The Improvement Effect of Interactive Digital Devices on Audience Participation Experience

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Abstract

To apply interactive digital devices to the audience participation experience in exhibition scenarios, firstly, the limitations of traditional exhibition modes were analyzed, and the inherent defects in interaction, information transmission, immersion and personalized services were clarified, which laid a realistic foundation for exploring the improvement path of audience participation experience. Then, the implementation paths of interactive digital devices to improve audience participation experience were elaborated from four aspects: two-way interaction mechanism, multi-modal information presentation, low-threshold operation and personalized scene design. Finally, the improvement effects of interactive digital devices on audience participation experience were summarized from the transformation of participation mode, optimization of information reception, upgrading of immersive experience and optimization of experience texture. The research results can provide theoretical reference and practical paths for immersive exhibitions, new media art creation and pavilion interaction design.

Keywords

Interactive digital devices, audience participation experience, immersion.

1. Introduction

The continuous integration of digital technology and art exhibition has made audience participation experience a core indicator for measuring exhibition effects. Relying on real-time response, physical intervention and multi-sensory linkage, interactive digital devices reconstruct the relationship between people and works. Traditional exhibition modes have shortcomings in interactivity, information transmission, immersive atmosphere and personalized services, which cannot meet the current demands of audience experience. This paper analyzes the internal logic and application effect of improving audience participation experience from four aspects: interaction mechanism, information presentation, operation threshold and scene customization, so as to provide a theoretical basis for the design and implementation of related fields.

2. Main Problems Existing in Current Audience Participation Experience

2.1. One-way Output of Traditional Exhibition Forms and Lack of Interaction in Passive Audience Acceptance

Traditional exhibitions rely on static displays, graphic explanations and video playback to complete one-way information output with fixed and closed transmission paths. Audiences can only passively receive content without real-time interaction with exhibits through physical movements, behavioral choices or sensory feedback [1]. Most participate as onlookers, and physical perception and subjective will are difficult to integrate into the exhibition process, unable to affect content presentation and narrative trend. One-way transmission suppresses

the demands for exploration and expression, reduces active perception and interest of experience, and participation only stays at shallow viewing without deep immersion. Long-term passive acceptance will weaken participation willingness. The overall experience lacks interactive texture, immersive atmosphere and profound memory, which is difficult to meet the modern audience's demand for immersive and intervention experience.

2.2. Single Information Transmission Mode and Weak Audience Understanding and Memory Effect

Information transmission of traditional exhibitions relies on single visual carriers such as words, pictures and display boards with solidified forms and linear logic, lacking multi-modal transformation and dynamic interpretation, which is difficult to adapt to audience cognitive laws. Complex information cannot be intuitively understood through static presentation, easy to increase cognitive burden with shallow understanding. Multiple perception channels such as hearing and touch cannot be mobilized, making it difficult to form sensory coordination and cognitive association, with vague information memory points and low retention rate. It cannot respond to audience interests and questions, and outputs uniformly according to the preset process, reducing information receiving efficiency, weakening knowledge transformation effect, and difficult to achieve the ideal goal of information transmission.

2.3. High Participation Threshold and Insufficient Audience Immersion

Traditional experience has complicated operation processes and obscure interaction logic, with high requirements for audience's technical proficiency and knowledge reserve. Lack of low-threshold guidance and real-time feedback makes most audiences unable to get started quickly, resulting in unsmooth participation [2]. Space design tends to long-distance viewing without the construction of enclosed fields, multi-sensory atmosphere and dynamic situations, which is difficult to retain audience attention. Distraction and early departure occur frequently with short average staying time. Without physical participation, real-time feedback and immersive scene wrapping, it is difficult to enter a focused state, failing to obtain immersion at sensory, emotional and cognitive levels. The experience is fragmented with poor content integrity and coherence.

2.4. Serious Experience Homogeneity and Difficulty in Meeting Personalized and Emotional Needs

Current exhibition content is highly identical with single forms and rigid processes, lacking differentiated design for different ages, interests and behavioral habits. All audiences receive the same content and experience the same process, and personalized demands are ignored for a long time. Experience links mostly stay at information transmission and surface display, lacking emotional narration, value resonance and humanistic care, which makes it difficult to establish a stable psychological connection with audiences and trigger emotional touch and deep identity. Homogeneous content cannot create exclusive experience marks. The lack of emotional elements further weakens experience texture and favorability, leading to low audience satisfaction and weak willingness to revisit, which is also one of the core shortcomings of traditional exhibition modes failing to meet current audience experience demands.

