Creative Practice and Aesthetic Breakthrough of Light and Shadow Technology in Modern Stage Design

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ABSTRACT In the era of digital and cultural integration, light and shadow technology has evolved from an auxiliary lighting tool into a core creative carrier based on the controlled propagation, reflection, projection, and perception of optical electromagnetic waves. When combined with translucent textile membranes and fiber-interlaced surfaces, modern light and shadow systems create dynamic media for immersive spatial innovation in stage design. Through LED display, projection mapping, laser technology, and intelligent control, these systems break the spatial limitations and performance boundaries of traditional stages and construct an immersive, interactive, and multisensory aesthetic paradigm. Supported by stage aesthetics, technical aesthetics, and spatial design theory, this paper defines the core types of modern light and shadow technology and the aesthetic characteristics of stage design, and analyzes the creative logic and aesthetic empowerment mechanism of optical electromagnetic-wave technologies in modern stage environments. From the four dimensions of spatial reconstruction, narrative reinforcement, emotional resonance, and style shaping, the paper outlines a practical path for creative application. It further selects representative cases from musicals, plays, traditional opera, and large-scale performing arts events for comparative analysis. The study clarifies how optical propagation control and digital interaction support aesthetic breakthroughs in modern stage design.

INDEX TERMS optical electromagnetic waves, projection mapping, stage design, interactive lighting, textile membranes

I. INTRODUCTION

A. RESEARCH BACKGROUND

The report of the 20th National Congress of the Communist Party of China clearly proposed the implementation of the national cultural digitization strategy, the improvement of the modern public cultural service system, and the innovative implementation of cultural welfare projects, which has pointed out the direction for the digital innovation and development of the cultural and artistic fields. As an essential medium of cultural expression, stage art breathes life into the spirit of the times by weaving the profound heritage of textile craftsmanship directly into the aesthetic fabric of performance, transforming raw fibers of tradition into a visceral experience for the audience. This fusion not only preserves the tactile legacy of cultural artistry but also meets the public's evolving needs for a narrative that is as structurally enduring as it is visually inspiring. As the core visual carrier of stage art, stage design's creative expression and aesthetic presentation directly affect the overall dissemination effect and artistic appeal of stage art.

II. THE CREATIVE LOGIC AND AESTHETIC MECHANISM EMPOWERED BY LIGHT AND SHADOW TECHNOLOGY IN MODERN STAGE DESIGN

Light and shadow technology enhances the aesthetic expression of stage narration through narrative perspective guidance, narrative rhythm control, and narrative image construction, achieving an aesthetic transformation from one-way narration to immersive narration. One is narrative perspective guidance, which guides the audience's visual attention and achieves precise control of the narrative perspective through the focusing of light and shadow, contrast of light and shadow, and other effects; The second is to control the narrative rhythm, by adjusting the brightness of light and shadow, color conversion, dynamic speed, etc., to strengthen the speed and tension of the narrative and promote the development of the plot; The third is the construction of narrative imagery, which uses light and shadow technology to create symbolic visual images (such as flowers, birds, stars, etc. composed of light and shadow), conveying abstract narrative themes and emotional connotations. Compared with traditional manual-controlled lighting, modern digital lighting technology realizes a real trans-

formation from one-way narration to immersive narration through real-time rendering, AI self-adaptation, multi-screen synchronous linkage, audience-state sensing and data-driven narrative rhythm, rather than simply enhancing brightness or color changes.

III. THE CREATIVE PRACTICE PATH OF LIGHT AND SHADOW TECHNOLOGY IN MODERN STAGE DESIGN

Based on the creative logic and aesthetic mechanism empowered by light and shadow technology in modern stage design, combined with the actual needs of stage design, a creative practice path of light and shadow technology is constructed from four dimensions: spatial reconstruction, narrative reinforcement, emotional resonance, and style shaping. The core content, technical support, and practical methods of each path are clarified.

A. PATH 1: CREATIVE PRACTICE OF SPACE RECONSTRUCTION - INTEGRATION AND SYMBIOSIS OF VIRTUAL AND REALITY

Space reconstruction is the most essential creative practice path of light and shadow technology. The core is to break through the limitations of physical space through light and shadow technology, construct a stage space that integrates "virtual reality", and realize infinite possibilities for spatial expression.

