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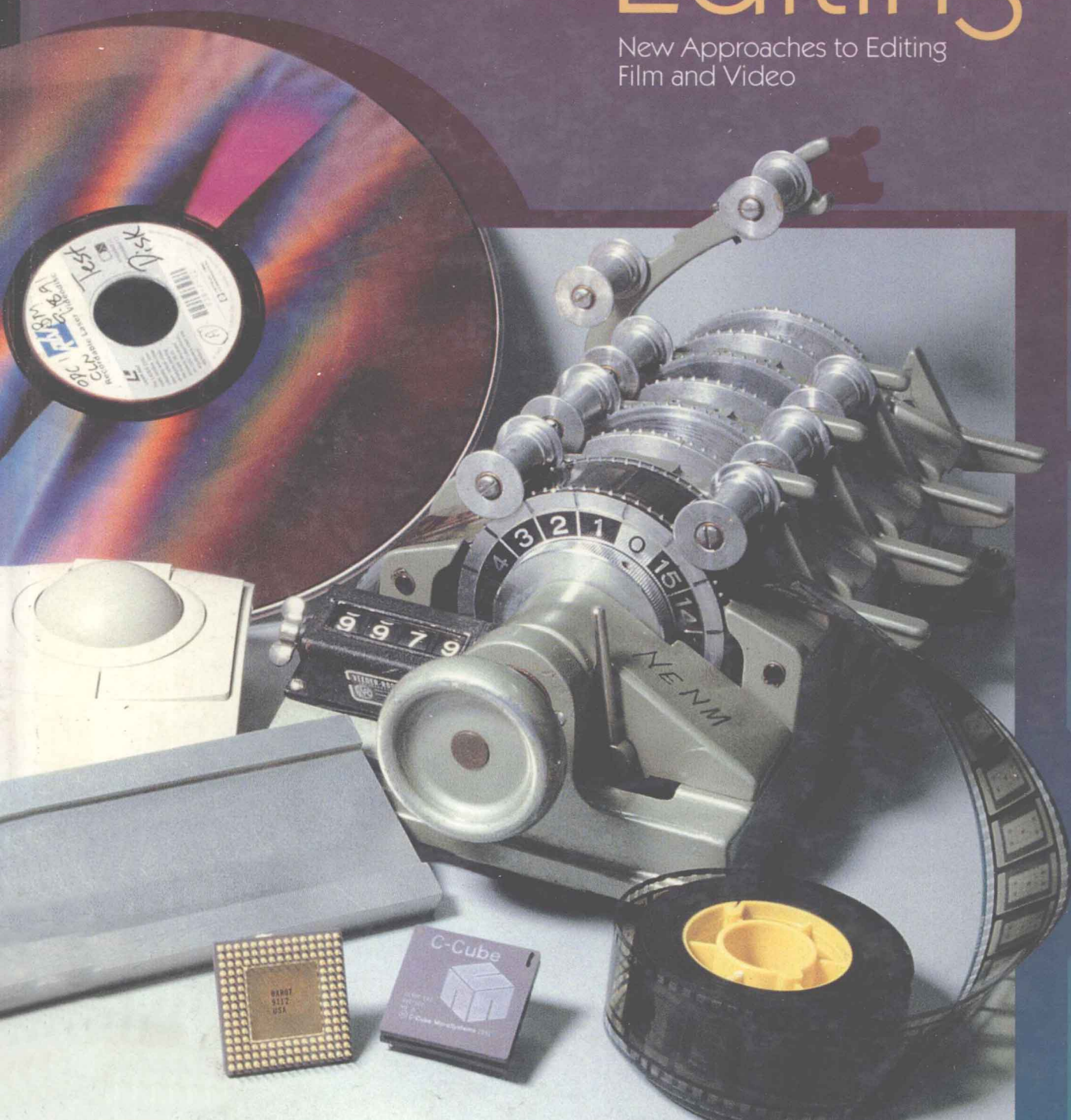
Digital Nonlinear Editing

New Approaches to Editing
Film and Video

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*New Approaches to
Editing Film and Video*

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For Aram and Susan

Preface

The first job I had in the film and television industry was to cut narration audio tracks for training films. The audio was given to me on large audio tape reels. I was given a splicing block, a razor blade, and a script. My job was to take out the pauses, the microphone pops, and the clicks and to make the narration sound as natural as possible. It taught me a lot, including patience and a sense of pace and rhythm, and gave rise to a quest for better ways of putting together pictures and sounds.

The process of editing film or videotape or putting together a presentation consisting of 35mm slides and an audio cassette requires creative and technical decisions. It is extremely rare that the final project is in the same form as the first edited attempt. Projects require some time to evolve, and the film and videotape editor needs time to try ideas.

