

# The Practical Model of Public Art Participation in Community Aesthetic Education under the Digital Background

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**Abstract:** Digital technology has reshaped the internal logic of public art participation in community aesthetic education. Traditional community aesthetic education is limited by fixed carriers and the indoctrination method of fixed time and place, whereas digital technology endows public art with interactivity, programmability, and distributed existence, thereby embedding aesthetic information into residents' daily touchpoints and extending aesthetic education into a continuous experience within the life stream. This study proceeds from three levels: theoretical correlation, communication mechanism, and integration model. It analyzes the bidirectional expansion of the digital attributes of public art on the connotation of community aesthetic education and the paradigm shift in the mode of reception from physical perception to virtual presence. It examines the perceptual channels, adaptation paths, and generation of the aesthetic community constructed by interactive interfaces, algorithmic distribution, and asynchronous co-presence. Furthermore, it proposes an integrated model that encompasses digital twin resource topology, chain generation of cross-media narrative, and dynamic feedback adaptive regulation. The research reveals that digital community aesthetic education is transforming from a preset one-way output into a responsive co-evolutionary system, with its core lying in the dynamic balance between aesthetic supply and community demand.

**Keywords:** Digital Background; Public Art; Community Aesthetic Education; Digital Twin; Cross-media Narrative; Adaptive Regulation

## Introduction

Digital technology is restructuring the existing form of public art and the operational foundation of community aesthetic education. The traditional model relies on fixed artworks and residents' conscious presence, and its mode of reception is mainly one-way static perception. In contemporary society with enhanced information mobility, fragmented activity trajectories and diversified time allocation make sustained attention and focused presence difficult to achieve universally. The conditions provided by digital technology, such as interactive interfaces, algorithmic distribution, and virtual presence, create the possibility of reconstruction for public art participation in community aesthetic education. A systematic examination of the intrinsic correlation, communication pathways, and integration logic between the two holds theoretical necessity. This study aims to clarify the ways in which digital attributes expand the connotation of community aesthetic education, to reveal the perceptual channels and adaptation paths within the communication mechanism, and to construct an integrated framework encompassing resource topology and adaptive regulation, thereby providing a systematic explanatory model for community aesthetic education in the digital era.

## 1. Theoretical Correlation between Public Art and Community Aesthetic Education in the Digital Context

### 1.1 The Expansion of the Connotation of Community Aesthetic Education by the Digital Attributes of Public Art

Digital technology endows public art with new attributes such as interactivity, programmability, and distributed existence, and these attributes break through the limitations of traditional public art in terms of physical carriers and one-way communication. In the community context, public art is no longer

confined to fixed sculptures or murals; instead, it embeds aesthetic information into multiple touchpoints of residents' daily activities through media such as sensors, projection mapping, and mobile terminals. This embedding method extends the occurrence of aesthetic education from specific viewing moments to a continuous experience within the life stream, thereby changing the indoctrination logic of community aesthetic education that originally relied on fixed time, fixed location, and fixed content.

The connotation of community aesthetic education therefore gains a bidirectional expansion: on the one hand, digital public art can respond to residents' active operations and generate differentiated aesthetic feedback, thereby turning aesthetic education from "receiving established works" to "participating in the co-construction of meaning"; on the other hand, digital public art can connect multiple community nodes through network protocols to form cross-regional aesthetic dialogues, expanding the boundary of community aesthetic education from physical neighborhoods to virtual communities. This expansion is not a simple media superposition; instead, it restructures the element structure of aesthetic education: the boundaries among creators, works, recipients, and spatial environment tend to become blurred, and thus community aesthetic education gains greater adaptability and generativity.

### ***1.2 The Reconstruction Logic of the Aesthetic Education Function of Community Space in Digital Media***

The aesthetic education function of traditional community space relies on the visual order of architectural forms, landscape arrangements, and public facilities, and its mechanism of action is mainly static perception and indirect suggestion. After the intervention of digital media, community space is transformed into a programmable interactive interface: walls, floors, public screens, and even sound fields can all carry dynamically changing artistic content. This transformation means that the triggering of the aesthetic education function no longer depends on fixed aesthetic objects but on the information flow in the space and the real-time interactive behaviors of residents, and the space itself becomes the active carrier of the aesthetic education process<sup>[1]</sup>.

The reconstruction logic manifests itself in three progressive levels. The first level is the reconstruction of spatial cognition: digital public art, through augmented or virtual superimposition, enables residents to engage in defamiliarized observation of their daily routes, thereby stimulating aesthetic attention. The second level is the reconstruction of functional temporality: community space can call upon different digital art contents at different time periods, corresponding to the aesthetic education needs of various social activities in the morning, afternoon, and nighttime, thus achieving a temporal differentiation of functions. The third level is the reconstruction of participatory relationships: residents' touches, voice commands, or mobile device linkages to the digital public art write back into the aesthetic education parameters of the space, transforming the space from a "container of indoctrination" into a "field of co-construction." These three levels of reconstruction jointly shape a paradigm shift in the aesthetic education function of community space from static giving to dynamic negotiation.