3. Realization Paths for Interactive Digital Devices to Improve Audience Participation Experience

3.1. Constructing a Two-way Interaction Mechanism

Interactive digital devices rely on motion capture, somatosensory recognition, touch sensing and real-time data feedback technologies to build a two-way interactive operation system and reshape the inherent mode of one-way information transmission in traditional exhibitions.

Audience's physical movements, gesture tracks, sight points and touch behaviors can be collected in real time, and body signals will be transformed into execution instructions for scene regulation [3]. Daily behaviors such as walking, waving and touching can drive content changes, and the body becomes the core medium connecting audiences and digital devices. Embodied cognition and body perception theory provide support for scene intervention, gradually breaking the onlooker state, and behavioral subjects can directly participate in experience construction. Self-operation can trigger real-time response at the content level, and low-delay design runs through the interaction process. Operation logic and judgment steps are simplified, the corresponding relationship between behaviors and screen changes can be clearly perceived, and a stable participation mode is formed. Behavior accumulation, multi-person linkage and dynamic generation mechanism are integrated into deep interaction links, and participation dimensions are continuously expanded. Single operation is retained and superposed in the form of data, acting on light and shadow effects, sound intensity, screen rhythm and narrative promotion rhythm. Individual behaviors realize superposition, collision and coordination in multi-person participation scenarios, and scene contents change dynamically accordingly, weakening the monotony caused by fixed processes. Visual, auditory and tactile feedback are integrated into a unified interaction system. Multi-sensory feedback channels run synchronously, and a technical bridge connecting audience behaviors and scenes is built. Behavior input, signal processing, content response and continuous feedback constitute the core of mechanism operation, forming a complete and recyclable interaction structure, providing reliable technical support and operation framework for audience participation (see Figure 1).

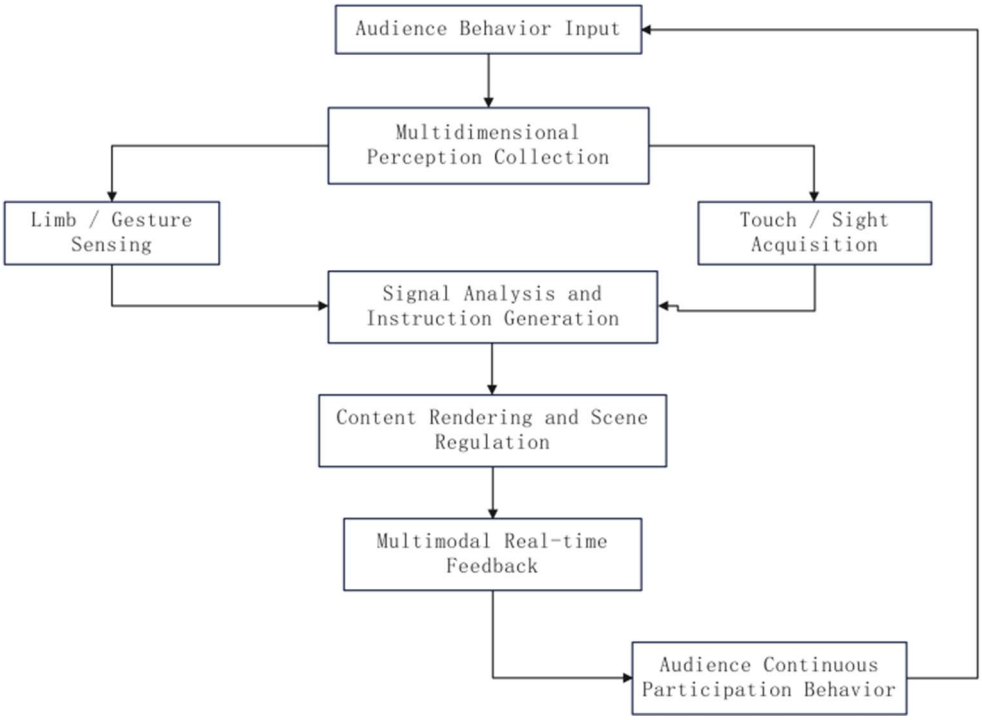


Figure 1. Flow chart of two-way interaction mechanism of interactive digital devices

