Postprint: Application of Non-linear Editing Technology in Television Program Production

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Abstract

Entering the 21st century, the technological revolution has been advancing profoundly, characterized by the rapid development of information technology, which has consequently greatly propelled the advancement of Internet technology. Under these circumstances, numerous television stations, when producing television programs, particularly in the post-production process, attach significant importance to the application of non-linear editing technology. Non-linear editing technology is characterized by high integration, strong networking capabilities, and high cost-effectiveness. These advantages constitute the key to its distinction from traditional editing technologies, and it has become an extremely important technology in contemporary television program production. Accordingly, this paper primarily investigates the application of non-linear editing technology in television program production, with the aim of providing relevant references for industry professionals.

Full Text

Abstract

Entering the 21st century, the technological revolution has advanced profoundly, marked by the rapid development of information technology, which has in turn greatly propelled internet technology. In this context, numerous television stations attach great importance to the application of non-linear editing technology in television program production, particularly during post-production. Non-linear editing technology is characterized by high integration, strong networking capabilities, and high cost-effectiveness. These advantages are key to its emergence from traditional editing techniques, and it has become an extremely important technology in current television program production. This paper primarily explores the application of non-linear editing technology in television program production, aiming to provide relevant references for industry professionals.

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At present, the vigorous development and widespread application of computer technology and video cameras have changed the situation where only radio and television stations possessed video production technology, making video production a very common phenomenon. This is closely related to the development of video editing technology. Video editing technology can be divided into two categories: linear editing and non-linear editing. Linear editing, also known as traditional editing, involves searching for video materials within multiple storage media and conducting reasonable editing and arrangement. Non-linear editing, by contrast, directly utilizes computer technology to edit and arrange video materials stored in media, allowing specific music, backgrounds, and other elements to be added during the editing process. A significant advantage of non-linear editing is that it greatly compresses editing steps and improves work efficiency without compromising video quality.

1. Overview of Non-linear Editing

The application of non-linear editing systems in television program production is extremely widespread, greatly promoting the rapid development of the media industry and providing television audiences with entirely new visual experiences. Non-linear editing records video signals on hard disks or other digital storage media, enabling users to directly and rapidly access all information without being constrained by the "linear"length of program segments or chronological order. Due to the rapid development of television editing and production technology, computers now possess multimedia processing capabilities, which undoubtedly provides strong technical support for the application of computers in the field of television program editing.

Non-linear editing technology offers numerous advantages, including high efficiency, low cost, high picture fidelity, long-term video information storage, and flexible processing methods. It has been vigorously promoted and widely applied in a short period. Its widespread application not only effectively enhances the technical aspects of film and television production but also helps align film and television production work with public aesthetics. Consequently, non-linear editing technology and systems enjoy high acceptance among users.

2. Working Principle of Non-linear Editing Technology

Non-linear editing technology, simply put, involves the reasonable matching of editing software with relevant equipment such as computers and video cards to

effectively process video in computers. The working principle involves using a video card to present input signals (analog signals) from recorders, cameras, and other devices in digital form. The converted digital signals are then compressed and stored as data files in the computer. Subsequently, editors use relevant editing software to process the video in the computer, such as adding audio, subtitles, and special effects. Finally, through the coordination of hardware and software, a non-linear editing system is formed, achieving the organic integration of digital television technology and computers. In terms of hardware, the main components include peripheral devices, sound cards, high-speed hard drives, video cards, network storage devices, and computers. Software components include two-dimensional animation software, three-dimensional animation software, image processing software, audio processing software, and non-linear editing software.

3. Main Components of Non-linear Editing Systems

At present, with network connectivity not yet fully realized, systems primarily consist of peripheral storage systems, computers, and video recorders. Non-linear systems have two main interfaces: the interface between the non-linear editing machine and external devices, and the interface between the computer' s internal storage and the system bus. Details are shown in Figure 1 [Figure 1: see original paper].