Nonlinear editing techniques and systems allow the editor to try different ways of putting together the pieces. No longer is it acceptable to not try an idea simply because there isn't enough time to do so. The emergence of digital nonlinear editing techniques will fundamentally change the manner in which pictures and sounds are combined, rearranged, viewed, and distributed.

I have since put my splicing block in storage.

Acknowledgments

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Word Processing, Linear and Nonlinear Editing, and the Promise of Digital Nonlinear Editing

The editing of film and video images is influenced by technical and aesthetic tasks and decisions.

Editing film and video images is a combination of aesthetic judgments and a technical mastery of the film and videotape crafts.

These two sentences deliver essentially the same message. What is important is that an attempt was made to try the original sentence in a new way. The tool used to write these sentences, a word processor, allowed the writer to try out variations easily. One could argue that if the tool were too cumbersome and not as conducive to experimentation, then there would only have been one attempt made at the sentence.

Having the ability to add and delete words or sentences easily allows you to try different ways of writing and expressing your thoughts. Film editors, videotape editors, producers, directors, writers, and those who work with moving pictures and sounds always find themselves wanting to try things in different places and in different ways, and usually, these individuals will exercise this propensity right up to the last possible minute!

Linear editing means that ideas must proceed in a sequential order: Idea one is followed by idea two, and so on. Nonlinear editing means that ideas (shots) can be tried in any order and can easily be rearranged in the same way that words can easily be rearranged when using a word processor. As architect Frank Lloyd Wright wrote,

"Conceive the piece in the imagination, let it live there, gradually taking more definite form. When the thing lives for you start to plan it with tools. . . . Complete the harmonious adjustment of its parts."

Being able to try things, to play "what if" scenarios, not with words but with moving pictures and sounds, is what nonlinear

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editing is all about. Trying things and not having to make creative compromises is at the heart of nonlinear editing. Being able to feel that the one edit that should be shortened, the one thing in a program that is just not quite right, can be changed without sending the project over budget or off schedule, is what all nonlinear editing systems promise.

Digital nonlinear editing is an alternative to analog nonlinear editing, which until 1990 was largely confined to specialized sections of post-production in New York and Los Angeles. The promise of digital nonlinear editing is that it will bring together not only film, video, and audio, but also a variety of other media that have never had one common environment in which to coexist.

Digital nonlinear editing offers the following benefits:

1. Creative flexibility. Technology becomes more transparent, freeing up the individual to concentrate on the needs of the presentation without regard to mastering the technical details of how the system operates.

2. Ability to integrate different media easily. Whether a program consists solely of video or a combination of video, film, 35mm slides, and so on, digital nonlinear systems allow the user to combine these different media easily into a completed program.

3. Savings in time and money. A digital nonlinear editing system offers a savings in time, resulting either in the ability to explore additional ideas or in decreased costs.

4. Preparation for digital integration. With an undeniable movement to all things digital, when to introduce and retrain staff to the concepts of digital media manipulation becomes an important question. Digital nonlinear editing systems provide a cornerstone of that educational process.

WORD PROCESSING: NONLINEAR EDITING WITHOUT PICTURES AND SOUNDS

It hasn't been that long since we were working almost entirely with typewriters. Although IBM introduced an electric typewriter in 1935, through the mid-1960's, manual typewriters were the norm. If we were creating documents, we were doing it by hand, and for business, we were using manual typewriters. You can extrapolate the difficulties: If you typed something and made a mistake, you used one of several, usually messy, methods of erasing the mistake. For important presentations, you had to retype the document.

By the early 1970's, electric typewriters were outselling manual typewriters. At the same time, dedicated word processors began to arrive in the business marketplace. With the lowered cost and increased availability of microcomputers, the idea of creating machines that would be used for manipulating text began to flourish. By the early 1980's, word processing was big business.

Companies such as Xerox, Digital, Royal, Wang, and Data General were all making dedicated word processors. These systems were designed specifically to handle the repetitive tasks required when creating documents.

It wasn't until the mid-1980's that word processing progressed to its next stage of development. This involved the movement away from dedicated word processing systems that consisted of hardware and software. This movement of software from one computer hardware system to another represents a significant step. It is at this stage that software developed for one computer is rewritten in order to run on a different computer system. The movement was afoot. Now you could start to buy software instead of having to buy the whole machine. Early word processing software programs were WordStar, EasyWriter, and VolksWriter.

Has this technology made a difference in what and how people write? Does the student become a better writer because she has an opportunity to go back and rework a paragraph? Does an established author write differently because he has the opportunity to try writing in many different ways? Does the film screenwriter write a better film because she can offer several different endings to the director? Overall, the answer to these questions is a resounding yes! The writers mentioned benefit from being able to hone and develop the initial idea. Similar benefits are realized when the digital nonlinear editing system is used.