3.2. Innovating Multi-dimensional Information Presentation

Interactive digital devices rely on multi-modal fusion, dynamic rendering and spatial projection to break the traditional exhibition's dependence on a single visual carrier and complete the reorganization and transformation of abstract, static and fragmented information. Words, data, images, 3D models and animations are incorporated into a unified scheduling system to realize fluid, situational and narrative presentation of content with the support of real-time calculation.

Complex concepts and internal logic are separated from the form of word-by-word interpretation, and intuitive display is completed through process simulation, time-space restoration and situation reproduction. Audiences can grasp the content structure in an immersive environment. Multiple sensory channels are activated simultaneously to form a multi-sensory information receiving mode of audio-visual-tactile coordination, conforming to modern cognitive habits [4]. Information presentation integrates narrative design, rhythm control and atmosphere creation. The system adjusts the content promotion speed according to the interaction progress and improves scene appeal at key nodes. Synesthesia design participates in content expression. Sound signals are transformed into visual forms, light and shadow changes are unified with scene rhythm, tactile feedback responds synchronously with screen content, and a multi-dimensional information transmission structure is built. Multi-channel integration and dynamic expression are different from traditional static displays, establishing a multi-dimensional connection path between content and audience, and enhancing the coherence and sense of scene in information transmission. Exhibition content can evolve in real time with audience behaviors. Information output is no longer limited to fixed time sequence and single form, and the overall communication is more flexible and adaptable. Technology integration, form transformation and rhythm control run through the entire presentation mode, providing audiences with multi-level and three-dimensional information receiving paths, promoting the transformation of exhibition scenes from passive viewing to active perception, and making information transmission more natural and closer to real experience scenes.

3.3. Lowering the Operation Threshold

Interactive digital devices rely on natural interaction logic, minimal operation process and visual guidance strategy to reduce audience participation difficulty from the source and broaden the coverage of applicable groups. Complex menus, multi-level instructions and redundant steps are eliminated, taking intuitive operation as the core. Audiences can smoothly participate in the experience process without prior learning. Non-contact sensing, automatic human body recognition and intelligent error correction technologies operate stably, automatically positioning audience positions, predicting behavioral intentions, reducing false touches, freezes and delays, and ensuring stable and smooth experience. Low-threshold design takes into account the elderly, children and groups with low proficiency in using digital devices. By simplifying operations, enlarging prompts, slowing down response rhythms and other forms, the inclusiveness and universality of the overall experience are enhanced. Space construction and content layout cooperate with each other to improve participation fluency. A fully wrapped field is built by means of circular screen projection, surround soundscape, dynamic lighting and ground interaction, shortening the psychological and physical distance between audiences and content. Stepped exploration nodes are set inside the content with continuous and real-time feedback mechanism to attract audience attention and extend staying time. Multi-sensory coordination and stable rhythm design interact to guide audiences into a stable and focused experience state without burden. The whole design focuses on four dimensions: operation simplification, technical support, space construction and content layout, weakening participation obstacles, improving process fluency, and providing stable, continuous, easy-to-use and high-comfort participation conditions for audiences of different ages, technical foundations and demand levels [5].

3.4. Creating Personalized Experience Scenarios

Interactive digital devices rely on intelligent perception, behavior collection and algorithm adaptation to build differentiated experience paths and weaken the homogeneity caused by standardized processes. Audience's moving speed, staying position, operation frequency and selection preference can be captured in real time. Behavior data are transformed into scene