The components of a non-linear editing system mainly include four parts: First, the electronic system—the computer that plays the primary role, enabling high-speed transmission, playback, and management of various data, as well as graphical interfaces between users and system hardware. Second, non-linearity—referring to the physical characteristics of recording media, generally using CDs and hard disks. Third, random access—the ability to arbitrarily search for shots and material segments. Fourth, the editing system—where editors organize audio and video tracks using hardware and software installed in the computer to create the final program version. Digital non-linear editing refers to the process of converting all materials, such as audio, video, and subtitles, into digital signals during editing, then saving them on the computer hard disk for post-processing. The method of editing digital video and audio signals through the hard disk' s random access function is what we currently refer to as digital non-linear editing. Moreover, non-linear editing is not merely an editing technology or system; it also represents an editing mindset.

4. Application of Non-linear Editing Technology in Television Program Production

Television programs are actually formed by the continuous rapid projection of still frames, so the quality of each frame plays a crucial role in the realism of the program. Traditional television program production typically relies on editing machines, where magnetic heads read according to the shooting sequence—also

called linear editing. This editing method restricts television editing efficiency because it cannot arbitrarily switch the reading order. In contrast, non-linear editing technology can freely arrange digitized television programs without damaging the signal strength of the master tape. The main applications of television non-linear editing include material editing, subtitle production, shot splicing, sound effect addition, and special effect composition.

4.1 Material Editing

First, browsing materials. One can generally select materials arbitrarily before viewing them, taking into account the characteristics of the non-linear editing system. Due to its strong operability and flexible operation, numerous methods can be employed. For playback, one may consider accelerating the playback speed for quick browsing, which can increase the normal playback speed, or use normal playback. Second, adjusting material length. Timecode editing is generally used to ensure operational precision—what is known as frame-accurate editing. Finally, reusing materials. Materials used in the non-linear editing process must be in a specific format, namely stored in digital format, to ensure consistent picture quality during copying without ghosting or quality issues, thereby enabling secondary use of materials within a single television program. This also saves storage space and improves utilization of occupied storage space.

4.2 Shot Assembly

The editing process of a non-linear system can be summarized in three steps: audio input, editing, and output, among which audio-visual editing occupies the core position in television program production. During audio-visual editing, numerous raw materials exist, and shots belong to relatively scattered fragments. In this regard, when producing programs, editors should fully understand and grasp the program content, extracting the editing 脉络 (structure/flow) based on overall program needs. Only in this way can they distinguish between primary and secondary elements when facing fragmented shots. During production, valuable shots can be flexibly selected. Additionally, shot combination is extremely important—scattered shots must be based on thinking patterns and objective laws, combining multiple scenes. In terms of shot combination, observation patterns and thinking logic should be satisfied. Through reasonable shot selection and coordinated use of long, medium, and close shots, the main news storyline can be highlighted. Second, the principle of "static-to-static, dynamic-to-dynamic" should be followed, with shot length properly controlled. Increased attention should be paid to scene and camera position changes to ensure unified tone and color, thereby ensuring that the created work has "soul."

4.3 Slow Motion Settings and Multi-layer Composition

In the process of television program production, slow-motion replay is often employed to present certain details clearly for the audience. The use of non-linear editing technology can simplify this process without affecting video qual-

ity. Television program production includes multi-layer composition. When simultaneously presenting the actual conditions of characters or angles, traditional methods required cutting, pasting, and connecting—relatively complex operations. However, using non-linear editing technology can achieve these effects more simply. The operation is also very convenient, allowing for timely completion without regenerating video files.

4.4 Subtitle and Graphics Production and Processing

Compared with early editing systems, non-linear editing systems offer faster processing speeds and richer functions, adding many new features including subtitle editing and graphics processing systems. For example, subtitles can be rotated, zoomed, and transformed to achieve three-dimensional animation effects. Second, non-linear editing technology possesses multi-layer composition processing capabilities without generating new files. Based on source files, content can be enriched through cutting, connecting, and related compositing processes, thereby enhancing program effects. Additionally, this technology can store data in subtitle documents for direct addition to broadcast layouts, adjustable at any time.

