

Narrative Expression in Digitized Traditional Cultural Spaces: Case of the Virtual Exhibition Hall Design at Du Fu Cao Tang

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Abstract: As digital technology advances and becomes widespread, the demand for protecting traditional cultural spaces grows. Utilizing digital narrative expressions enhances the appeal and impact of these spaces, promoting the dissemination of traditional culture. Virtual exhibition hall design can transcend time and space limitations, offering richer and more diverse display methods, thereby enhancing the audience's experiential enjoyment. This paper uses narrative expression in digital virtual spaces, both domestic and international, as the research entry point. It provides an in-depth content analysis and a systematic elaboration of the methods. The core connotation of the narrative theme is further explored, detailing the performance methods of narrative design. The constituent elements of the virtual exhibition hall's narrative structure and their interrelationships are rigorously deduced. The necessity and feasibility of spatial narratives in virtual heritage presentations are discussed, and the characteristics of these cases are summarized. Finally, the focus is on using narrative expression in digital traditional cultural spaces, exemplified by Du Fu Cao Tang. This includes developing three aspects: character construction, environment construction, and behavior construction.

1. Introduction

The essence of narrative expression resides in its narrativity, a term derived from the Latin word "narration," which means to tell or narrate. Narrative expression establishes meaning by unfolding in time and, fundamentally, communicates information and emotion through storytelling [1]. Throughout this process, narrative expression not only presents factual details of an event but also establishes connections between events and unveils their underlying significance [2, 3]. Narrative expressions frequently encompass a sequence of plots, characters, and conflicts. These elements interact with one another in a time-driven manner, giving rise to a cohesive storyline. Such a storyline not only captivates the listener's attention but also aids in their comprehension and retention of the conveyed message. In museum and exhibition design, the incorporation of narrative expression can enrich the educational significance and artistic value of the exhibition [4]. This enables the audience to emotionally connect with the exhibits, facilitating a deeper understanding

and memorization of the exhibition's content. Leveraging digital technology, narrative expression can be presented in a more vibrant and diverse manner, offering audiences a more immersive and profound cultural experience.

As a pivotal technology in the information age, digital technology enables electronic presentation through information conversion and processing [5]. Its widespread application across diverse fields not only enhances efficiency but also fosters organizational innovation. With its multi-sensory and interactive characteristics, digital technology can construct realistic virtual worlds that offer a more intuitive representation of historical information and cultural connotations related to traditional cultural spaces compared to traditional media. It serves as a new approach to safeguarding traditional culture. Digital technology has facilitated the visualization of non-visual elements, and in the post-COVID-19 epidemic era, there has been a significant surge in demand for online exhibitions. Museums and art galleries have introduced online digital exhibitions to engage a larger online audience using virtual technology. Additionally, three-dimensional virtual exhibitions have been created to offer an immersive experience for exhibits that lack physical spaces or are challenging to set up. Users can interact with designers in the virtual environment. The development of digital technology holds great promise, boasting a substantial user base and delivering significant economic benefits, all while reinforcing the bond between culture, art, and individuals [6].

Virtual cultural spaces exemplify digital technology, expanding traditional cultural spaces and transcending temporal and spatial boundaries, allowing us to experience global cultural charm. It preserves and transmits traditional culture, safeguarding precious heritage and increasing public awareness and respect for it. Additionally, virtual cultural spaces offer a platform for cultural innovation, promoting cultural exchange and integration. Virtual cultural spaces enhance public cultural literacy and aesthetics, offer personalized cultural experiences, broaden cultural horizons, and meet the cultural needs of diverse groups. Modern science and technology drive the gradual integration of digital virtual technology into daily life [7, 8]. As a significant symbol of Chinese culture, Du Fu Cao Tang faces challenges in adapting to modern society's development and effectively protecting and inheriting traditional culture. This study aims to explore the narrative expression technology of digital virtual technology in Du Fu Cao Tang's traditional cultural space to better protect its traditional culture and enhance the audience's experience and cultural identity. By digitally reconstructing Du Fu Cao Tang through advanced technologies like virtual reality and augmented reality, its historical culture and artistic value can be vividly and intuitively demonstrated. Viewers can experience the lives of ancient literati and artists in Cao Tang, deeply understanding the context of Du Fu's poetry and the era's background, enhancing their knowledge and interest in traditional culture. Utilizing narrative expression technology, the connotation of traditional culture is presented more intuitively through storylines, characterization, and scene reproduction. It narrates Du Fu's life in a storytelling manner. Rather than a simple introduction, it allows the audience to experience Du Fu's cultural charm immersively, enhancing their interest and appreciation for traditional culture.