1) Technical Support

1. Projection mapping technology: The core technologies include 3D projection mapping, edge fusion technology, and real-time tracking projection technology, which can accurately project virtual images onto irregular physical carriers, achieving seamless integration of virtual and reality;

2. Laser technology: The core technology includes color laser and laser scanning technology, which can construct spatial contours and create spatial atmosphere through dynamic changes of laser beam;

3. Laser technology: The core technology includes color laser and laser scanning technology, which can construct spatial contours and create spatial atmosphere through dynamic changes of laser beam;

4. Intelligent control technology: The core technologies include RDM, Art-Net/sACN, AI real-time control and programming control, which can achieve precise control and dynamic adjustment of light and shadow effects.

B. PATH 2: NARRATIVE STRENGTHENING CREATIVE PRACTICE - DEEP INTEGRATION OF VISION AND PLOT

Narrative reinforcement is one of the core creative practice paths of light and shadow technology. The core is to enhance the logic, rhythm, and emotion of stage narrative through visual expression of light and shadow technology, and achieve the depth and visualization of narrative.

1) Technical Support

1. Dynamic light and shadow technology: The core technology includes light gradient, color conversion, and dynamic scanning technology, which can achieve dynamic changes in light and shadow effects and enhance narrative rhythm;

2. Image projection technology: The core technology includes high-definition image projection and video projection technology, which can supplement narrative content through visual elements such as images and videos;

3. Focused lighting technology: Core technologies include chasing light, beam light, and fixed-point light technology, which can achieve precise guidance of narrative perspectives;

4. Interactive sensing technology: The core technology includes motion sensor and sound sensor technology, which can achieve real-time linkage between light and shadow effects and actors' movements and sounds, enhancing the interactivity of narrative.

C. PATH THREE: EMOTIONAL RESONANCE CREATIVE PRACTICE - DUAL TOUCHING OF SENSES AND SOULS

Emotional resonance is one of the core goals of creative practice in light and shadow technology. The core is to create an emotional atmosphere, convey emotional symbols, stimulate emotional interaction through light and shadow technology, and achieve emotional connection between the audience and stage art.

1) Technical Support

1. Color light and shadow technology: The core technology includes RGB color mixing and color temperature adjustment technology, which can convey emotions through color changes;

2. Atmosphere lighting technology: The core technology includes fog machines, bubble machines, and lighting combination technology, which can create a unique emotional atmosphere;

3. Interactive light and shadow technology: The core technology includes infrared sensors and pressure sensor technology, which can achieve real-time interaction between the audience and light and shadow effects;

4. Multi-sensory fusion technology: The core technology includes the collaborative technology of light, shadow, sound, and touch, which can achieve multi-sensory emotional expression. The core technology includes the collaborative technology of light, shadow, sound, touch and smell. Light and shadow rhythm synchronizes with music in real time; interactive sensors trigger airflow and vibration devices; specific light and shadow images are linked with fragrance release systems to achieve real multi-sensory emotional expression.

IV. EMPIRICAL VERIFICATION: MULTIPLE CASE ANALYSIS

A. CASE SELECTION AND ANALYSIS FRAMEWORK

TABLE 1. Core Creative Practice Paths of Lighting Technology in Modern Stage Design

Practice Paths	Core Connotation	Key Technical Support	Typical Application Scenarios
Spatial Reconstruction	Integrate virtual and physical spaces to expand expression boundaries	Projection Mapping, LED Displays, Laser Technology	Historical scene restoration, immersive environment creation
Narrative Enhancement	Strengthen plot logic and rhythm through visual symbols	Dynamic Lighting, Image Projection, Focused Illumination	Spy war dramas, historical musicals, thematic performances
Emotional Resonance	Convey feelings via color, atmosphere and interaction	Color-adjustable Lighting, Fog Machines, Interactive Sensors	Romantic scenes, solemn themes, collective emotional mobilization
Style Shaping	Integrate traditional and modern elements for unique aesthetics	Digital Cultural Element Processing, LED Flexible Screens	Traditional opera modernization, cross-cultural stage works

TABLE 2. Technical Application Characteristics of Different Stage Types

Stage Types	Core Lighting Technologies	Key Application Priorities	Aesthetic Goals
Musicals	LED Screens, Dynamic Lighting	Rhythm synchronization, spatial fluidity	Energetic, immersive, narrative-driven
Dramas	Projection Mapping, Contrast Lighting	Era restoration, atmosphere creation	Realistic, emotional, plot-focused
Traditional Operas	Cool-toned Lighting, Projection Mapping	Artistic conception presentation, traditional style inheritance	Elegant, implicit, culturally resonant
Large-Scale Performances	LED Floor Screens, Laser Technology, Interactive Lighting	Grand visual impact, theme communication	Magnificent, inclusive, globally appealing

