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Postprint: Research on Imaging Effects of Digital Imaging Logarithmic Technology in Dynamic Media LUT

Authors: Chen Long

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Abstract

Dynamic media broadly refers to digital video materials predominantly comprising films, short videos, and similar content. Among the numerous Log technologies, we primarily focus on S-Log2 as our main research subject. The imaging effects of LUT presets are primarily realized through DAVinci Resolve software (or Fcpx) to generate multi-LUT preset packages. This paper will, through research and analysis of the Log (LogArithmic) digital shooting mode, apply LUT preset effect processing to captured video materials, thereby achieving a wider gamut and more hierarchical image color space, while enabling multi-bit (BitrAte) deep color adjustment, thus providing tremendous creative space for film and television post-production professionals.

Full Text

Preamble

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Research on Imaging Effects of Digital Logarithmic Technology in Dynamic Media LUT

(Minnan University of Science and Technology, Shishi, Fujian 362700)

Abstract: Dynamic media broadly refers to digital video content dominated by films and short videos. Among the numerous Log technologies, this study primarily focuses on S-Log2. The imaging effects of LUT presets are mainly realized through DaVinci Resolve software (or FCPX) to generate multi-LUT preset suites. This paper investigates and analyzes the Log (Logarithmic) digital shooting mode, applying LUT preset effects to captured footage to achieve a wider gamut and more layered color space. This approach enables multi-bit

(bitrate) deep color adjustment, providing substantial creative space for post-production professionals.

Keywords: dynamic media; digital imaging technology; Logarithmic technology; Log mode; LUT preset
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1. Recent Developments in Logarithmic Technology at Home and Abroad

The contemporary imaging industry, centered on film, television, and variety shows, has witnessed the production and post-production processes evolve into increasingly scientific and digital workflows. While early imaging—both dynamic and static—relied primarily on film capture, digital imaging has now largely replaced film to meet demands for speed and convenience. In digital imaging production and processing, scientific calculation and analysis are essential for efficiently leveraging these technologies and maximizing image quality. Beyond film and television, the emergence of short videos and self-media has brought unprecedented attention to image processing. Live streaming software filters and beauty enhancements, in some sense, represent fixed preset templates for image processing. In today's era, where everyone pursues exquisite image quality and wide color gamut, the application prospects for image processing technology appear broad and promising.

Currently, Log technology is relatively mature among foreign imaging companies, including Arri' s Log-C mode, RED' s LogFilm mode, Sony' s S-Log series [2], and Canon's recently introduced C-Log. These represent mature proprietary shooting modes from major manufacturers, each with unique image processing algorithms. Domestically, DJI' s D-Log mode is relatively common but remains limited in adoption, primarily confined to aerial cinematography. Due to the limited integration of aerial shots in most films—except for genres like road movies that require extensive aerial footage—many domestic colorists prefer Arri-based Log modes as the benchmark for high-end theatrical color grading [1][4]. Overall, China still has considerable room for improvement in Log technology applications, though the domestic LUT restoration landscape shows more positive developments. Influenced by Hollywood visual effects in recent years, China' s image processing sector has made significant strides, producing notable works in color grading for film materials.

[Figure 1: see original paper] Primary Color Grading

2. Research on Log Technology and LUT Preset Processing

In post-production color processing, the Log algorithm shooting mode is typically employed to preserve maximum color space, though this substantially increases workload for image restoration. Two core issues emerge: first, manufacturer-provided LUTs cannot fully adapt to their Log algorithms across all scenarios due to environmental complexity, enabling only relative rather than comprehensive restoration. Second, official LUTs rarely achieve ideal color restoration, necessitating primary color grading to recover light sources (Figure 1) followed by secondary grading for color details [3]. Consequently, professional colorists often develop proprietary LUT files, categorizing scenes within a film to create custom presets that compress primary grading workload while delivering superior color restoration (Figure 2 [Figure 2: see original paper]) [4].

On major domestic post-production websites, LUT presets typically range from tens to hundreds of yuan in price, with well-regarded presets often downloaded tens of thousands of times. LUT presets from renowned films can exceed hundreds of thousands of downloads, demonstrating strong market demand for quality LUTs. Effective LUT presets possess specific applicability, though LUT files from famous films are generally copyright-protected and difficult to access.

The research team conducted studies on Sony' s S-Log2 algorithm, finding that exposure compensation must be increased by two stops, imposing certain lighting requirements. Natural light shooting without this adjustment may result in footage that cannot meet grading requirements in post-production. Alternatively, Sony' s HLG mode offers more straightforward implementation with minimal color difference on monitors, though its latitude and restoration capabilities remain inferior to the S-Log family. S-Log is not a raw video format; raw capture would generate prohibitively large file sizes manageable only by professional cameras and storage systems. Log essentially functions as a flat profile, appearing gray and hazy in its original state. Previously exclusive to Sony professional cameras, this technology preserves maximum image information with superior latitude and dynamic range for post-production flexibility, later extending to Sony' s A7 mirrorless series.

S-Log2 better retains highlight details, hence the recommendation for increased exposure compensation. S-Log3, conversely, excels in shadow detail reproduction, making different algorithms suitable for different scenarios. Overall, S-Log3 demands higher bit depth (color depth) from the camera. Several Sony models now offer 10-bit internal 4:2:2 recording, and when combined with S-Log3, post-production restoration can approach the cinematic quality of Arri' s Log-C [5].

3. The Power of Color Grading

Technology originates from demand, and Logarithmic technology ultimately serves color grading. Without tonal support, even quality video lacks "atti-

tude" (Figure 3) [6]. Through controlled experiments locking scene, lighting, and production design parameters, the team captured Log-mode footage and applied LUT presets in post-production, achieving five distinct narrative styles [7]: pale yellow evoking war film restlessness; orange expressing romance' s warmth; copper green conveying suspenseful distrust; deep red representing horror violence; and blue enhancing sci-fi' s technological futurism. The experiments revealed that identical footage conveys completely different narratives under different color grades, with both grading and background music providing crucial guidance [8]. This combination creates subconscious audiovisual cues that accelerate viewer immersion and empathy; without such treatment, films become mundane.

These colors are relative rather than absolute, as no film employs a single color throughout, and each color possesses rich hierarchical gradations. Even within one color family, multiple tiers exist [9]. As Patti Bellantoni describes in *If It' s Purple, Someone' s Gonna Die*, yellow encompasses vitality, obsession, recklessness, and warning; red signifies not only stimulation and power but also anxiety, anger, and romance; blue expresses not just futuristic technology but also rationality, hesitation, passivity, and indifference. The book enumerates countless examples, demonstrating that no fixed color-emotion correspondence exists—adjustments must serve narrative requirements [10].

Digital Logarithmic technology in dynamic media LUT imaging provides optimal technical support for tonal adjustment. When production fails to achieve perfect lighting and color, post-production technical processing becomes essential (Figure 4 [Figure 4: see original paper]) [11]. This technology enhances visual experience and image quality, imbuing footage with dramatic impact through tonal adjustment. The advent and popularization of Log mode have catalyzed a qualitative leap in post-production capabilities, substantially elevating color' s narrative role and enabling creators to achieve higher standards and more expressive visual storytelling [12].

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Author Introduction: Chen Long (1988-), male, Harbin, Heilongjiang, lecturer, research direction: digital media.
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Note: Figure translations are in progress. See original paper for figures.

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