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On-set editing as a modern technology for real-time video editing

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Abstract: The article examines the use of on-set editing as a modern technology for real-time video editing. Current trends in video production demand fast yet high-quality processing of footage directly on set, driven by the increasing volume of content, significant acceleration of production workflows, and the growing need for adaptability. The relevance of this topic is supported by advancements in automated editing technologies, improvements in video processing algorithms, and an increased focus on the importance of pre-editing preparation. However, contradictions are observed in scientific publications and online reviews between algorithmic approaches aimed at automation and traditional theoretical concepts that emphasize narrative logic and artistic editing principles.

The objective of this study is to analyze the specific features and nuances of on-set editing as a tool for real-time editing, considering its technical implementation, creative potential, and organizational-production aspects. The study identifies key advantages, including the acceleration of post-production, cost reduction in material reprocessing, and improved coordination between the production and editing teams.

The findings will be useful for researchers in digital filmmaking as well as industry professionals, including directors, editors, cinematographers, producers, and technical specialists involved in integrating editing solutions into the filming process.

Keywords: Algorithms, automation, video production, visual narrative, filmmaking, editing, real-time editing, post-production, filming process, technology, on-set editing.

Introduction: The modern film and television industry faces the need for rapid adaptation to changing production conditions. The issue examined in this study concerns the integration of editing directly on set, which

minimizes the risk of reshoots and optimizes the subsequent post-production stage.

Under tight deadlines and high costs, especially when complex visual effects and dynamic action scenes are involved, the traditional approach to editing often lacks flexibility. This makes it particularly important to analyze the theoretical foundations and practical aspects of on-set editing, as well as to assess its impact on the quality of the final product.

The prospects for implementing real-time editing significantly influence the creative process in filmmaking. The ability to immediately evaluate footage allows directors and cinematographers to experiment with visual solutions without concerns about the lengthy time required for corrections. This dynamic approach positively impacts the development of innovative directorial techniques, fostering the emergence of new genres where technical precision and creativity are closely and harmoniously interconnected.

METHODS

The issue of integrating on-set editing into modern video production practices is examined in the literature from various perspectives. Researchers focus on both the technical aspects of process automation and the theoretical models of video narrative construction. Additionally, challenges related to adapting traditional methods to new digital technologies are explored.

Studies focused on algorithmic advancements in video processing include works by H.Y. Kim and colleagues [1], K. Lomotin and I. Makarov [3], X. Meng and Q. Deng [4], and Zh. Wei and co-authors [9]. These publications emphasize the use of computational methods to enhance video quality and identify optimal editing points. They examine the application of special effects filters for real-time editing and discuss the potential of quantum computing in video processing, which opens new opportunities for transformative industry developments.

Another group of studies addresses theoretical and conceptual aspects of video editing. P. Li [2] analyzes the spatial-temporal patterns of editing points, which are important for developing new paradigms. Zh. Wang and colleagues [8] characterize different storytelling approaches in editing, highlighting the role of narrative strategies. M. Yin [10] examines the impact of big data and the transformation of video content on the editing process, focusing on how traditional methodologies adapt to new conditions.

The practical side of the issue is explored by B. Michael [5] and the contributors of Show Me Shorts [6]. Their works discuss on-set workflow organization, role distribution within the production team, and the significance of the initial post-production stage. While these sources are more applied than academic, they provide valuable insights into the realities of the production process.

The challenges faced by novice editors are described by R.E. Talabbaev [7], who analyzes common mistakes in editing. The author emphasizes that insufficient understanding of rhythm, transition logic, and visual composition often leads to ineffective editing decisions.

Despite the variety of perspectives, certain contradictions are observed in the literature. Researchers focusing on automation often overlook artistic editing principles, while those emphasizing theoretical approaches do not always account for modern technological advancements.

The methodology in this study includes content analysis for examining academic sources and industry strategies, comparative analysis in the study of narrative structures, as well as methods of observation, systematization, and generalization.