### ***1.3 From Physical Perception to Virtual Presence: The Paradigm Shift in the Reception Mode of Aesthetic Education***

Physical perception relies on the body's displacement, gaze, and close contact in physical space, and its aesthetic reception is characterized by immediacy, embodiment, and irreproducibility. In the digital context, public art establishes a virtual presence channel for aesthetic education through virtual reality, augmented reality, and telepresence technologies. Virtual presence does not require the recipient's physical body to arrive at a specific location; instead, it creates a sense of aesthetic presence in the digital interface through sensory simulation and interactive feedback. This transformation makes the reception of community aesthetic education no longer constrained by residents' time conflicts, mobility limitations, or geographic distance.

The core of this paradigm shift lies in the change in the generation logic of aesthetic experience. In physical perception, the experience originates from the actual distance and material texture between the work and the body; in virtual presence, the experience originates from the precise modulation of perceptual channels by digital models and the user's active choices. The recipient of community aesthetic education can enter the virtual community space constructed by public art from any terminal, participate in aesthetic activities from the perspective of an avatar, and even interact synchronously

with other recipients in different time and space. This reception mode dissolves the binary opposition between “audience” and “work” and replaces it with a continuum of “participant-environment.” At the same time, virtual presence retains embodied characteristics: motion-sensing devices, spatial audio, and tactile feedback keep the body at the center of the aesthetic experience, only with the material boundary of the body being penetrated by digital information. This transformation does not negate the value of physical perception; instead, it provides a parallel and complementary aesthetic education path, significantly expanding the accessibility and depth of participation in community aesthetic education.

## **2. The Communication Mechanism of Community Aesthetic Education through Public Art under the Intervention of Digital Technology**

### ***2.1 Interactive Interfaces and Immersive Experience: The Perceptual Channels of Digital Public Art***

Interactive interfaces serve as the technical mediators between digital public art and community recipients, and they determine the conversion efficiency of aesthetic education information from the artwork system to the human perceptual system. In community contexts, common interactive interfaces include touch screens, motion-sensing detectors, voice interaction devices, and mobile applications. These interfaces are not neutral transmission channels; their response sensitivity, feedback modalities, and operation logic directly affect the depth of residents’ reception of artistic information. When an interface can parse the user’ s movement trajectory or voice commands in real time and drive the corresponding changes in digital art content, the perceptual channel upgrades from one-way visual or auditory reception to a closed-loop perception-action cycle, thereby enhancing the continuity of aesthetic attention and the sense of participation<sup>[2]</sup>.

Immersive experience is built upon the synergistic activation of multimodal perceptual channels. Digital public art constructs an enveloping aesthetic field through high-resolution projection, surround sound fields, tactile vibration feedback, and even ambient temperature regulation. In such a field, residents’ daily spatial perception is temporarily suspended and replaced by the perceptual rules set by the digital art. The intensity of the immersive experience depends on the degree of synchronization and consistency among the perceptual channels: if visual, auditory, and tactile information conflict or lag, the experience breaks down immediately. The precise modulation of perceptual channels by digital public art enables community aesthetic education to no longer rely on the indoctrination of language or text; instead, it accomplishes the penetration of aesthetic consciousness by directly reshaping residents’ sensory experiences.

### ***2.2 Algorithmic Distribution and Community Cultural Genes: The Precise Adaptation Path for Aesthetic Education Content***

The algorithmic distribution mechanism collects, clusters, and predicts residents’ aesthetic behavior data, and then it pushes public art content to different individuals or groups in a targeted manner. In the process of community aesthetic education, the algorithm constructs an aesthetic interest model based on behavioral traces such as residents’ dwelling time, interaction frequency, and work preferences. This model then matches the content tagging system of public art, thereby determining which type of digital artwork is presented at a specific time and in a specific spatial location. This distribution method differs from the “fixed display” of traditional public art; it endows aesthetic education content with the ability to adjust dynamically, and it improves the degree of fit between artistic information and the aesthetic expectations of recipients.