This paper focuses on remodeling Du Fu Cao Tang, providing an overview of its layout and exploring the development of traditional cultural space using virtual technology to meet the aesthetic needs and cultural experiences of modern people. During the remodeling of Du Fu Cao Tang, we will incorporate advanced technologies, including Virtual Reality (VR) and Augmented Reality (AR), to offer viewers an immersive cultural experience. This research promotes the integration and innovation of traditional culture and digital technology. Applying narrative expression technology to the digital display of traditional cultural spaces like Du Fu Cao Tang achieves a seamless blend of traditional culture and modern technology. This integration enhances the display of traditional culture, making it more vivid and visual, and provides a new cultural experience for the audience, increasing their interest and identification with traditional culture.

Digital narrative expression technology overcomes the limitations of traditional display methods, making the dissemination of traditional culture more convenient and efficient. Through virtual exhibition halls and other digital platforms, audiences can access and experience traditional culture anytime, anywhere, free from temporal and spatial limitations. This shift in communication mode broadens the audience for traditional culture, better integrating it into modern life and meeting the cultural needs of more people. Digital technology offers new methods for cultural heritage protection. Emerging science and technology digitally protect traditional cultural and architectural heritage, avoiding the limitations and risks of traditional preservation methods. Additionally, digital narrative expression technology supports the restoration and reconstruction of cultural heritage, better restoring its original appearance and display value.

2. The Spatial Narrative Expression of Poetry Culture in Du Fu's Cao Tang

Du Fu Cao Tang, situated in Qingyang District, Chengdu, Sichuan Province, serves as the former residence of Du Fu and has been revered as a sacred destination for literati since the Tang Dynasty. The hall boasts a delicate layout that harmoniously blends the characteristics of Jiangnan gardens and northern architecture, showcasing simplicity and elegance. Its main features include wooden structures and green tile roofs. The compound encompasses various buildings, including the grand Light House, the Hall of Poetry and History, and the Chai Gate, all of which bear rich historical traces and cultural significance, captivating numerous tourists and researchers.

The spatial narrative expression of the poetic culture of Du Fu's Cao Tang is an art form that integrates the profound connotation of the poems with the unique spatial environment of the Cao Tang. It is not only reflected in the architectural layout and landscape design of the Hall, but also vividly presents Du Fu's poetic culture in the form of spatial narrative through the tour experience of visitors. As a carrier of Chinese culture, the Cao Tang attracts many literati to visit and realize, showing the profound heritage and unique charm of poetic culture. The architectural layout and spatial planning of the Cao Tang is itself a narrative expression. The overall layout of Du Fu's Cao Tang follows the gardening techniques of traditional Chinese gardens, with a symmetrical central axis, and creates a secluded and elegant atmosphere through skilful borrowing and counterpointing of scenery. During the tour, the audience can feel the echo between the step-by-step scenery of the Cao Tang and the mood of the poems, as if they are in the world of Du Fu's poems. The landscape design of the Cao Tang also reflects the spatial narrative expression of poetic culture. The plants, water features and statues in the Cao Tang are all in line with Du Fu's poems. For example, the plants such as bamboo and red plum not only add to the ornamental nature of the landscape, but also express the noble quality and resilience of Du Fu's poems through their symbolic meanings. At the same time, the water features also create a tranquil and profound atmosphere, so that the audience can enjoy the beautiful scenery and at the same time feel the deep thoughts in Du Fu's poems.

3. Methods for Expressing Digital Spatial Narratives

3.1. Character Building

Character construction is crucial in virtual display design to enhance realism and create an immersive user experience [9]. When a character serves as the thematic thread of a narrative, its design must be carefully planned to establish close connections with the storyline and environmental context of the entire virtual scene, creating a coherent and unified whole. The character's interactions with other elements in the scene, task accomplishments, and communication with other characters play a significant role. These action paths and interactions should revolve

closely around the storyline, enabling the user to experience a complete and coherent narrative.