regulation basis to dynamically adjust content difficulty, exhibition rhythm, scene style and interaction intensity, realizing high matching between experience content and individual characteristics. Classification configuration is completed for different ages, operation abilities and demand levels. Children can enjoy simplified processes and interesting visual and interactive feedback, adults can access in-depth content and diverse narrative options, people with slow movements can get longer response time and larger prompt interfaces, and frequent participants can experience faster content update rhythm to maintain the freshness of continuous exploration. Beyond the basic adaptation link, personalized expression space is further opened. Audiences can independently plan exploration paths, switch observation perspectives, save preference content and generate exclusive experience tracks. Participate in content construction through natural methods such as gestures, voices and physical movements, complete custom adjustment of scenes, rhythms and narrative trends, and endow the overall experience with unique marks. The algorithm system continuously records behavior data and iterates output strategies to optimize matching accuracy, make subsequent interactions fit usage habits, and form a dynamically optimized closed-loop mechanism. Personalized scenarios cover four levels: demand identification, real-time adaptation, independent creation and continuous optimization, breaking the unified content supply mode, weakening the limitation of one-size-fits-all traditional exhibitions, and providing more adaptable, demand-fitting and exclusive participation conditions for different audiences.

4. Improvement Effect of Interactive Digital Devices on Audience Participation Experience

4.1. Transformation of Participation Mode

Interactive digital devices reshape the audience's role positioning in the exhibition scene, promoting the transformation from passive acceptance to active participation and content co-creation. The real-time responsive interaction system can undertake audience's physical movements and behavioral choices, drive corresponding changes in exhibition content and scene forms, form a stable closed loop between behaviors and feedback, and arouse audience's participation awareness and exploration interest. The traditional mode of long-distance viewing is replaced by experience forms of physical intervention. Audiences can naturally integrate into exhibition narratives, and participation state transitions from shallow browsing to continuous immersion. Multi-person collaborative interaction expands the experience boundary. Individual behaviors converge into group interaction, and participation, autonomy and investment show a steady upward trend.

4.2. Optimization of Information Reception

Multi-modal and dynamic information presentation can reduce audience cognitive load and improve the understanding efficiency and knowledge transformation effect of complex content. Information transmission in traditional static display is relatively rigid. Interactive digital devices rely on audio-visual-tactile multi-sensory coordination, process simulation and situational interpretation to transform abstract information into intuitive and perceptible experience content, conforming to the cognitive habits of modern audiences. Information reception is separated from the linear and passive memory mode and unfolds naturally with interactive behaviors, with clearer memory anchors and more lasting information retention. This mode can strengthen the overall efficiency of information transmission and promote the transition of information reception from passive acceptance to active understanding.

4.3. Upgrading of Immersive Experience

Low-threshold and high-fluency interaction design and fully wrapped space construction can effectively improve audience immersion. Intuitive operation logic, real-time sensory feedback

and coherent content rhythm can help audiences quickly enter a focused state and reduce external interference and possibility of early departure. Multi-sensory linkage and dynamic scene construction can strengthen the on-site atmosphere. Audiences can form a stable sense of substitution at both psychological and physical levels, and the staying time and experience integrity are significantly improved. Compared with the fragmented and long-distance viewing form of traditional exhibitions, interactive digital devices can achieve multiple immersions at sensory, emotional and cognitive levels.

4.4. Optimization of Experience Texture

Personalized scene design based on behavioral data and intelligent adaptation effectively breaks the homogeneity and standardization limitations of traditional exhibitions. The system can dynamically adjust content rhythm and interaction intensity according to audience's age, operation habits and interests, providing more targeted experience paths for different groups. The opening of personalized expression and independent creation space enables audiences to obtain exclusive and memorable experience marks, enhancing psychological identity and emotional resonance. The integration of humanistic care and emotional narration further improves the experience temperature and satisfaction, and promotes the development of exhibition experience towards a more humanized, differentiated and high-quality direction.

5. Conclusion

Research shows that interactive digital devices, through the combination of technology and experience design, realize the comprehensive upgrading of audience experience from four aspects: participation mode, information reception, immersive experience and texture optimization. It breaks the one-way transmission barrier, strengthens physical intervention and emotional resonance, and makes the experience more profound, warm and unique. With the rapid development of digital media, interactive digital devices will continue to expand boundaries and continuously enhance the sense of participation, immersion and belonging. Future research can further combine intelligent algorithms and cross-media technologies to explore more natural and humanistic interaction forms, and continuously promote the evolution of exhibition experience towards high-quality, personalized and immersive directions.

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