

RESEARCH ON THE TRANSLATION METHOD OF ARTIFICIAL INTELLIGENCE (AIGC) INTERVENTION IN INTERIOR SPACE NARRATIVE

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Abstract: As the demand for culture and spirituality grows, people are increasingly seeking immersive and narrative indoor space experiences. However, translating and expressing spatial narratives poses a design challenge. Leveraging the popular AIGC technology, this study explores innovative ways for artificial intelligence to intervene in interior design space narratives. Through a literature review, we summarize and deduce the core elements and practical processes of spatial narrative theory in contemporary interior design. We analyze the effective application of AIGC technology in the narrative process of indoor spaces, establish a novel approach for translating spatial narratives, and integrate it into design practice and teaching. With the aid of AIGC technology, we aim to assist students in comprehending the design expression of spatial narratives. The integration of artificial intelligence into the teaching process can facilitate rapid expression in interior design, from keywords to generated images, and enable a more comprehensive and precise control over the core elements of indoor space narratives.

Spatial narrative is a widely applied theory in architectural design and is also extensively utilized in contemporary interior space design. It facilitates the creation of unique indoor environments through spatial storytelling, enabling people to experience different emotions and sensations within them. It focuses on the behavior, feelings, and experiences of individuals within indoor spaces, as well as the connections and changes between space and time. However, in the transition from story to space, more attention is paid to the translation of cultural symbols, while neglecting the core three elements of spatial narrative: space, events, and movement [8]. Relatively speaking, this process is too abstract and difficult to understand. In today's rapidly developing information technology era, leveraging artificial intelligence technology and allowing computers to assist us in transferring abstract concepts to concrete graphics represents a breakthrough in effectively applying spatial narrative in interior design.

NARRATION IN ARCHITECTURAL SPACE

Narration, as a literary genre, integrates various parts into a coherent whole by orderly presenting stories within a temporal and spatial framework. Simultaneously, it

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constitutes a narrative process that closely engages readers with time through the selection and arrangement of story themes and plots, thereby producing a unique effect. Through its distinctive structure and narrative approach, narrative literature enables readers to immerse themselves in the storyline and experience the emotions and meanings conveyed by the narrative [2].

Spatial narrative employs spatial texts as a medium to directly engage with human existence through specific spatial manipulations, thereby stimulating and evoking sequential experiences within a particular space. By engaging in a series of events within the space, individuals acquire experiences, perceptions, and emotions related to the built environment, thus undergoing a transition from the "narration" of spatial texts to the "reception" by the experienter [3]. Drawing on the fundamental concepts and functions of narrative, architecture offers methodologies and strategies for constructing meaning and integrating connections. Architectural narrative utilizes architectural language to narrate stories within spaces, conveying the spirit of the place and aiding in a deeper understanding and experience of the space. To achieve this, architects must employ suitable structural organization and rhetorical devices. The application of narrative theory not only broadens the expressive and research dimensions of architecture, but also offers fresh perspectives and ways of thinking for architectural design, spatial experience, and social and cultural exchanges [5].

Since the 1970s, modern architectural aesthetics have faced challenges under the impact of digital design. The aesthetic paradigm in the Euclidean classical system is no longer sufficient to measure or interpret the complex relationships and semantic features of avant-garde architecture [5]. Therefore, the architecture industry is constantly seeking new interdisciplinary research paradigms and rethinking architectural creative activities. In the early 1980s, Bernard Tschumi introduced "narrative" into the field of architectural research, and since then, architectural narrative has received widespread attention from academia as a design method and theory. Qu Mi believed that architecture is the sum of space, events, and movements [8]. In his work "The Manhattan Transcripts," narrative is introduced into architecture by unfolding events, allowing people to break through and control traditional concepts and limitations through storytelling. In this abstract process, Manhattan becomes a symbol of special architectural reality, reminding people to pay attention to the environment in which real actions occur. This complex reality environment prompts people to think and understand the significance and importance of these actions [9]. Unlike Qumi's focus on the deconstruction of place context and the resulting lack of spatial structure and social order, Sophia Psarra focuses on how spatial and cultural meanings are constructed in architecture and conveyed to observers. In his work "Architecture and Narrative: The Construction of Space and Its Cultural Significance," he explores the balance strategy between spatial encoding and form through cases with strong narrative dimensions. Focusing on the value of narrative in architectural cognition, spatial order, and the construction of social and cultural significance [7], let us re-examine the relationship between architecture and narrative.

