

Enlightenment of Modern Immersive Space Design from the Perspective of Integration of Embodied and Disembodied Perception

Xiuying Xing^{1*}, Jianjun Liao¹

¹ Solux College of Architecture and Design, University of South China, Hengyang, China

Email Address

1462424668@qq.com (Xiuying Xing)

*Correspondence: 1462424668@qq.com

Received: 20 October 2025; **Accepted:** 16 November 2025; **Published:** 3 December 2025

Abstract:

In the era of digital intelligence, immersive spatial design has emerged and is transitioning from a passive reception mode to an active participatory experience. This has also made the integration of embodied and disembodied perception an inevitable trend. By studying and analyzing the current development status of the integration of embodied and disembodied perception in immersive spatial design, this article explores ways to address the inherent drawbacks in traditional immersive spaces. It proposes a three-dimensional dynamic integration model strategy to solve the problem of separation and dislocation between embodied and disembodied perception in traditional spatial design, thereby providing theoretical support and practical strategies for the innovative development of modern immersive spatial design.

Keywords:

Embodied, Disembodied, Perception Integration, Immersive Space Design

1. Introduction

The deep integration of body perception and body perception drives the development of immersive space design towards immersion deepening, multi-dimensional cognition and intelligent interaction, which breaks through the established limitations of traditional single technology stacking. In 2025, “embodied intelligence” was first written into the Government Work Report made by Premier Li Qiang on behalf of the State Council at the Third Session of the 14th National People’s Congress [1], and was included in the national key development strategy. Such a policy orientation gives a broader development prospect for the integration of the perception of being and leaving the body. At present, the research shows that embodied cognition considers the body as the carrier of cognition and emphasizes the core position of the body in the cognitive process [2]; Off-body cognition holds that the concept is abstract and modeless, and cognition is essentially based on the operation of logic, symbols and rules, and has no direct connection with the specific perception and action of the body [3]. However, most scholars only focus on the

opposite level of the two, and pay insufficient attention to their application in the integration mechanism of space design. Accordingly, this paper explores three core topics: how to break the boundary between reality and reality in immersive space, how to get rid of the one-way sensory stimulation, and how to deepen the sense of participation experience. At the same time, it is necessary to clarify their essential differences and independent development paths, and adopt interdisciplinary integration and case analysis to provide reference and inspiration for the improvement of immersive space design. The research adopts the methods of literature summarization and representative case analysis, trying to create a multi-sensory collaborative design framework, and to promote the individual experience from the separation of knowing and doing to the state of body and mind integration. It not only meets the diverse perceptual needs of human beings, but also achieves a deep spiritual docking and releases individual subjective initiative.

2. Separation of Knowledge and Action: The Issue of Embodied and Disembodied Perception Misalignment

2.1. Discussion on the Design Philosophy of Embodied and Disembodied Cognitive Theories

Embodied and disembodied cognition are not isolated static categories, but rather form a closed-loop system established through a progressive mechanism of ‘experience-based foundation—abstract extraction—practical feedback,’ becoming an important support for the human cognitive structure. The theory of embodied cognition posits that cognition is a process closely integrated with the environment. Maurice Merleau-Ponty elaborated on this in depth in his seminal work “Phenomenology of Perception,” which broke free from the constraints of traditional cognitive theory and clearly proposed that ‘the body is the key vehicle of cognitive activity.’ In contrast, the theory of disembodied cognition holds that cognitive activity can transcend physiological boundaries and operate autonomously. As Descartes’ mind-body dualism suggests through the proposition [4] ‘Cogito, ergo sum,’ the cognitive subject is separated from the material substrate, treating the latter as suspendable, thereby establishing the internal logical structure of the cognitive world. Although the two exhibit obvious differences in their forms of expression, they do not exist in isolation; rather, each interprets various aspects of cognitive attributes in its own unique way, demonstrating an intrinsic connection and complementary significance.