The emotional performance of characters in the virtual display design can be expressed through various means, including facial expressions, body movements, and sounds. When characters encounter dilemmas, challenges, or moments of joy, their emotional performance should be authentic and profound, allowing users to empathize with them and gain a deeper understanding and experience of the emotions and information conveyed in the virtual scene.

3.2. Environmental Building

Utilizing the environment as a clue to develop spatial narratives is a significant design approach and narrative method in virtual display design. The creation of the environmental atmosphere, including light and shadow, should align with the theme or its keywords. The three main aspects of environmental narrative clues are theme relevance, clear scale and scope, and exceptional content. In the narrative, the environment functions as the primary clue, while the surrounding space, characters, objects, etc., serve as auxiliary elements to the environment.

For a successful environmental construction, it is crucial to deeply align with the theme. This fit goes beyond surface-level decoration and involves meticulous planning of ambience, lighting and shadow effects, object placement, and other intricate details. The scale and scope of environmental construction should be clearly defined [10]. This includes not only the physical space size, but also how the designer directs the viewer's attention and guides their gaze within the environment. The designer must have a clear understanding of the primary and secondary elements, as well as how to create an organized and layered space using these elements.

3.3. Behavioral Building

Using human behavior as the narrative clue is applicable to virtual environment art design with clear behavioral goals. In this narrative design, human behavior and its goals are the core, with other scene elements supporting the behavior. The core is to understand and design human behavior patterns and goals in virtual environments. An in-depth understanding of people's psychological, physiological, and behavioral habits, and their interaction with the virtual environment, is needed to guide users to achieve their goals. The first step is to define the behavioral goal, then analyze the steps required for the user to achieve that goal and how they interact with the environment during each step.

Various elements used in virtual environments to guide and support user behavior, including interface design, interaction design, and environment design, can effectively assist users in achieving their intended behavioral goals.

4. Narrative Representation in Digitized Traditional Cultural Spaces - Du Fu Cao Tang

4.1. Du Fu Overview

Du Fu, the literary giant of the Tang Dynasty, has left a colorful mark in the history of Chinese literature with his profound social insight and exquisite artistic attainments. His poems are not only a profound reflection of social reality, but also a testimony to the ups and downs of his personal destiny. Taking Dufu's life as a clue, we can divide him into four important stages: his early years of study, the Chang'an period, the years of exile, and his later years in seclusion. Like the changing of the seasons, it shows Du Fu's journey from youthful ambition to twilight contemplation. His representative poems "Looking at Yue", "Lixianxing", "Spring Looking" and "Song of the Thatched House Broken by the Autumn Wind" are incorporated into this work to show the stylistic

characteristics of his different periods.

The main space plays an important role in layout and presentation, aiming to create an orderly and harmonious spatial atmosphere through rational display and organization. In the design of Dufu Cao Tang, classical elements such as the Cao Tang, the red wall, the pavilion and the corridor were extracted. In terms of spatial composition, we adopted a rectangular layout with the red wall as the entry point for spatial division. Through the guidance of the red wall, visitors can enter the anteroom, the first scene interaction area, the second scene interaction area, the third scene interaction area and the fourth scene interaction area in turn, forming a clear and orderly visiting route. This layout not only reflects the sense of order in the space, but also facilitates visitors to tour and better understand Du Fu's life and poetic situation.

Early spring was Du Fu's courtship semester. At that time, he was full of ambition and longing for the future. As he wrote in "Looking at Yue": "How is Dai Zongfu? Qilu green not yet. Creation bells God's show, yin and yang cut the twilight." The poem is full of reverence for nature and hope for life. In the specific design, with mountains surrounding the way, Dufu climbed to the top to see the peaks and cloud tops, flying birds into the bosom, depicting the vitality and vigor of early spring, symbolizing Dufu's early ambitions and hopes.

The summer was in full swing, Du Fu's years in Chang'an. At that time, he was in the center of power and felt the complexity and contradiction of the society. His "The Walking of the Likely Couple" was composed during this period. Through the depiction of the couple's life, the poem is a metaphor for all kinds of social injustices and contradictions. In the scene, he uses warm stylization to show the heat of summer and the prosperity of Chang'an, symbolizing Du Fu's fervor and impulsiveness during his time in Chang'an.