ARTIFICIAL INTELLIGENCE-INTEGRATED SPATIAL NARRATIVE TRANSLATION IN INTERIOR DESIGN

Narrative of Indoor Space

Interior design involves recreating the interior space of a building, serving as a continuation of architectural design. By applying design principles and

methodologies such as aesthetics, ergonomics, and materials science, the space undergoes artistic treatment to fulfill people's living needs and aesthetic pursuits [6]. Interior design not only caters to people's functional needs but also considers their emotional experiences and aesthetic aspirations. Spatial narrative theory conveys a specific theme and emotion through spatial design, thereby better meeting the requirements of interior design. Additionally, spatial narrative theory emphasizes the experiential and interactive nature of space, enhancing space users' understanding and perception, thus enabling them to better enjoy the experience brought by the space [1].

The theory of spatial narrative encompasses three core elements of architecture: space, events, and motion [8]. Spatial narrative underscores the creation of a specific spatial atmosphere, the memory of special events, and the process of individual movement, aligning with the design process of indoor spaces. Interior design emphasizes functional zoning, integrating various functional divisions to create an atmosphere and achieve spatial construction. It also highlights the extraction of cultural symbols, combined with narrative memory carrying, to achieve the reproduction of cultural elements such as color, material, texture, and symbols. Additionally, it emphasizes the flow of people and combines it with narrative chronological order to achieve an immersive multi-dimensional spatial experience.

The spatial narrative of interior design evolves from textual description to visual description, and further to spatial description. The transition from text to vision falls under the umbrella of narrative theory, encompassing image and film narratives. Collage and mapping are common techniques employed in artistic creation. In interior design, visual description signifies not only the synthesis of images but also the extraction of design symbols. The transition from visual description to spatial description constitutes the core element of interior design, where visual symbols are transformed into design elements, considering aspects such as spatial (functional zoning), motion (pedestrian flow), and events (cultural symbols), and then applied to architectural spaces. During this translation process, it is imperative to utilize design methods like symbolism, metaphor, and exaggeration, while adhering to the fundamental design principles: emphasis, balance, unity, contrast, rhythm, proportion, and variety [4].

The narrative translation of indoor spaces poses a challenge in interior design, as it involves multiple steps from narrative language to architectural language, including reading, analysis, refinement, transformation, and output. Particularly in the transition from visual symbols to architectural spatial language, there's a tendency to be superficial, focusing solely on the reproduction of cultural symbols, emphasizing patterns and colors, while neglecting the structure and materials of the architectural space itself. (Figure 1)

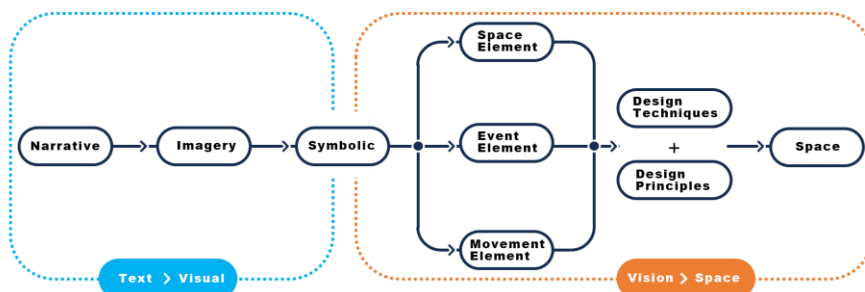


Figure 1: Teaching Process and Method of Indoor Space Narrative.

Artificial Intelligence Involvement in Indoor Space Narrative

AIGC (Artificial Intelligence Generated Content) is an AI technology that employs techniques like generative adversarial networks and large-scale pre-trained models to generate relevant content through learning from existing data and recognition. The rapid advancement of AIGC technology has permeated various domains, including writing tools, image tools, audio tools, video tools, office tools, lifestyle tools, and detection tools. Looking at the design process of architectural spatial narrative, it primarily involves application software pertaining to writing tools and image tools. The AI writing tool is one of the earliest commercial applications of AIGC technology, demonstrating a high level of maturity. Its ability to understand context, grasp common sense knowledge, and generate long texts has been significantly improved, while ensuring the completeness, accuracy, and logicity of the generated content. There are three types of text generation for writing essays: application based, creative based, and dialogue based. Application based text generation, such as meaning based sentence lookup and reverse dictionary, has clear functions and strong directional usage; Creative text generation such as Notion AI, WPS intelligent writing, etc. can be used for text continuation, content generation, etc. Users have greater creative space and freedom; Conversational text generation, such as ERNIE Bot, Tongyi Qianwen, iFLYTEK Spark, is highly interactive and requires high ability to understand natural language of large models. AI image tools are the most popular application in the field of AIGC technology and hold the widest potential for promotion. Utilizing deep learning and computer vision technology, they manifest in three major applications: image generation, image local modification, and image editing. Image generation products such as Midjourney, Stable Diffusion, and DALL-E 2 can generate complete images of specific styles based on text descriptions or sketches, providing inspiration for creators. Image editing products such as Imagen AI and Maker Paste AI Painters offer functions such as intelligent image watermark removal, style filter settings, style modification, and image clarity enhancement. Adobe Firefly, a representative product for image partial modification, can focus on changing some elements of the image or modifying and adjusting layer by layer. It is suitable for secondary creation or post-production work improvement.