In this regard, Karl Heinrich Marx and Friedrich Engels once pointed out: ‘Labor creates humans; the human body is the precondition for engaging in embodied cognition; social practice is the way to realize embodied cognition; objectification is the source of embodied cognition; specialization is a characteristic of embodied cognition; and abstraction is the essence of cognition. Therefore, embodied cognition and disembodied cognition complement each other [5]. Jean Piaget also proposed in his argument on ‘genetic epistemology’ (regarding how higher knowledge emerges) that cognitive development is a continuous building process from embodied action to abstract thinking, where embodied sensorimotor activity and disembodied formal operations interact with each other [6]. Based on the above philosophical theoretical framework, there exists an intrinsic hierarchical connection from low to high between embodied and disembodied cognition modes; they promote and depend on each other (Figure 1). On the one hand, embodied cognitive experiences form the foundation for

the development of disembodied cognition. For example, the judgment 'it is not advisable to drink overly hot liquid' originates from the integration of bodily sensory information and brain neural networks. Through the disembodied feedback mechanism, people can internalize the experience of burns into long-term memory and enhance self-protection awareness, thereby providing practical grounds for the formation of cognitive structures.

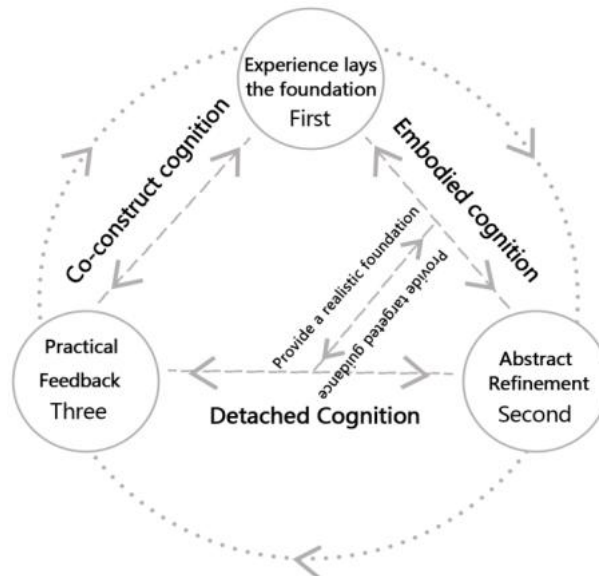


Figure 1. The relationship between 'cognition' and 'out-of-body cognition'.

On the other hand, disembodied cognition relies on embodied experiences to shape a universally applicable theoretical framework, providing clear guidelines for specific operations. Unlike context-dependent embodied cognition, the rules it derives are more flexible and widely applicable. Just like the general principles of organic matter decomposition at high temperatures, these rules can serve as practical guidance when encountering unknown situations. The two exhibit a deep intrinsic connection and dynamic characteristics through interaction and collaborative mechanisms

2.2. Design Practice of Embodied and Disembodied Perception Misalignment

In design practice, imbalances between embodied and disembodied perception often arise due to inconsistencies between individual sensory experiences and cognitive expectations. When comparing traditional and modern immersive spatial designs, the cognitive conflicts caused by this contradiction become particularly evident. Traditional design concepts mostly prioritize humanistic care and a sense of presence as core elements, yet they still show deficiencies in spatial orientation, sensory interaction, and the depth of participation. Their planning is often limited to static visual representation. For example, at the spatial level, the fixed seating design of dome theaters not only restricts the audience's free movement but also causes discrepancies between audiovisual responses and bodily coordination, thereby triggering cognitive dissonance. At the sensory interaction level, panoramic paintings like 'The Battle of Waterloo' attempt to create an immersive atmosphere through multimodal integration. However, excessive stimulation can diminish the authenticity of historical experiences, making it difficult for the audience to deeply adopt the perspective of participants, thus hindering profound historical reflection. At the level of participation depth, VR games like 'Magic Sandbox' emphasize bodily engagement and interactive design, but due to limitations in narrative structure, the immersive

effect remains shallow, making it hard to evoke emotional resonance and deep thinking among the audience.