RESULTS AND DISCUSSION

Historically, editing has always played a crucial role in filmmaking, serving as an integral part of the creative process. However, the traditional post-production model relies on a sequential workflow, often leading to delays in finalizing the director's vision [2, 7]. With the advancement of digital technologies and the emergence of high-performance computing tools, it has become possible to conduct the initial processing of filmed material in real time. This shift has necessitated a reconsideration of existing production paradigms, where editing is no longer a postponed task but an integral component of the filming process.

Until recently, the use of computer systems in this field was primarily limited to post-production. Modern solutions now enable not only preliminary scene assembly but also real-time adjustments to color correction, sound synchronization, and visual effects directly on set. By utilizing powerful processors combined with specialized software, contemporary cinematographers can immediately assess whether the captured footage aligns with the creative concept. This transformation facilitates more precise scene adjustments and reduces the time required for correcting errors in subsequent stages.

It is necessary to examine the principles of integrating editing into the filming process (Fig. 1).

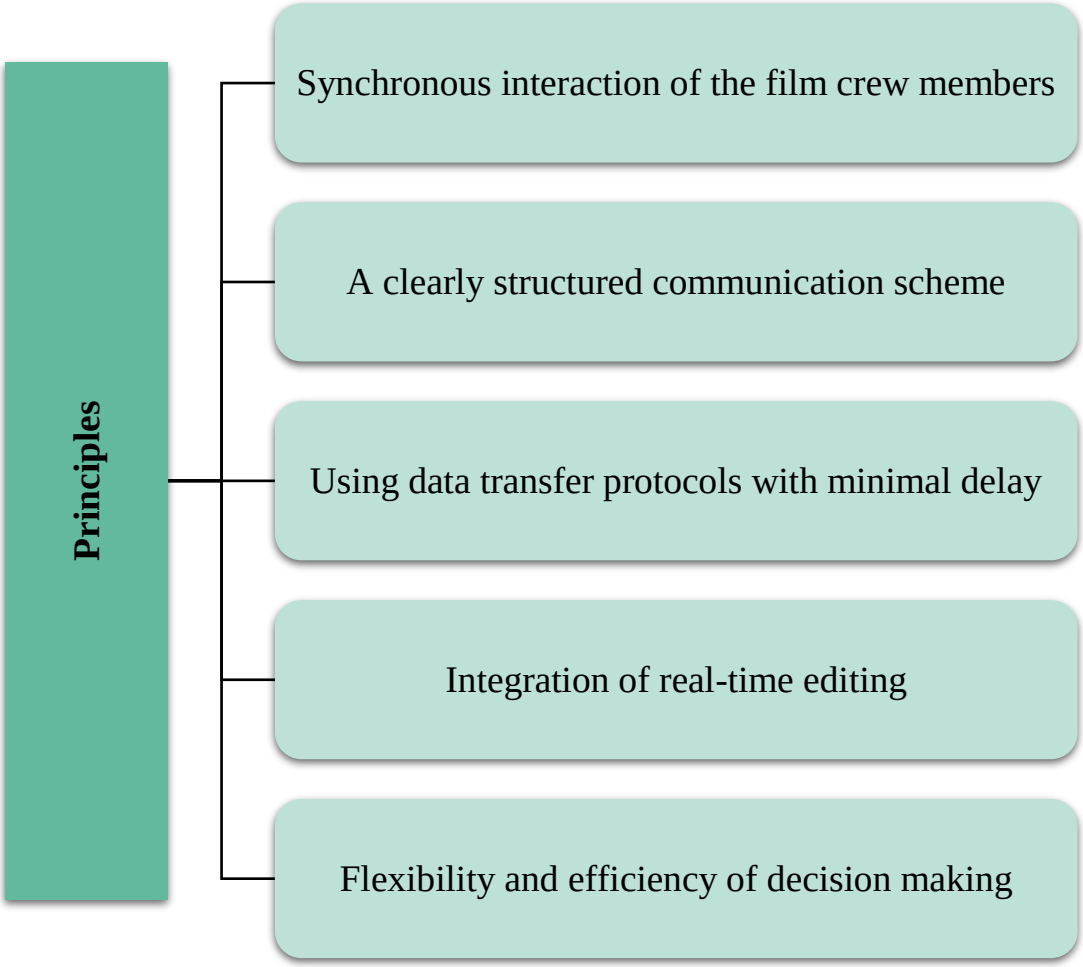

Fig. 1. Highlighting the basic principles according to which on-set editing is integrated into the filming process