TABLE 3. Key Success Factors of Lighting Design in Typical Cases

Case Names	Core Success Factors	Technical-Art Integration Highlights	Aesthetic Breakthroughs
Hamilton	Rhythm synchronization, spatial flexibility	Lighting-music interaction, modular space transformation	From fixed stage to flowing time-space
The Eternal Wave	Era restoration, symbolic expression	Retro projection + contrast lighting, spy war atmosphere creation	From plot telling to symbolic implication
Only Green and Blue	Artistic conception integration, cultural inheritance	Traditional painting projection + dance coordination	From physical space to poetic realm
Beijing Winter Olympics Opening Ceremony	Grand vision, cultural communication	Large LED screen + interactive lighting, theme visualization	From single expression to global cultural resonance

1) Case selection criteria

To verify the feasibility and effectiveness of the creative practice path of light and shadow technology, four different types, scales, and cultural backgrounds of stage works were selected as research cases. The criteria for case selection are as follows:

1. Type representativeness: covering four typical stage art forms: musicals, plays, operas, and large-scale performing arts events, with broad representativeness;

2. Typical application of technology: The case works have innovation and typicality in the application of light and shadow technology, which can fully reflect the four creative practice paths;

3. Market and reputation recognition: The case works have high market attention and good reputation, and their lighting design has been widely recognized by industry experts and audiences;

4. Data availability: The relevant materials of the case works (such as design schemes, performance videos, expert comments) are relatively abundant, which facilitates in-depth analysis.

2) Case Overview

Case 1: Musical "Hamilton"

Background of the work: An American musical premiered in 2015, with the life of Alexander Hamilton, the founding father of the United States, as its theme, integrating hip-hop R&B, Jazz and other modern music styles have achieved great success worldwide;

Application of Light and Shadow Technology: Modern light and shadow technologies such as LED display screens, projection mapping, and dynamic lighting are extensively utilized to construct flexible and versatile stage spaces, enhancing narrative rhythm and emotional expression;

Core idea: Through the rapid switching of LED screens and the construction of virtual spaces using projection technology, the rapid transformation of historical scenes has been achieved. Coupled with dynamic lighting, the rhythm characteristics of hip-hop music have been enhanced, creating an immersive historical narrative atmosphere.

2. Case 2: Drama "Eternal Radio Waves"

Background of the work: A Chinese drama premiered in 2018, with the theme of espionage stories during the Liberation War. Through delicate storytelling and wonderful stage design, it has received widespread praise;

Application of Light and Shadow Technology: Using projection mapping, dynamic lighting, LED light strips and other light and shadow technologies, a stage space with a sense of the times has been constructed, enhancing the tense atmosphere and emotional expression of espionage stories;

Core idea: Narrative imagery such as "radio signals", "clocks", and "rainy nights" constructed through light and shadow technology, combined with strong contrast lighting design, creates a tense and suspenseful espionage atmo-

TABLE 4. Aesthetic Breakthrough Directions and Optimization Strategies

Aesthetic Breakthrough Directions	Core Transformations	Optimization Strategies
Physical Space → Immersive Artistic Space	Expand boundaries, integrate time-space, create emotional atmosphere	Prioritize artistic orientation, innovate spatial expression
Single Visual Expression → Multi-Sensory Experience	Combine vision with hearing/touch/smell	Strengthen cross-sensory design, enhance audience participation
One-way Communication → Interactive Participation	Real-time interaction, collective creation, personalized experience	Apply intelligent sensors, design user-friendly interaction
Traditional Style → Cross-border Integration	Blend traditional-modern, Eastern-Western, art-technology elements	Dig deep into cultural connotations, avoid homogenization

sphere, achieving a deep integration of narrative and emotion.

3) Analysis Framework

Conduct in-depth analysis of the case from four dimensions: "creative practice path, technical application characteristics, aesthetic expression effect, and core success factors", verify the effectiveness of the four major creative practice paths, and summarize the common laws and differentiated characteristics of the application of light and shadow technology.