Driven by digital transformation, current research attempts to bridge the divide between embodied and disembodied perception. The studies aim to promote their joint development through precisely controlled sensory feedback mechanisms and bidirectional interaction facilitated by smart technologies. For instance, the ‘Kingdom of Smell’ project in Hangzhou uses digital scent technology to break through traditional sensory limitations and create an immersive experience environment. This project employs high-precision equipment to release scene-related gaseous substances, enhancing users’ spatial perception and thereby establishing a multimodal collaborative interaction system to improve the overall experience.

3. Immersive Spaces Are Medium Fields Where Embodiment and Disembodiment Merge

The expression of traditional design concepts in the fields of embodied and disembodied cognition generally exhibits misalignment in terms of space, sensory perception, and engagement; in contrast, modern immersive spaces integrate multiple perceptual technologies to create an innovative immersive environment, effectively driving the fusion of embodied and disembodied perception (Figure 2).

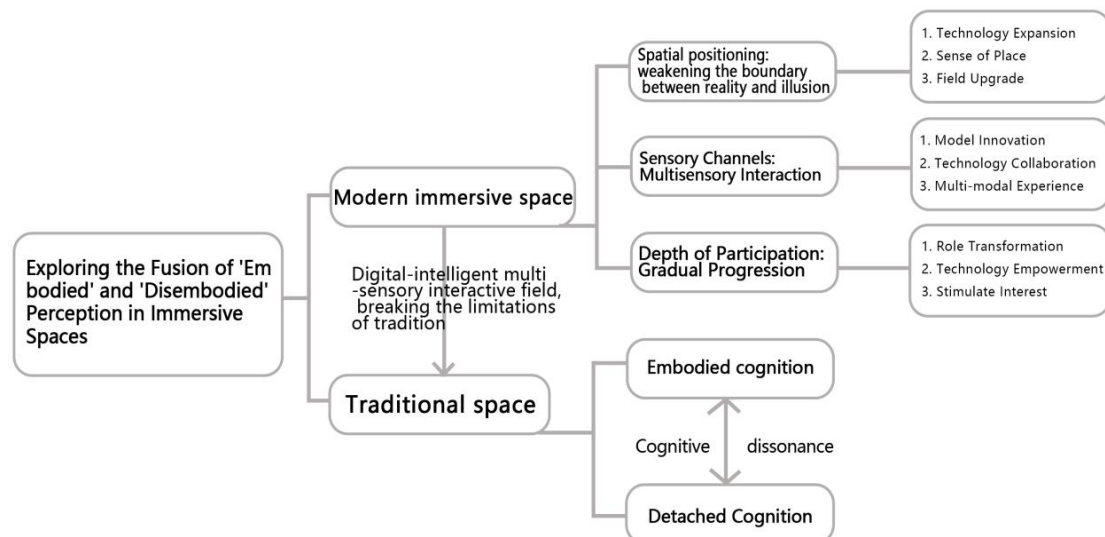


Figure 2. *Exploration of the Integration of Embodied and Disembodied Perception in Modern Immersive Spaces.*

3.1. Weakening the boundary between virtual and real in spatial positioning

From a spatial perspective, modern immersive design is gradually breaking through tradition, blurring the inherent boundaries between embodied and disembodied cognition. This design, which relies on a profound integration of embodied and disembodied perception, enhances the distinctiveness of a place and its cultural connotations. This aligns closely with the core concept of Genius Loci [7], which represents a crucial component of the presence of subjects in a specific space, encompassing unique attributes and cultural values. It can guide the target audience to form a cognitive framework for spatial order, evoke individual emotional resonance, and, in turn, promote deep interactions between people and the environment.