(compiled by the author based on [2-4, 9])

The approach involves parallel execution of filming and editing, requiring both advanced technical capabilities and a deep understanding of creative and organizational aspects. One of the key principles is the synchronized collaboration of the director, cinematographer, sound engineer, and editor, enabling immediate responses to deviations from the original script. Such an approach logically demands a well-structured communication framework (Fig. 2) and the use of data transmission protocols that ensure minimal latency.

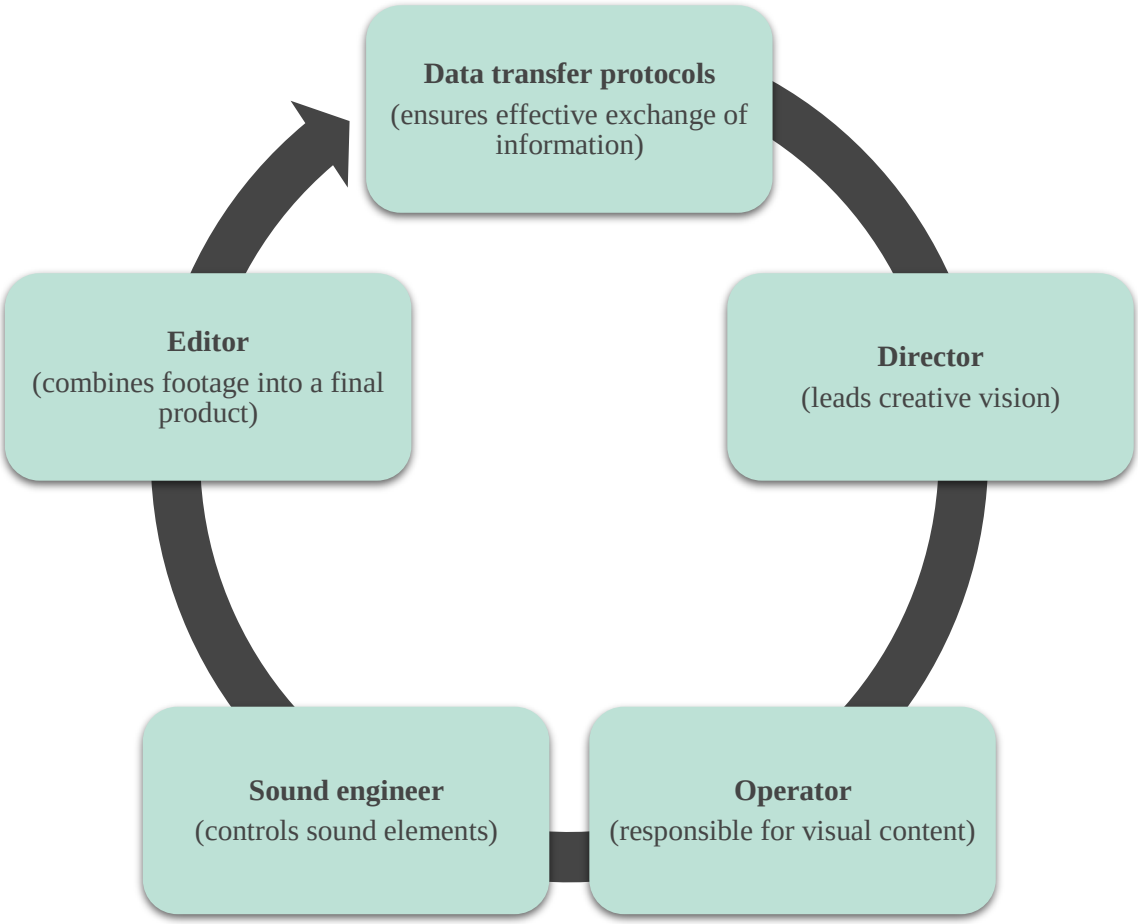

Fig. 2. Communication scheme of filming and editing processes

(compiled by the author)

At the current stage of industry development, specialized software systems are used to edit filmed material without delays. These include systems integrated with high-performance video monitors and network solutions that enable instant data transmission between various devices on set. The use of data compression algorithms and parallel computing helps maintain image quality even during real-time processing, which is critically important for high-budget projects with extensive graphics and complex visual effects.

