Research on the Application of Non-linear Editing Systems in Video Production (Postprint)

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Abstract

Non-linear editing systems are the most widely used software in modern media applications, as they enable simple and fast program production for both short and medium-to-long videos. Utilizing wireless transmission systems, on-site production allows for real-time shooting and transmission, achieving very high efficiency while effectively saving costs and time.

Full Text

Research on the Application of Non-linear Editing Systems in Video Production

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Abstract

Non-linear editing systems are the most widely used software in modern media applications. Whether for short videos or medium-to-long videos, using non-linear editing software for program production is simple and fast. By utilizing wireless transmission systems, on-site production with immediate shooting and transmission achieves very high efficiency, effectively saving costs and time.

Keywords: Non-linear editing system; EDIUS.8; special effects; image; converged media

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Since the beginning of the 21st century, scientific and technological development has propelled the television and video industry forward by leaps and bounds. In recent years, particularly with the rise of short videos on converged media platforms such as Douyin, Kuaishou, and various other applications, program production has made significant strides in adopting new technologies. While an excellent television program or an enjoyable video brings wonderful visual experiences to audiences, it also requires sophisticated technical support in its production. During post-production editing, non-linear editing systems allow for the addition of vivid and effective special effects. Raw materials are processed through production equipment and software, integrating text, sound, images, and special effects to create more dynamic, lively, and visually appealing video files.

1. Components and Advantages of Non-linear Editing Systems

Non-linear editing systems consist of computer software and hardware. The host and interface constitute the core components and operation platform of the system, while USB and other interfaces connect peripheral devices through data cables. These control devices provide considerable convenience for editing software, audio cards, and video cards. The hardware completes the input and output of video and audio signals, as well as video image compression and decompression. Additionally, we must strengthen the management of large-capacity, ultra-high-speed storage hard drives. Television post-production involves editing digitized video and audio, and video files have extremely large data capacities with demanding system transmission rates. The read/write speed of hard drives largely determines editing smoothness, and large-capacity, ultra-high-speed storage hard drives can solve a series of difficulties in the production process.

Common software includes non-linear editing software, animation software, 3DSMAX, AE, and special effects software. Frequently used non-linear editing software includes Premiere, EDIUS, Adobe Photoshop, and FinalCutPro [1]. Domestically, commonly used non-linear editing software includes Dayang, Sobey, and NewAuto. The production software examples used in this paper are the EDIUS 6, 7, and 8 series. Figure 1 [Figure 1: see original paper] shows the EDIUS.6 software, and Figure 2 [Figure 2: see original paper] shows the Photoshop software.

Technological development has directly driven the rapid advancement of computer technology, accelerating the update speed of computer hardware and software devices. The general trend for hardware development is toward greater functionality and miniaturization, while software development focuses on functional optimization and full integration and utilization of resources. The substantial improvement in computer hardware performance has increased the convenience and dependency of image editing on such hardware.

Non-linear editing systems integrate video recorders, switchers, digital special effects machines, editing machines, multi-track recorders, mixing consoles, and MIDI creation equipment, encompassing almost all traditional post-production devices. This high degree of integration of traditional equipment minimizes the devices required for post-production, effectively saving investment and making the advantages of non-linear editing systems in video post-production more prominent. Furthermore, analyzing from the perspective of image quality, traditional editing equipment suffers from wear on original tapes and the need to shuttle through materials repeatedly. Repeated rewinding and fast-forwarding searches cause wear on original audio tapes, directly affecting picture clarity. Moreover, each time a videotape is copied, the signal weakens significantly, and every special effect or audio/video insertion requires re-copying, resulting in a large gap between broadcast tape signal quality and original tape quality. For non-linear editing systems, these problems can basically be overcome at once. Original material is directly captured onto hard drives for random access, and repeated use does not affect quality or require frame-by-frame recording and calculation. Due to digital storage, even countless copies will not cause any signal loss, and special effects, sound, and music can all be completed in one go.

1.1 Resource Sharing

During the production of television or video programs using non-linear editing systems, all resources are shared within the system through local area networks and intranets. Digital video and audio resources require orderly management. Combined with Internet technology, the value of non-linear editing systems is effectively realized, providing greater convenience for producing higher-quality programs—this is precisely the advantage of such systems.