Modern immersive spaces rely on the integration of embodied and virtualized perception mechanisms to break through the established boundaries of traditional physical spaces. They focus on creating a spatial atmosphere characterized by a sense of identity, belonging, and emotional resonance, thereby endowing places with unique independent attributes and profound cultural connotations. This model relies on a highly coherent internal logical framework and meticulously designed narrative system to provide users with a place-related cognitive experience that is both autonomous and dynamically adaptive. This immersive interaction method, which combines technological empowerment with user co-creation, is in fact an innovative development of the concept of Genius Loci proposed by Schultz. It emphasizes breaking the inherent boundaries of traditional physical spaces and gradually transforming into a new type of “human-environment interactive” spiritual field created through immersive environments and digital technologies.

3.2. Multisensory Interaction on Sensory Channels

From the perspective of sensory channels, modern immersive spaces significantly enhance users' sensory experience patterns through advanced sensing technologies, prompting a shift from single visual input to multimodal interaction and full sensory immersion [8]. Advanced sensing technologies not only expand the boundaries of human perceptual abilities but also encourage the human perceptual system to actively adapt to changes in the external environment, thereby forming a human-machine collaboration mechanism led by the subject's agency. Professor Gu Riguo once stated, ‘Human daily communication is multimodal [9].’ In immersive environments, when audiences interact with virtual space through multiple sensory channels, true multimodal interaction can occur. In traditional scenarios, human perception is constrained by natural physical laws and remains in a passive state; modern immersive spaces, however, advocate combining ‘embodied’ and ‘transcendent’ modes of perception, actively breaking traditional physical limitations, encouraging participants to engage in cross-sensory and multi-level spatial exploration and communication, thereby creating a new type of mental domain.

Multisensory interaction in modern immersive spaces is not merely a simple accumulation of perceptual elements, but relies on carefully arranged sensory coordination mechanisms to achieve an immersive effect that unifies body and mind. Take the domestic animated film ‘Ne Zha’ [10] as an example: this movie integrates cutting-edge technologies such as artificial intelligence, audiovisual synchronization, 4D effects, and motion capture to create a highly realistic and engaging audiovisual environment. This example clearly demonstrates the key role of sensory coordination technology in enhancing immersive experiences and intuitively illustrates how modern immersive space design achieves cross-sensory mind-body connectivity through technological integration.

3.3. Participation in Progressive Depth Levels

From the perspective of participation depth, traditional spaces mostly rely on visual perception, exhibiting one-way and passive cognitive characteristics. In contrast, modern immersive spaces are designed around the core concept of integrating embodied interaction with disembodied contexts. This design approach significantly changes the role of the viewer, transforming them from passive observers into active participants.

This concept is vividly reflected in the currently popular topic of museum cultural transformation, ‘bringing museums to life.’ The key purpose of ‘revitalizing’ museums is to create an emotional connection between cultural relics and the audience, promoting the integration of historical and cultural values with modern ideas, achieving a profound shift from traditional static displays to immersive interactive experiences. Many museums are now actively adopting cutting-edge technologies such as holographic projection, digital twins, 3D modeling, and motion capture to innovatively integrate various resources, including historical artifacts, featured exhibits, and natural landscapes. By enhancing the interactivity of exhibitions and public engagement, they improve visitors’ overall perception of museum culture. Technological innovations have continuously driven updates in museum display formats, spatial layouts, and visual presentation techniques, greatly altering the characteristics of visitors and the ways they interact. Modern immersive space design treats technological innovation as its driving force. By combining embodied and disembodied perceptual mechanisms, it breaks through the inherent limitations of traditional design concepts in terms of interactivity. It fully stimulates the audience’s sense of agency and creative potential, enhances emotional resonance and depth of participation, and forms a new immersive experience model that goes beyond traditional frameworks.