Theoretical analysis places particular emphasis on studying the interaction processes among crew members. Real-time editing requires not only technical expertise but also the ability to make quick decisions under time constraints [5]. Effective collaboration among specialists on set reduces stress levels and enhances the efficiency of the creative process. In this context, training personnel in new technologies and workflow methods plays a crucial role, ensuring continuous information exchange and the timely resolution of emerging challenges.

In modern filmmaking, on-set editing has become an integral part of the production process, requiring high precision. For instance, in projects involving action sequences, where every second of footage may contain critical moments, real-time processing allows for immediate identification and correction of staging errors. Implementing this method significantly reduces the time spent on reshoots and ensures more accurate adherence to script instructions.

In television production, this approach to editing facilitates adaptation to dynamic live broadcast conditions. The application of this technology in news coverage and talk shows enables timely adjustments to visual and audio elements while allowing rapid responses to unforeseen situations. Case studies demonstrate that integrating editing directly into the filming process enhances content quality, making it better suited for live broadcasting requirements.

One of the main challenges in adopting this method is the high cost of equipment and the necessity of staff training. Implementation requires specialized server capacities, reliable data transmission systems, and highly qualified specialists (Table 1).

Table 1 – Characteristics of the technical difficulties of on-set editing and ways to overcome them (compiled by the author based on [1, 6-8, 10])

Technical Difficulty	Ways to Overcome
High equipment costs	Budget optimization through equipment rental, grant applications, and investment sourcing
Need for stable communication channels	Implementation of modern network technologies, backup channels, and QoS configuration
Data transmission delays	Optimization of compression algorithms, use of high-performance servers, and network protocol adjustments
Software compatibility issues	Development of unified standards, compatibility testing, and use of modular integration solutions
Limited computational power	Scaling server capacities, upgrading hardware, and implementing distributed computing
Challenges in staff training	Conducting specialized training, developing intuitive interfaces, and involving experts for mentoring

When comparing traditional editing methods with on-set editing, it becomes evident that integrating editing directly into the production process offers several significant advantages (Fig. 3). In addition to reducing time costs, real-time editing enables immediate adjustments to artistic and technical decisions. This approach minimizes the risk of accumulating errors, which is particularly important in dynamic and high-budget projects. Despite the need for substantial investments in technology and specialist training, the economic benefits from shortened production timelines and improved quality become apparent.

Fig. 3. Systematization of the advantages of on-set editing

(compiled by the author based on [1, 9])

Despite its clear advantages and numerous positive effects, on-set editing is accompanied by certain limitations. One of the primary challenges is the need for stable communication channels to transmit large volumes of data in real time. Delays or data loss can negatively impact the final product's quality. Additionally, integrating various software platforms requires the development of unified standards, which remains a complex task for the entire industry.

CONCLUSIONS

On-set editing represents a groundbreaking approach to filmmaking, allowing the integration of editing directly into the filming process. The application of this method contributes to reducing time costs, minimizing the need for reshoots, and enhancing the quality of the final product.

Despite existing technical and organizational challenges, the prospects for development in this field remain promising. The integration of real-time editing requires significant investments in infrastructure and specialist training; however, the economic and creative benefits justify these expenditures.

Contemporary research and practical experience confirm that the implementation of this method opens new opportunities in filmmaking. The advancement of technology, automation of processes, and improvement of communication systems not only reduce production timelines but also ensure a closer alignment with the artistic vision. As a result, this approach becomes an essential tool for modern filmmakers, facilitating the creation of high-quality and timely content.

Further research in this area should focus on the development of unified standards, increasing the reliability of data transmission systems, and implementing innovative processing algorithms. A

systematic approach to addressing these issues appears to be the key to fully realizing the potential of real-time editing in the current production environment.

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