Using AIGI technology to organize textual descriptions of story plot keywords and interior design functional layout keywords, and utilize image tools to generate spatial images from textual descriptions. The generation principle of AIGC is mainly based on the principle of diffusion models. After completing the spatial image generation, the most expected image is selected for training and iteration to form the final result. (Figure 2)

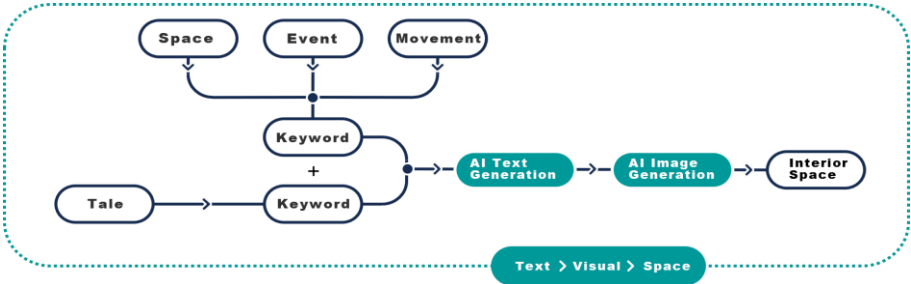


Figure 2: Teaching Process of AIGC Intervention in Indoor Space Narrative.

TRANSLATION METHOD OF INDOOR SPACE NARRATIVE IMPLEMENTED BY ARTIFICIAL INTELLIGENCE

Space Construction: Atmosphere Creation and Functional Zoning

Functional zoning is the core of interior design, which directly affects the efficiency of indoor space utilization and people's living experience. A good functional zoning needs to comprehensively consider the usage functions of the space and the activity needs of people, in order to improve the efficiency of space utilization, enhance the comfort and beauty of the space. Creating an atmosphere is a key part of interior design, involving multiple aspects such as lighting, color, furniture, and decoration. By integrating these design elements, an atmosphere that meets the needs of space utilization can be created. In interior design, atmosphere creation and functional zoning are interrelated. On the one hand, functional zoning can affect the creation of atmosphere; On the other hand, creating an atmosphere can also affect the rationality of functional zoning.

Extract keywords: Character, User; Scene, Function, Theme, Color, Lighting, Texture; Style.

Symbols of Space: Memory Bearing and Element Extraction

Element extraction in interior design mainly refers to obtaining design inspiration and elements from fields such as architecture, culture, history, art, etc., to express specific themes, emotions, or atmospheres, including concrete elements, geometric shapes, cultural symbols, etc.

By abstractly and indirectly deconstructing and reconstructing elements, the design space conveys historical context and regional culture and creates visual effects that conform to contemporary aesthetics. This coincides with the memory bearing in narrative theory.

Extract keywords: Climax, Memory Points, Scenery, Symbols, Patterns, Style.

Narrative of Space: Time Dimension and Flow of People

The pedestrian flow path refers to the movement path and method of people in indoor space. Reasonable pedestrian flow design can make it more convenient, comfortable, and safe for people to use the space. The main flow line refers to the primary movement path of people when using space, while the auxiliary flow line refers to some secondary movement paths of people when using space. The mainstream flow should be as smooth and simple as possible, avoiding too many twists and intersections. The auxiliary flow line can be more flexible, but it also needs to maintain a certain connection with the main flow line to avoid excessive dispersion and confusion. Adding storylines to the flow of people, supplementing the human action route with a temporal dimension, and guiding people's storylines and emotional experiences through spatial design and planning.

Extract keywords: Prologue, Theme, Plot, Props, Interactive Experience.