4. An Empirical Study on the Integration Strategies of Embodied and Disembodied Perception in Modern Immersive Spaces

In the context of traditional spaces, the misalignment between embodied and disembodied modes of perception has long been a major topic of academic discussion. This paper first provides a theoretical definition of embodied and disembodied perceptual modes and finds that the two are not entirely opposed, but rather mutually reinforcing and complementary. The former provides the latter with a basis in reality, while the latter enriches the categories in which the former can be applied. Their integration can alleviate perceptual imbalances and facilitate a dynamic balance between ‘presence’ and ‘transcendence.’ However, in current immersive spatial design, deep integration of the two still faces issues, such as the simple separation of virtual and physical spaces leading to fragmented experiences, cognitive subjects passively receiving information, overlapping information, or stimuli limited to a single sense. These drawbacks, in turn, lead to a dispersion of attention by the cognitive subject, resulting in fragmented situational perception, rigid interaction patterns, and lack of feedback. This exacerbates the gap between the two and hinders the cognitive subject from moving from superficial interaction to deep understanding.

In response, this article proposes three key integration strategies. First, in terms of spatial positioning, it weakens the boundaries between reality and virtuality to achieve an immersive experience of “harmony between humans and nature.” Merleau-Ponty once suggested that the interaction between bodily space and virtual reality space constitutes a “situated spatiality” [11]. This theory posits that spatial perception is a product of the interaction between the body and the environment, and weakening the boundary between real and virtual spaces can dissolve the divide, providing viewers with a fully harmonious and integrated immersive experience. For example, the 2025 domestic VR project “Xiaoyao Wudang” uses high-precision motion capture and positioning devices to synchronize user movement with virtual displacement, enhancing human-computer collaboration. Second, in sensory channels, it achieves multi-sensory interaction and builds a multimodal coordination mechanism,

integrating multiple perception channels to concretize abstract out-of-body information and realize a cognitive loop of “multi-sensory linkage—meaning construction.” For instance, “Only in Henan: Drama Fantasy City” integrates multimodal technology to transform historical culture into embodied experiences, greatly enhancing viewers’ sensory experience. Finally, in terms of depth of participation, it establishes a stepwise narrative logic to stimulate viewers to engage more deeply. Relying on Marzano’s progressive theory of the “New Taxonomy of Educational Objectives” [12], it guides viewers to explore layer by layer. For example, the Japanese teamLab Planets art exhibition creates a progressive experience, facilitating a shift from physical contact to emotional connection, thereby deepening the viewers’ level of engagement.

Based on the above three major strategies, this paper constructs a macro-level “Three-Dimensional Dynamic Integration Model” perception system (Figure 3). The system is designed according to a practical framework of “boundless virtual-reality—multidimensional sensory—progressive participation,” using advanced immersive technologies to create an initial environment where virtual and real elements interweave, and employing a multimodal sensory collaboration mechanism to further enhance the user’s sense of engagement. At the narrative construction level, the system progressively deepens the interaction layers, prompting users to shift from passive recipients to active constructors, continuously adjusting key numerical elements based on behavioral data, forming a closed-loop self-adaptive process. This achieves a dynamic balance between the user’s physical immersion experience and the spatial expansion function, providing both practical reference and theoretical support for immersive space design.