THE EVOLUTION OF DIGITAL MEDIA PROCESSORS

The manner in which text is manipulated and documents are created has changed dramatically! The evolution and availability of inexpensive word processing software has been achieved in a short period of time. The manner in which film and video images are combined and edited will inevitably repeat in their development path in the same manner as the typewriter evolved into the word processor. We will see the same evolutionary path. At first, the machines will be dedicated systems that are used to edit film and video into professional presentations and are used by professionals trained in the art and craft of making presentations. Next we will see the availability of less sophisticated systems that will be affordable and within the grasp of more individuals who are less classically trained both aesthetically and technically in the art of making presentations. Finally, these new machines will evolve in the same manner in which word processing software evolved to the point where the computer's hardware platform is not important. This movement will lead to the availability of powerful software that is affordable on the mass market. We will most likely come to know these new series of machines and the software that directs these machines as *digital media processors* directed by *digital media managers*.

The evolution of these machines will mean that the machine is not always going to be something that you can see and touch. Instead, these media processors will be machines that are arti-

ficially created through the use of software. When we make a phone call from our computer and call up another computer, can we point to the telephone being used? Can we say, "Ah, there is the physical telephone; it looks like the telephone I use everyday"? No. Instead, we rationalize and understand that the computer is using a modem to send and receive signals. But the undeniable fact is that a machine, one that we all know in appearance, has changed. A piece of equipment, a machine, has been supplanted by a different technology.

The facsimile (FAX) machine has become extremely popular. Now, however, it is possible to send and receive faxes via modem because there is computer software that can direct a computer to act like a fax machine. So, if you already own a computer, it may not be necessary to purchase a fax machine. Instead, purchase the software that will accomplish the same task. While we now use dedicated machines to perform tasks and these machines were designed to accomplish only one task, the unceasing growth of technology will bring these capabilities within the realm of software programs.

The Turing Machine

Originally a mathematical concept, the term *Turing Machine* describes a general-purpose machine that can do anything if given the right software instructions. Every computer is a potential Turing Machine, and in theory, the computer can become any existing machine if given a set of instructions that emulate how the original machine operates.

Digital video, digital audio, and digital media can all be viewed as mathematical problems to be solved. The Turing Machine concept of general-purpose computers that are able to adopt the appearance and function of any given analog environment is especially important in the evolution of digital nonlinear editing. The digital nonlinear editing system will begin to offer more of the functions that heretofore were confined to dedicated analog hardware. As a result, the computer will draw upon its capabilities of being a Turing Machine, offering characteristics of the traditional machines used for editing film and videotape. This evolution is going to affect the process of editing and will change how presentations in the professional, institutional, and consumer arenas are made.

THE INCREASING COMPLEXITY OF THE EDITING PROCESS

Ask any film editor what he does, and he will tell you he manipulates images and audio to tell a story. Ask any videotape editor what she does, and she will tell you she manipulates images and audio to tell a story. Even though film and videotape editors work in different environments and with different equipment, their jobs are essentially the same. They both use
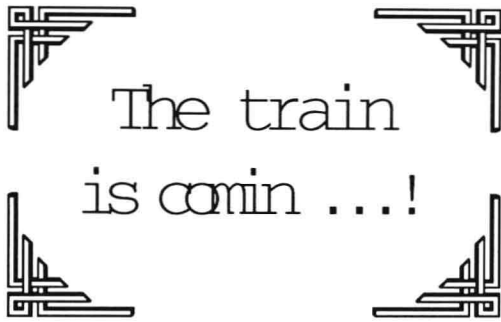
Figure 1–1 The silent movie art card and background music were at one time the most complex information presented to the person watching a film. Illustration by Jeffrey Krebs.

Figure 1–2 Multilayered graphic treatments often contain several visual themes within one frame, presenting the viewer with a great deal of information.

their skill and craft to give a scene its rhythm and an edited sequence its drive. Finding, defining, shaping, and delivering the message are the tasks that both editors have to accomplish. Balancing the creative aspects of craft with the technical details of film and videotape editing can be a formidable juggling act.

The elements that make up a presentation can be many in number and can be quite disparate, but it wasn't always that way. Consider the early silent movie. Usually, it consisted of just three elements: live action of actors and actresses, still art cards, and music. Music provided the mood, and the art cards provided the dialogue (Figure 1–1).

Now consider the images that appear every day in graphic treatments for television commercials (Figure 1–2). The number of visual layers, each providing one additional statement to the intended message, is quite far from the days of the simple silent movie art card. Today, more ingredients are being added to the process of making presentations.

