange, the luminance can be raised and the hue shifted towards yellow-green. This method of color correction gives acceptable results in most cases, but it is impossible to exactly match the film and television colors. Television colors are produced by an additive mixture of narrow bands of spectral energy, while film utilizes subtractive dyes that transmit a much wider spectrum. Then, in projection of the film transfers, different types of light sources, with different spectral energy distributions may be used.

The demand for high-quality tape-to-film conversions in the theatrical feature film market provided the inspiration for Image Transform. By the simple procedure of re-timing the vertical interval in NTSC recordings to a rate of 24 frames per second, a 655-line 24-frame picture was produced. This provided additional lines to give higher definition and reduced line structure effects, while the 24 frames-per-second rate gave a one-to-one relationship with film. This technique had been suggested many years earlier but was not developed because the necessary facilities were not available.

The ability to change video frame rates suggests the possibility of application in standards conversion – that is, to convert the North American 525-line 60-field television to the European 625-line, 50-field system, and vice versa. However, that process is much more complicated than changing the 30-frame television rate to the standard film rate of 24 frames per second.

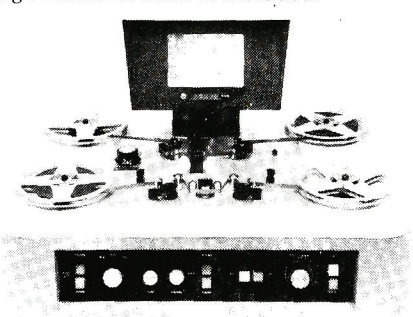
The Image Transform system is protected by a number of US. patents listed in the SMPTE paper.

EQUIPMENT NEWS

Note to Canadian distributors: We would like to include the names and addresses of Canadian distributors of equipment and services mentioned in this section. Please ask your suppliers to give Canadian sources in their publicity releases. Ed.

Super 8 Editing Table

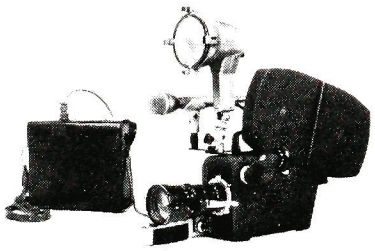
PGP Consultants Ltd. of 325 Grande Caroline, Rougemont, Que., has announced their Model AD11 horizontal editing table, which accomodates one Super 8 picture and one Super 8 full coat sound track. The table has four independent winding motors and an inching knob is provided for manual operation. The film head has an eight-sided prism and the picture is projected from the rear on a day-light ground glass. A built-in speaker is provided for the sound, as well as jacks for earphones or a remote speaker. The picture film and sound track can be uncoupled and moved independently. Forward and reverse speeds are continuously adjustable up to 62 frames/sec. A 5-digit frame counter is included.



PGP Editing Table

New CP Newslite From Cinema Products

A new lightweight CP/Newslite 12V/100W lighting system, available from Cinema Products Corp., is said to be ideal for use with the new, faster film stocks such as Eastman VNF 7250 and Fugicolor RT400, both rated at 400 ASA, in most television newsgathering, documentary and similar applications. This lighting unit consists of a focusing CP newslite, with a 100W/12V 3400° K quartz lamp, and a 12V battery with built-in charger.



CP/Newslite

It is designed for top-mounting on CP-16, CP-16R and other 16mm cameras. It weighs only 19 oz and is priced at $85 (US) less lamp. The battery weighs 6 lbs and can be recharged overnight. It is priced at $275 (US). Write Cinema Products Corp., 2037 Granville Ave., Los Angeles, CA 90025 for further information.

Neutaper – A Splicer for the Film Library, from Neumade

No scraping, no cement – just place the ends of cut film on the die plate, pull tape across, lower handle, depress, and that's it. Fold perforated tab over (does not cover the sound track) and wrap-around splice is complete. The Neutaper perforates the sprocket holes and trims the edges of the tape accurately. It's stronger than a cement splice, the maker claims. The unit is precision made, with cast aluminum base and handle. Punchouts stay in the base. Neutaper pays for itself as it uses non-perforated tape in rolls at savings of about 75%, compared with prepunched tape patches. Three models are available, from $301 to $365. Rutherford Photo Ltd., 211 Laird Dr., Toronto, Vancouver, Ottawa and Montreal.