1.2 Flexibility and Convenience

Traditional production uses manual machines where images must be viewed frame-by-frame before selection, and great care must be taken at each image junction to prevent black screens and frame misalignment, requiring seamless connections. After completion, materials are stored on disks or tapes, where video and audio can be synchronized, but text must be added separately. Modifying sound and images is not easy, and any revised image segment must be longer than the original. Non-linear editing systems, however, allow arbitrary modifications, insertions, or deletions of video and audio with great convenience. They offer multiple subtitle tracks for easy overlay use, and subtitles can be completed together with video and audio. Countless modifications can be made without affecting signal quality—advantages that traditional production equipment cannot match. This represents a leap forward in television production technology.

1.3 Improved Efficiency

Non-linear editing systems are the crystallization of computer technology and digital television technology. In these systems, the large capacity of computer hard drives can store vast amounts of video and audio materials that are very convenient to call upon without signal attenuation, saving considerable time [2]. Traditional manual editing machines cause tape wear and deformation with each use, often resulting in player tape jamming. If backups are inadequate, data storage is at risk, and once tape jamming occurs, all video and audio may be destroyed. Non-linear editing systems can avoid such situations while enabling multiple conversion methods, fast production speeds, and high picture quality.

1.4 High Cost-performance Ratio

A complete non-linear editing system does not require connection to numerous other devices; post-production work can be completed with minimal cost and resources. Compared with traditional editing systems, the reduced number of devices and highly integrated circuits result in very low maintenance costs—only about 10%—making for high cost-performance ratios.

2. Rich Special Effects Templates in Non-linear Editing Systems

The main panel of non-linear editing systems includes material windows, special effects, sequence markers, display windows, subtitles, and video and audio tracks. The special effects window contains audio/video adjusters, subtitle mixers, source file browsing, picture-in-picture effects, 2D, 3D, and more.

To better utilize the special effects panel and achieve perfect unity of sound and picture, the 2D dissolve transition is frequently used, and Alpha custom image effects are also commonly employed [3]. However, special effects must be determined based on changes between shots. For example, when transitioning from a moving large scene to a full or medium shot, applying special effects between the two images creates smoothness without a jarring sense of jump, and the transition duration should not be too short. A film may be shot from multiple camera positions, resulting in color tone differences between shots. Color correction in video filters is also a type of special effect, and we frequently perform color grading to compensate for deficiencies in original footage. Among these, YUV curves, three-tone color correction, monochrome, color balance, and color wheels are particularly useful for remedying defects in original materials, as shown in Figure 5 [Figure 5: see original paper] and Figure 6 [Figure 6: see original paper].

Non-linear editing possesses powerful editing functions that integrate computer, video, audio, and multimedia technologies. It combines multiple functions—including video/audio processing, special effects, subtitles, and mixing consoles—into one device that can simultaneously edit programs using images, sound,

and text. It can also arbitrarily clip and modify shot materials for further processing. The commonly used non-linear editing system EDIUS.8 supports file formats such as MPEG, BMP, and JPG, demonstrating extremely high compatibility, which is why non-linear editing has become an essential software for post-production program creation.

2.2 High Equipment Utilization Rate

During linear editing production, one often encounters long source materials, such as field events, evening performances, and lectures shot from multiple camera positions with extensive and lengthy footage requiring high image quality. This demands sufficiently large hard drive capacity for storage [4]. Standard hard drive systems may struggle with such storage requirements. The general practice is to first store all materials on hard drives with high compression ratios for non-linear editing, then compress and export the final product. Standard high-definition formats do not affect image quality.

In summary, non-linear editing technology features easy learning, convenient operation, and streamlined production processes. In practical work, we should leverage its advantages—such as convenient audio/video conversion, the ability to arbitrarily mix multiple formats on the same timeline for editing, real-time output, and arbitrary modification, calling, and transmission of materials. It represents the crystallization of computer technology and digital television technology.

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Note: Figure translations are in progress. See original paper for figures.