There used to be only two key ingredients to editing: knowing which shots to include and knowing which shots to leave out. Today, the editing process has come to require many more tasks: slow motion, repositioning shots, electronic painting, and so on. The amount of work that is sometimes done to pictures before they are even edited into a program has become quite a significant portion of the post-production process. Most viewers are completely unaware that these "fixes" have been made. All are attributed to "the magic of movies."

Consider the 35mm motion picture. Until only recently, most feature films were shot using 35mm film. The 35mm film negative was loaded into the camera, exposed, and processed. Then a print was made from the processed negative, and this print was the film that the editor cut together to form the movie. There just weren't that many additional visual elements used in the presentation. Films, for decades and decades, were made in this fashion: Shoot the live action, edit the film, finish the sound for the film, put the titles and credits on the film, and show the film.

In the late 1980's, the integration of many types of media into the feature film began. Today, it is not at all unusual, depending upon the look of the feature film that the director is trying to establish, for portions of the film to include material shot on 35mm film, 16mm, Super 8, professional videotape formats (such as D2 and 1"), and consumer videotape formats (such as Hi 8, and VHS). These various formats can further be enhanced or degraded through electronic means. Since these different formats will record images in different ways depending upon how their limitations are stretched, integrating many formats into one feature film can provide exciting visual results; it all depends upon what the director is trying to express visually.

Technological manipulation of film and video has increased dramatically. For example, if a period piece is being filmed and it simply wouldn't be correct to see telephone poles in the frame, technology is used to fix the shot after it has been filmed. Spending time and money by using electronic painting systems to erase the telephone poles and replace these sections with a sky

background is the only viable alternative. It would be unlikely that the poles could be physically removed!

Using computer-generated objects and 3D animation to create environments and characters has also become very popular. As the viewing audience, not only of feature films, but also of television, corporate, business, and educational videos, continues to grow in sophistication and expectation, there has been an increased pressure on program makers to deliver messages in newer fashions. Now more than ever, there is a reliance on new technologies to provide these functions. The use of improvements in digital technology not only to enhance, but also to repair visual and aural material is clearly on the increase. Today, using technology to make pictures and sounds "larger than life" is a reality.

THE COMING TOGETHER OF FILM AND VIDEO EDITING

The art of editing film was long considered to be resistant to technology because film editing requires a modicum of equipment. This attitude is changing as users of film and video struggle with ways of bringing the two forms together and determine what is required for both to coexist. Does film need video, and does video need film? The answer is yes.

The current manner in which the film and video worlds are being brought together revolves around the user of computers. Does film editing have anything to offer to video editing, and does video editing have anything to offer to film editing? Again, the answer is yes. The use of computers will bring the two art forms together because computers and digital technology can reduce both film and video into a common element: the digital bit.

What does this marriage mean for the person putting together a presentation? Whether this person is a film editor, a videotape editor, or a creator of multimedia presentations, being able to command and balance a number of different technologies, some old, some new, and seamlessly integrate their by-products into the completed program can take much more concentration than simply trying to find out what shots should and should not be used.

It is important to note that what will converge are forms of media manipulation and combining media. There are misconceptions about the media of film and video and whether they will combine or whether they will both be superseded by some new form of imaging, whether it is high-definition television or some future technology.Shooting film and shooting videotape will continue to be with us for some time to come. However, the standard, traditional, and known methods of editing these media forms will change dramatically, and they will change far more quickly than the span of time that film editing and videotape editing have been in existence.

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The Editing Process: Film and Videotape Post-Production Procedures

If we charted the development of different editing techniques, we would find the following:

Film Editing	c. 1900
Analog Audio Editing	c. 1945
Videotape Editing	1956
Videotape Editing with Timecode	1970
Digital Disk-Based Audio Editing	1985
Digital Disk-Based Picture Editing	c. 1989

Film editing, as both a craft and a means of story telling, has been in use longer than other methods. For decades and decades, and in the face of the growth of computers and digital technology in the 1980's, film has been considered the quintessential "low-tech" method of making presentations. But, as a craft and as a method of practice throughout the great centers of film production—Hollywood, Europe, and the biggest center of film production of all, Bombay!—film editing has persisted and remains the most reliable method.

FORMATS AND STANDARDS

In discussing whether a project should be edited on film or on videotape, more than once the following words have been uttered, "We'll do it on tape because we've got a better chance at making the deadline, but if anything goes wrong, we'll fall back on the film edit." Editing film is a process that has had the benefit of time and experience to develop work methods that are understandable and shared throughout the world. Film is a unique standard in a world in which standards are difficult to achieve. A 35mm film running at 24 frames per second (fps) can be run on any 35mm film projector anywhere in the world.

A videotape, however, may or may not play back properly depending upon where you are in the world. A videotape