B. CASE ANALYSIS RESULTS

1) Analysis of Creative Practice Path Application

1. Application of spatial reconstruction path:

Case 1 (Hamilton): Through projection mapping technology, a virtual stage space integrated with physical scenes is constructed, realizing the flexible transformation of historical space and enhancing the fluidity of narrative.;

Case 2 ("Eternal Radio Waves"): Using projection mapping technology, virtual spaces such as streets and alleys in old Shanghai were constructed on stage, organically integrated with physical scenery, creating a strong sense of the times.

Case 3 (The Journey of a Legendary Landscape Painting): The virtual space of "a thousand miles of rivers and mountains map" built by projection technology forms the effect of "virtual reality" with the physical stage space, creating a distant and ethereal artistic space;

Case 4 (Winter Olympics Opening Ceremony): A three-dimensional virtual space was constructed using large-scale LED ground screens, such as the visual effect of "Yellow River water rising from the sky", achieving a deep integration of physical and virtual spaces and creating a grand spatial atmosphere.

2. Application of narrative reinforcement path:

Case 1 (Hamilton): The narrative rhythm of hip-hop music is strengthened through the rhythm changes of dynamic lighting and the image switching of LED screens. For example, in rap segments, the flashing frequency of lighting is consistent with the music rhythm, enhancing the infectiousness of the narrative;

Case 2 ("Eternal Radio Waves"): The narrative imagery of "radio signals" and "clocks" constructed through light and shadow technology enhances the tense rhythm and suspenseful atmosphere of espionage stories, such as the countdown effect of clock light and shadow, which promotes the development of the plot.

Case 3 (The Journey of a Legendary Landscape Painting): The narrative relationship between "the person in the picture" and "the painter" is strengthened through the light and shade changes and color conversion of light and shadow. For example, in the "Green" dance paragraph, light and shadow focus on the dancers, highlighting the core narrative elements;

Case 4 (Winter Olympics Opening Ceremony): Visual elements such as the "24 Solar Terms" and the "Ice and Snow Five Rings" presented through light and shadow technology enhance the core theme of "Moving Forward Together", such as the rising light and shadow of the ice and snow five rings, conveying the Olympic spirit.

3. Application of emotional resonance pathway:

Case 1 (Hamilton): By using warm toned lighting and dynamic light and shadow effects, a passionate and emotional atmosphere is created. For example, in war scenes, red lights and rapidly flickering light and shadow stimulate the audience's tension and excitement;

Case 2 ("Eternal Radio Waves"): By combining cool toned lighting with fog machines, a oppressive and tense espionage atmosphere is created. For example, in the rainy night joint scene, blue lighting and fog effects enhance the audience's sense of immersion.

Case 3 ("The Journey of a Legendary Landscape Painting"): Through soft cold tone lights and slow changes in light and shadow, a distant and peaceful emotional atmosphere is created. For example, in the "Lying Stone" dance, the faint green light conveys a peaceful and ethereal emotion;

Case 4 (Winter Olympics Opening Ceremony): Through large-scale interactive lighting effects, such as the linkage of illuminated props in the audience seats and stage lighting, a collective resonance emotional atmosphere was created, inspiring the audience's sense of national pride and global solidarity.

4. Style shaping path application:

Case 1 (Hamilton): It combines the modern style of hip-hop culture with traditional elements of historical themes, shaping a unique style of "modern historical" fusion through dynamic lighting and fragmented images on LED screens;

Case 2 ("Eternal Radio Waves"): Shaped a realistic style with a sense of old Shanghai era, restored the aesthetic

characteristics of the Republic of China period through warm yellow lighting and retro image projection.

Case 3 ("The Journey of a Legendary Landscape Painting"): shaped the Chinese aesthetic style of "traditional modern" integration, and conveyed the beauty of the artistic conception of Chinese traditional aesthetics through the projection of cold tone lights and traditional painting elements;

Case 4 (Winter Olympics Opening Ceremony): Created a grand style of "technology culture Olympics" integration, combining large-scale LED screens, laser technology, and traditional Chinese cultural elements to create an aesthetic style that combines technology and cultural heritage.

2) Comparison of Technical Application Characteristics

3) Analysis of Aesthetic Expression Effect

1. Breakthrough in spatial aesthetics:

Case 1 (Hamilton): The flexible combination of LED screens and projection technology breaks the limitations of fixed physical stages and achieves free conversion of multiple spaces such as streets, Capitol buildings, and battlefields. The audience experiences the flow of time and space through rapid scene switching, and the aesthetic experience of space is upgraded from "passive viewing" to "active immersion".