4.5 Special Effects Production

Some television programs have profound and ancient historical backgrounds. In production, black-and-white images are often used to render atmosphere, complemented by deep, powerful voices to fully immerse the audience. In martial arts dramas, fight scenes frequently appear. To create a good atmosphere, make images more realistic, and produce martial arts special effects, smoke and shadow effects are added during production to enhance impact. Using non-linear editing technology, editors can search the stored special effects library based on plot needs and their artistic imagination and experience to find matching sound effects, enhance special effects, and create an immersive experience for the audience. For example, the documentary *Inheritance* incorporates background, natural, and surround sound effects through multi-track audio synthesis, creating a good atmosphere and adding artistic effect. Some shots in the documentary use dissolve transitions (“fade out + fade in”), a very common transition technique that enhances the smoothness and seamlessness between shots.

5. Innovation of Non-linear Editing in Television Program Production in the New Era

Because analog equipment has long been used for television program editing, people have generally formed thinking habits such as convergent thinking and forward thinking, usually neglecting non-linear thinking modes like multi-directional thinking, reverse thinking, divergent thinking, and divergent thinking, resulting in serious program homogenization. However, with the continuous development of advanced communication technology, it has become

increasingly important in people' s lives, and audiences have stronger interactive awareness and participation consciousness. Many people have become DV enthusiasts, and documentaries produced by non-professionals have won numerous awards. Among them, the online short film *Murder Caused by a Steamed Bun* deconstructed *The Promise*, becoming a typical case of individual participation in video editing and production. Keeping pace with the times and continuously innovating the artistic level of television production has become an important means for television practitioners.

5.1 Film Editing Techniques

The term montage is frequently mentioned in visual arts. It originally refers to using different splicing to disrupt spatial and temporal boundaries, combining various shots into a meaningful story to provide audiences with new audio-visual experiences. For a single program' s production, non-linear editing can transform an entertainment program into a horror program or turn an emotional program into a movie. Therefore, with sufficient materials, non-linear editing can satisfy all experiences audiences wish to obtain. For production teams, grasping the program' s production intent is extremely important. They can flexibly use Lasswell' s "5W Model" to stimulate the audience' s audio-visual passion and employ film editing techniques to convey socialist core values and positive energy to the audience. This breaks dogmatic program formats and ensures that audiences can independently understand the program' s profound connotations.

5.2 Multi-angle Use of Materials

When producing programs, narration and subtitles often need to be added. Some programs also require illustration special effects, and even the currently popular barrage (danmaku) comments can be applied in program production. "Editing without boundaries" is an important characteristic of non-linear editing. Materials represent extremely broad meanings and can even express human dreams and memories. Therefore, the multi-angle use of materials is paramount to innovation in program production.

5.3 Enhancing Feedback Mechanisms and Interactivity

Audience feedback occupies an extremely important position in communication studies. Without audience interaction and feedback, program quality cannot be ensured. Currently, people' s livelihood news production has incorporated WeChat. In the future, audience feedback mechanisms should be flexibly utilized to better edit programs. This innovative model can shorten the distance between audiences and media, ensuring that program styles better suit audience tastes.

5.4 Networked Applications

The main advantage of non-linear editing technology lies not only in its integrated single-machine multi-function capabilities but more importantly in its multi-machine networking capabilities. This transforms single-operation models into networked cooperative and distributed production models. The grid-based application of digital video resource transmission and sharing has been successfully implemented, with more applications in digital video resource query and management. Furthermore, combined with internet technology development and cloud storage applications, more learning channels for production techniques and richer program materials have been provided to television workers, thereby meeting the work requirements for continuous innovation in television program production.

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