Practice of Artificial Intelligence Intervention in Indoor Space Narrative Design

The design site is a boutique hotel in the urban university city area, which is different from the positioning of general economy hotels. It is based on the use of

narrative space theory to create a characteristic immersive theme hotel. The selected building is divided into two floors. The first floor is designed for reception and restaurant functions, while the second floor is designed for guest rooms. The hotel selected the novel "One Hundred Years of Solitude" as the blueprint for spatial narrative creation and read and understand the work.

Story Interpretation

Select a story, filter the scenes of the story, extract plot elements, including character roles, character relationships, spatial scenes, character emotions, light and shadow colors, sound effects, actions, etc. In the design of this themed hotel, the story of the female protagonist Remedios was selected as the narrative space scene for the first floor of the building, which includes functional spaces such as the entrance, front desk reception, rest and waiting, and themed restaurant. The plot of the female protagonist's story is interpreted as the following nodes (Figure 3):

- Worries, the female protagonist's concern about her appearance being too beautiful, leads to the theme of "beauty".
- Politeness, a gentleman's polite encounter with Remedios, fell in love at first sight.
- I, Remedios, have never cared about the arrogance of gentlemen.
- Calm down, the gentleman peeped at Remedios and died, the beauty was unaware.
- Helpless, many men fell in love with Remedios and quietly passed away.
- Freedom, Remedios ascended to the sky with the drying sheets.

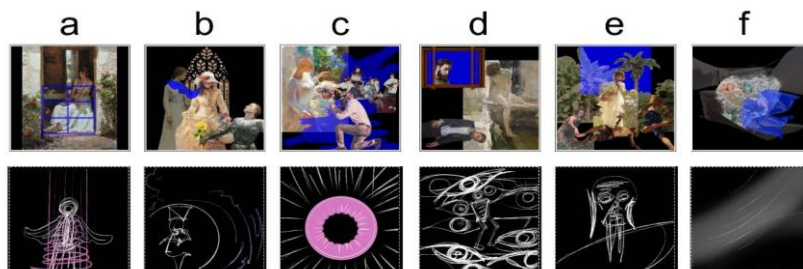


Figure 3: Interpretation of the Story of the Female Protagonist in "One Hundred Years of Solitude"

Logical Analysis

Based on the interpretation of the story, organize the story logic, summarize different prologue chapters, and analyze the narrative structure. Organize space, events, and movements through character relationships and plot development. The design of this themed hotel adopts implicit expression in the entrance section (a), introducing the design theme of "beauty"; Highlight the stage visual effect of the protagonist "beauty" appearing in the front desk section (b); The resting and waiting area (c) depicts the proud wandering of the "beauty" Gu Fang, and the distance beauty produced by her arrogance; The middle aisle section (d&e) highlights the central space, depicting the beauty being noticed in the crowd without being aware of the surrounding changes; At the end of the curtain, arrange to sit in the dining area (f), which is hidden and calm, interpreting a low-key atmosphere. (Figure 4)

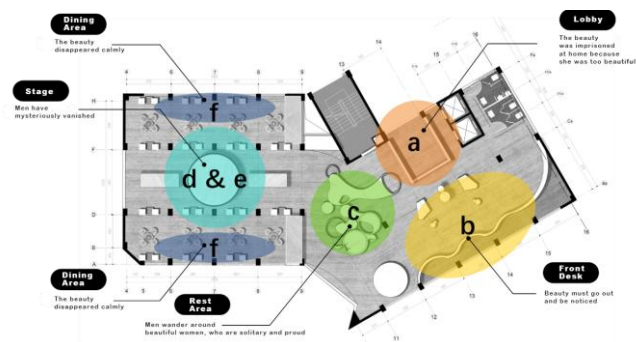


Figure 4: Analysis of the storyline's flow.

Graphic System (AI Writing Tool Intervention)

Extract atmosphere keywords based on character scenes: beauty, confinement, mystery, psychedelic, surreal, legendary, contemplative, romantic, weighty, fantastical, lost, entrance hall, welcoming home.

Extract the key words of the storyline: winding paths leading to secluded places, intricate and complex, looping back and forth, maze like, looping back and forth, tracing history, crossing time and space, mysterious hidden paths, and appearance.

Extract narrative keywords based on the plot structure: entanglement of fate, passage of time, historical changes, love and emotions, isolation and helplessness, fables, happiness and sadness, absurdity and magic, cycle of life and death, and opening of prologue.

Using the AIGC word processing tool, input keywords into ChatGPT and convert them into descriptive paragraphs (Figure 5).