Case 2 ("Eternal Radio Waves"): Projection mapping technology superimposes virtual spaces such as old Shanghai streets and alleys onto a physical stage, creating a spatial effect of "virtual real fusion". The warm yellow light enhances the sense of hierarchy and depth in the space, making the audience feel as if they are immersed in the historical scene of old Shanghai, achieving the aesthetic expression of "using technology to restore history" in the space.

Case 3 ("The Journey of a Legendary Landscape Painting"): Based on the elegant bluegreen gradient costumes and minimalist scroll-style scenery, soft cold tone lights and slow light changes further amplify the peaceful and ethereal emotional atmosphere, corresponding to the implicit emotional expression of Chinese traditional culture.

Case 4 (Winter Olympics Opening Ceremony): Large scale LED ground screens have created three-dimensional virtual spaces such as "Yellow River Water Comes from the Sky". The combination of laser technology and projection mapping has expanded the spatial expression boundaries of the stage, allowing the audience to experience the grand spatial beauty of "heaven and earth connected" and achieve a spatial aesthetic upgrade from "limited to infinite".

2. Narrative aesthetic expression:

Case 1 (Hamilton): Dynamic lighting and LED screen images synchronize with the rhythm of hip-hop music, and the fast-paced changes in light and shadow enhance the narrative tension of the historical story. The fragmented composition of light and shadow is in line with the modern expression of historical themes, achieving a narrative aesthetic fusion of "modern form+historical content".

Case 2 ("Eternal Radio Waves"): Light and shadow imagery such as "radio signals" and "clocks" have become important narrative symbols. The countdown effect of clock light and shadow, as well as the flickering light and shadow of radio signals, enhance the suspense of espionage narrative, and elevate the aesthetic expression of narrative from "plot narration" to "symbolic metaphor".

Case 3 (The Journey of a Legendary Landscape Painting): The changes of light and shadow are closely coordinated with the dance movements. In the "Green" dance paragraph, the light gradually focuses on the dancers, highlighting the core narrative element of "people in the picture". The slow rhythm of light and shadow matches the elegant dance style, achieving a narrative aesthetic expression of "silent poetry and dynamic painting".

Case 4 (Winter Olympics Opening Ceremony): Light and shadow elements such as the "24 Solar Terms" and the "Ice and Snow Five Rings" directly convey the core theme of "Moving Forward Together". The grand light and shadow scenes strengthen the global dissemination of the Olympic spirit and Chinese culture, achieving a narrative aesthetic expression of "grand theme+visual shock".

3. Emotional aesthetic resonance:

Case 1 (Hamilton): Warm toned lighting and dynamic light and shadow effects create a passionate emotional atmosphere. In war scenes, red lights and rapidly flickering light and shadow stimulate the audience's tension and excitement, achieving emotional resonance through strong sensory impact.

Case 2 ("Eternal Radio Waves"): The combination of cool toned lighting and fog machines creates a repressed and tense emotional atmosphere. In the rainy night joint scene, blue lighting and fog effects enhance the audience's sense of immersion, and emotional resonance is achieved through the restoration of the scene atmosphere.

Case 3 (The Journey of a Legendary Landscape Painting): Soft cold tone lights and slow changes in light and shadow create a distant and peaceful emotional atmosphere. In the "Reclining Stone" dance passage, the light green light conveys a peaceful and ethereal emotion, which corresponds to the implicit emotional expression of Chinese traditional culture, and achieves emotional resonance through the pursuit of artistic conception.

Case 4 (Winter Olympics Opening Ceremony): The large-scale interactive light and shadow effects (such as the linkage between illuminated props in the audience area and stage light and shadow) have stimulated the audience's sense of national pride and global unity, and emotional resonance has been upgraded from "individual experience" to "collective identity", achieving widespread dissemination of emotions.

4. Style aesthetic shaping:

Case 1 (Hamilton): Integrating the modern style of hip-hop culture with traditional elements of historical themes, dynamic lighting and fragmented images of LED screens create a unique style of "modern historical fusion" that is both innovative and meets the aesthetic needs of young audiences.

Case 2 ("Eternal Radio Waves"): Created a realistic style with a sense of the old Shanghai era, with warm yellow lights and retro image projections that restore the aesthetic characteristics of the Republic of China period. The style is rigorous and in line with the realistic theme of the play.