Late fall was Du Fu's years of exile. After the Anshi Rebellion, Dufu's life was in a difficult situation, and his poems became deeper and more introspective. In "Spring Hope," he wrote, "The country is broken, the mountains and rivers are there, and the grass and trees are deep in the city in spring." The sadness and helplessness in the poem is a true reflection of Du Fu's years in exile. The use of a scene opposite to the height of summer highlights the ruthlessness of war and symbolizes Dufu's resilience and perseverance during his years of exile.

The severe winter is Dufu's return to seclusion in his later years. After experiencing various ups and downs in his life, Du Fu chose to go into seclusion. His "Song of the Thatched Cottage Broken by the Autumn Wind" was composed during this period, and the poem is full of concern for the country and society. The poem is full of concern for the country and society. The stylized rendering of the scene of the thatched cottage's dilapidation and the bleak scene of old age's powerlessness expresses the deep thought of worrying about the country and the people.

4.2. Character Building in Spatial Narratives

In the design of the virtual exhibition hall of Du Fu's Cao Tang, the character construction of spatial narrative is to transform the whole scene around Du Fu's poetry, his life and the historical background of the Cao Tang into visualized spatial information. The design process analyzes the mood and emotion in Du Fu's poetry, and then through digital means, these relatively abstract elements of Du Fu are visualized, endowed with a certain emotion on the objects, and transformed into the design language of spatial layout, color, light and shadow. The main scene as well as the four sub-scenes are all centered around the theme of Du Fu as a clue, connecting them together to become a complete story.

4.3. Environmental Building of Spatial Narratives

As shown in Figure 1 to Figure 5, the environmental construction of the spatial narrative is

specifically embodied in the creation of the ambience of the main scene as well as the four mini-scenes, as shown in Figure 1. In the design of Du Fu's Cao Tang, the timeline of Du Fu's life, his poetic creation, and his life circumstances are followed as the development line. The atmosphere of the four mini-scenes echoes Du Fu's poetry. From the beginning of entering the Cao Tang, the audience gradually explores the deeper background of Du Fu's life and poetry creation, so that they can gradually understand what happened to Du Fu and empathize with this great poet.



Figure 1: Overall structure of algorithm flow.



Figure 2: Mini-Scenario 1.



Figure 3: Mini-Scenario 2.



Figure 4: Mini-Scenario 3.



Figure 5: Mini-Scenario 4.

4.4. Spatial Narratives of Behavioral Construction of Spatial Narratives

The behavioral construction of spatial narrative involves the overall layout, interaction design and visual presentation of the virtual exhibition hall. The spatial layout guides the audience's sight and route, sets up interactive links to enhance the sense of experience, as well as uses visual elements to convey the aesthetic characteristics of Du Fu's poetry. A virtual tour guide system is set up to guide the audience to explore along a specific path. Within the main scene, the UI interface

can be clicked to enter four small scenes with related scientific introduction. Virtual reality technology is also utilized to allow the audience to experience the natural landscape and historical scenes written by Du Fu. Through these behavioral constructions, the audience's participation and immersion are enhanced so that they can more intuitively and deeply feel the cultural value and historical significance of Du Fu's Cao Tang.

5. Conclusions

This study carries out spatial narrative expression through the four life situations of Du Fu, taking Du Fu's poems, biography, and situations as part of the narrative, and reproducing them by virtual digital means, which retains some of the classic elements of Du Fu's Cao Tang while bringing in new adaptations.

Traditional cultural spaces are facing the dual challenges of inheritance and development, and the rise of digital technology has injected new vitality and possibilities into traditional cultural spaces. Narrative expression, on the other hand, is an important component with the ability to transform traditional cultural spaces into vivid and interesting digital narrative spaces. Through this study, a certain degree of understanding of the application of narrative expression techniques in digitized traditional cultural spaces provides new ideas and methods for the inheritance and development of traditional culture.

This study aims to develop a more effective strategy and technique for presenting virtual information by exploring spatial narratology in order to better present the historical information value of cultural heritage. This will help to remedy the current shortcomings of virtual reality projects in the field of spatial digital preservation of cultural heritage. At the same time, it also confirms that virtual digitization technology can serve as an important way to inherit architectural and cultural spaces.

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