Table 1: Comparison of Text Description and ChatGPT Text Generation.

My own description	Using keywords to input descriptions generated by ChatGPT
Help me create a heteromorphic space, with the requirement that the entire room be pink in color and have wavy textures. There needs to be an opening above the room where light can shine in through the opening. And some plants can be planted to enhance the atmosphere of the space.	This is an interior space of a hotel. When we look through the eye-like door frame, we enter a spacious lobby. Compared to the door frame, it is important to focus our gaze on the interior of the lobby. In the center of the lobby, there is an unconventional table displaying various artworks, while the lighting is directed to illuminate these artworks. On either side, there are extended tabletops showcasing sculptures of figures, and faint lights from above highlight the details of the sculptures. Moving further back is the reception area where guests are greeted, and the desk is adorned with essential items related to the reception. Beyond the windows, one can admire the exterior views. The overall color scheme of the space leans towards pink and purple, creating a dreamy atmosphere, while also emphasizing the theme of the Mankondo Hotel, which aims to embody the ambiance of a typical hotel.

Spatial Translation (AI Image Tool Intervention)

Use descriptive paragraphs to generate images of the entrance hall (a) scene. Enter Midjourney, Figure 6 shows the image generated from the self-written description in Figure 5, and Figure 7 shows the image generated from the text description generated by ChatGPT in Figure 5.



Figure 6: Image Generation of Self Written Description.
Source: Gou Xinyi,Huang Yijia drawing.



Figure 7: Image Generation of Text Generated by Chatgpt
Source: Gou Xinyi,Huang Yijia drawing

ChatGPT is a language model focused on dialogue-based tasks, with improvements in context understanding, response generation, and overall coherence. When generating articles or paragraphs, appropriate vocabulary and sentence structures will be automatically selected to ensure smooth and accurate expression. It typically generates multiple alternative sentences or paragraphs and sorts them based on fit and coherence, providing more accurate generation results. Comparing the image generation of self-descriptive language and ChatGPT generated text descriptions, self-descriptive language is more like early design concept thinking, emphasizing the description of keywords; ChatGPT generates more comprehensive textual descriptions and does not overlook details.

Spatial Expression (AI Image Tool Intervention)

Select appropriate images for AI learning and iterative calculation. Figure 8 uses the v2 image from Figure 7 for regeneration. This iterative process may take several

rounds and ultimately form the complete Figure 9.



Chart 8: Select Generated Images for Overlay and Generate Again.
Source: Gou Xinyi,Huang Yijia drawing.



Chart 9: Multiple Stacked Image Selections Complete the Complete Image.
Source: Gou Xinyi,Huang Yijia drawing.

CONCLUSION

AIGC technology has brought revolutionary changes to interior space design, not only enhancing the innovation and diversity of design, but also shortening the time from concept to implementation through efficient iterative processes. By utilizing virtual reality technology to generate a large number of conceptual solutions, designers are provided with streamlined visualization and real-time interactive design methods. This spatial expression technique transforms complex computer languages into new cognitive and behavioral experiences through internal complex data calculations and technological integration, providing designers with more intuitive design tools.

However, in complex indoor space design, artificial intelligence can currently only assist humans in completing complex tasks. AIGC technology may not be able to consider all practical and humanized factors like experienced human designers when dealing with complex spatial relationships and functional layouts. When creating a space, designers need to consider various factors such as the flow of human activities, the comfort of the space, and the sustainability of the environment, which are currently difficult for artificial intelligence to fully simulate. Secondly, although AIGC can provide visual design solutions, there are still limitations in understanding complex interpersonal communication and project coordination. Communication and collaboration in the design process are also irreplaceable by artificial intelligence generation. Communication between designers and clients, contractors, suppliers, and other parties requires a deep understanding of project requirements, budget constraints, and construction feasibility.

The auxiliary role of artificial intelligence in intervening in design teaching can be divided into three stages of design

Three different levels: First, using artificial intelligence to help quickly collect data and understand concepts. Secondly, with the assistance of artificial intelligence, design concepts can be explained, expressed, and translated. Thirdly, deepen and assist in the creative and expressive processes during the design process.

In summary, the role of AIGC technology in interior space design should be seen as a part of brainstorming. It can provide quick conceptual prototypes and design inspiration, but completing the entire design still requires the designer's professional knowledge, aesthetic judgment, and interpersonal communication skills. The future design industry will be an era of collaboration between artificial intelligence and human designers, and the combination of the two will drive the design field towards a more efficient and innovative direction.

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