Case 3 (The Journey of a Legendary Landscape Painting): It has shaped the Chinese aesthetic style of "traditional modern integration". The projection of cold tone lights and traditional painting elements conveys the beauty of the artistic conception of Chinese traditional aesthetics. The style is elegant, which is consistent with the cultural theme of dance drama.

Case 4 (Winter Olympics Opening Ceremony): Shaped a grand style of "technology culture Olympics integration", combining large-scale LED screens, laser technology, and traditional Chinese cultural elements to create an aesthetic style that combines technology and cultural heritage. The grand momentum meets the global communication needs of the opening ceremony.

V. THE AESTHETIC BREAKTHROUGH DIRECTION AND OPTIMIZATION STRATEGY OF LIGHT AND SHADOW TECHNOLOGY IN MODERN STAGE DESIGN

A. OPTIMIZATION STRATEGY

In response to the existing problems in the application of light and shadow technology in stage design, such as technological alienation, creative homogenization, and insufficient integration of technology and art, the following optimization strategies are proposed:

1) Adhere to artistic orientation and avoid technological alienation

1. Establish the concept of "art first, technology for use": take the artistic expression of stage works as the core, and select and apply light and shadow technology according to the needs of narrative themes, emotional expression, and style positioning. Avoid blindly pursuing technical skills and neglecting artistic connotations, ensuring that technology serves art.

2. Emphasize the aesthetic connotation of light and shadow technology: explore the aesthetic value of light and shadow technology itself, and achieve artistic expression of technical forms through the design of light and shadow colors, rhythms, and compositions. Avoid simple stacking of technical effects and pursue the aesthetic connotation and emotional expression of light and shadow.

2) Strengthen creative innovation and avoid homogenization

1. Dig deep into the theme connotation and create personalized light and shadow works: Based on the unique theme connotation and cultural background of each stage work, design personalized light and shadow creative schemes, avoid copying the successful experience of other works, and form a unique light and shadow expression style.

2. Promote the cross-border integration of light and shadow technology with other disciplines: integrate light and shadow technology with multiple disciplines such as art, literature, technology, sociology, etc., draw creative inspiration from interdisciplinary theories and methods, and achieve innovation in light and shadow creative concepts and expression forms.

3. Encourage innovation in the application of light and shadow technology: Continuously explore new application methods and combination forms of light and shadow technology, such as AI intelligent light and shadow control technology, VR/AR combined with innovative applications of light and shadow technology, to achieve innovation in light and shadow effects and experience forms.

3) Improve the level of technological application and ensure application quality

Strengthen the research and development of stage specific light and shadow technology: Encourage enterprises and research institutions to carry out research and development of stage art specific light and shadow technology, develop more professional, efficient, and artistic light and shadow equipment and software, and provide technical support for the innovative application of light and shadow technology.

4) Focus on audience experience and enhance aesthetic satisfaction

1. Conduct in-depth research on audience aesthetic needs: Through questionnaire surveys, interviews, data analysis, and other methods, understand the audience's aesthetic preferences, experiential needs, and psychological expectations, and design light and shadow works that meet the audience's needs. Pay attention to the differences among audience groups and achieve personalized customization of light and shadow experience.

2. Strengthen interactive design for audience participation: add interactive elements of light and shadow, design simple, interesting, and participatory interactive forms, and enhance the audience's sense of participation and belonging. Ensure that the interactive design is closely integrated with the theme of the work and does not appear abrupt.

VI. RESEARCH CONCLUSION

Modern stage design unveils a sophisticated aesthetic mechanism where light and shadow technology intertwines with the intricate textures of innovative textile materials to redefine creative logic. This synergy allows digital projection and luminous optics to animate the physical weave of the set, transforming static fiber surfaces into dynamic, multidimensional landscapes of cultural expression: the creative logic is a three-dimensional transmission logic of "technology empowerment creative transformation artistic presentation", achieving the organic unity of technical characteristics and artistic needs; The aesthetic mechanism includes four core mechanisms: spatial reconstruction mechanism, narrative reinforcement mechanism, emotional resonance mechanism, and style shaping mechanism. The four mechanisms

work together to promote breakthroughs and upgrades in stage aesthetics.

AUTHOR CONTRIBUTIONS

Jinyu Zhou designed, collected and analyzed the data, and drafted the manuscript. Jinyu Zhou conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Jinyu Zhou participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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