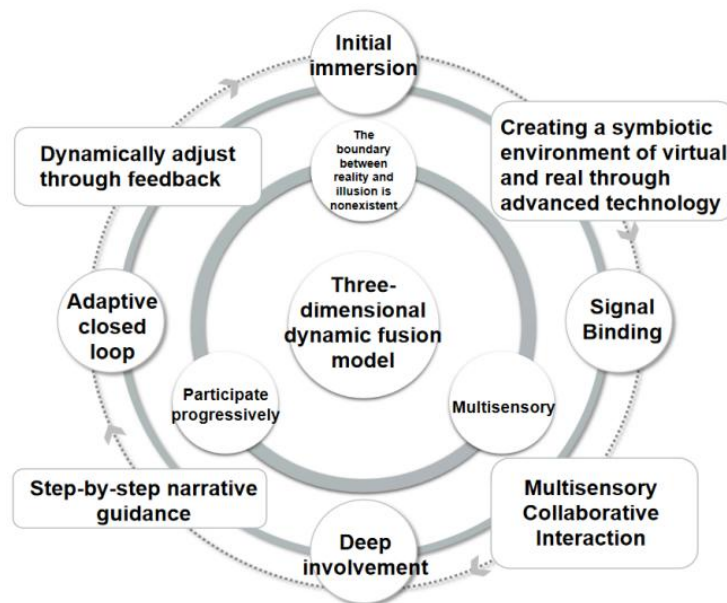


Figure 3. ‘Embodied’ and ‘Disembodied’ Perception Three-Dimensional Dynamic Fusion Model.

5. Conclusions

Digital intelligent technology is gradually breaking the boundaries between physical and digital spaces, blending embodied and disembodied perception, and bringing new vitality to immersive space design. Modern immersive spaces rely on intelligent interactive systems to create a dynamic connection between user behavior and virtual environment feedback. This addresses the problem of the ‘disconnect between

knowledge and action’ in traditional immersive experiences, enabling individual behavior to align with deep cognition. This innovative integration not only overcomes the technical limitations of traditional space design but also brings breakthroughs in various aspects, providing cutting-edge theoretical support and operational guidance for immersive space design.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

- [1] On March 5, 2025, Premier Li Qiang, on behalf of the State Council, delivered the “Government Work Report” at the third session of the 14th National People’s Congress.
- [2] Hu, Z.L. Discussion on the Theory of Embodied Cognition——A Brief Introduction to Littlemore’s “Metaphor in Thought: The Origins of Embodied Metaphor Variation”. *Chinese Foreign Languages*, 2025, 22(03), 32-36.
- [3] Zhou, Q.; Liao X.G.; Jiang, M. The “Seven Deadly Sins” of Embodied Cognition. *Advances in Psychology*, 2019, 39(04), 314-319.
- [4] Xu, S. I Think: Subject and Its Situation——From Descartes to Merleau-Ponty. *Social Sciences*, 2011, 09, 131-137.
- [5] Zhang, J.J.; Ma, L.J. The Thought of Embodied Cognition in Marx and Engels and Its Value. *Journal of South China Normal University (Social Science Edition)*, 2013, 05, 93-105, 208.
- [6] Liu, L.H. Embodied Cognition Thought in Piaget’s Epistemology. *Studies in Philosophy of Science and Technology*, 2014, 31(01), 51-55.
- [7] Zhao, K. Research on Service Strategies for Migrant Elderly in Urban Community Libraries Based on the Spirit of Place Theory——Taking Beijing Communities as an Example. *Library*, 2023, 07, 105-111.
- [8] Sun, J.X. The Internal Logic of Immersive Tourism “Winning Over” Young People. *People’s Forum*, 2025, 09, 88-91.
- [9] Gu, Y.G. Analysis of Multimedia and Multimodal Learning. *Foreign Language Electric Teaching*, 2007, 02, 3-12.
- [10] Li, Y. Innovative Practice of Synchronized Sound and Picture Technology in “Nezha: The Devil Child Breaks the Sea” for Immersive Experience in Animated Films. *Film Literature*, 2025, 10, 141-146.
- [11] Su, X. On the Mind-Body Integration Mechanism in VR Painting Spaces——A Study of Spatial Phenomenology Based on Merleau-Ponty. *Literary Theory Research*, 2021, 41(05), 148-156.

- [12]Jiang, S.L.; Lin, S.H. Self-Awareness and Deep Internal Cultivation: Research on the Inner Support System for the Leapfrog Professional Growth of Master's-Level Normal Students——From the Perspective of Marzano's Cognitive Objectives Taxonomy. *Teacher Education Research*, 2025, 37(01), 69-76.



© 2025 by the author(s); licensee International Technology and Science Publications (ITS), this work for open access publication is under the Creative Commons Attribution International License (CC BY 4.0). (<http://creativecommons.org/licenses/by/4.0/>)