Algorithmic distribution must perform computable feature extraction on community cultural genes to achieve precise adaptation. Community cultural genes refer to the stable structure of aesthetic preferences, symbolic preferences, and perceptual habits formed by a group of residents through long-term cohabitation. For example, if a community shows a general preference for natural forms, warm colors, and slow rhythms in its interaction data, the algorithm will prioritize the distribution of digital public art works with these characteristics. It is worth noting that this adaptation is not simply a matter of catering to preferences; instead, it creates aesthetic defamiliarization through moderate deviation from expectations, thereby introducing new aesthetic experiences while maintaining reception comfort. The essence of the precise adaptation path lies in establishing a dynamic balance between the stability of community cultural genes and the novelty required by aesthetic education.

### ***2.3 Asynchronous Co-presence and Emotional Bonding: The Generation of the Community Aesthetic Community in Remote Participation***

Asynchronous co-presence refers to a perceptual state in which different residents, at different points in time, share the same aesthetic event or aesthetic space through the mediation of digital public art. In traditional community aesthetic education, residents must appear simultaneously in the same physical location to obtain a sense of co-presence. Digital public art breaks this limitation: a public artwork can play in a loop for seven days, with different residents interacting with it at different time periods, and their operation records, comments, or generated artistic variants are saved by the system and displayed to later viewers. Later viewers see the traces of interaction left by previous participants and thus generate a sense of co-presence across time. This asynchronous co-presence enables community aesthetic education to no longer rely on the instantaneous aggregation of the collective; instead, it constructs a continuous aesthetic dialogue in an accumulative manner<sup>[3]</sup>.

Emotional bonding takes shape on the basis of asynchronous co-presence. The digital public art system can record residents' emotional responses to the artwork (such as through heart rate sensors, facial expression recognition, or active ratings), and it then presents these emotional data in a visualized form on community public screens. When one resident sees that another resident expressed a similar emotional response to the same artwork three days earlier, an implicit emotional bond is established between the two individuals. This bond does not rely on verbal communication or face-to-face contact; instead, it is based on a shared emotional experience of a common aesthetic object. As the number of participants accumulates, these implicit emotional bonds gradually weave together into a community aesthetic community—a loose yet genuine group structure grounded in aesthetic resonance and mediated by digital public art. The generative logic of this community provides a new form of social support for community aesthetic education in the digital context, which is distinct from physical aggregation.

## **3. The Integrated Model of Community Aesthetic Education Empowered by Digital Public Art**

### ***3.1 The Topological Network of Community Aesthetic Education Resources under the Digital Twin Framework***

Digital twin technology constructs a virtual mirror space parallel to the physical community through high-precision three-dimensional modeling of the community's physical space and real-time data mapping. Under this framework, the public art resources within the community—including permanent installations, temporary exhibitions, architectural interfaces, natural landscapes, and aesthetic elements spontaneously created by residents—are digitized into data units that can be tagged, retrieved, and recombined. Each unit carries metadata such as location coordinates, morphological descriptions, interaction attributes, and historical access records, thereby forming a digital asset library of aesthetic education resources. This twin mapping enables the originally dispersed, heterogeneous, and difficult-to-quantify community aesthetic education resources to obtain a unified operational foundation<sup>[4]</sup>.

Based on the digital twin, the constructed topological network of aesthetic education resources treats the above-mentioned data units as nodes and takes residents' movement paths, gaze trajectories, and interactive behaviors in both virtual and physical spaces as edges, thereby forming a dynamic resource association structure. The characteristic of the topological network lies in the fact that the connection strength between nodes is not fixed; instead, it updates continuously with the actual occurrence of residents' aesthetic activities. When a resident clicks on the detailed information of a public artwork in the virtual mirror, the system establishes a weighted connection between the node of that artwork and the node of the resident's preference. When multiple residents show similar access patterns to aesthetic education resources, clustering associations also emerge among the relevant resource nodes. This topological network breaks through the hierarchical limitations of traditional resource classification systems, allows for unexpected resource combinations and cross-category jumps, and thus provides community aesthetic education with resource accessibility and recombination flexibility far beyond the constraints of physical space.

### ***3.2 The Chain Generation of Community Aesthetic Experience Driven by Cross-media Narrative***

Cross-media narrative refers to the process in which the same aesthetic core migrates, extends, and intertextually relates across different media platforms. In the context of community aesthetic education, the core narrative of a digital public artwork can be simultaneously presented on outdoor screens, mobile applications, wearable devices, and soundscape installations, and each media version does not simply duplicate the original; instead, it provides differentiated narrative fragments according to the characteristics of the medium. Residents encounter multiple sections of the same narrative through different media at different times and in different scenarios, and they gradually piece together a complete aesthetic image. This cross-media distribution transforms aesthetic experience from a one-time event into a continuous process that permeates residents' daily lives.

The chain generation describes the accumulation and triggering mechanism of this aesthetic experience in the time sequence. When a resident encounters a preview segment of a digital public artwork on a mobile device, his or her aesthetic expectation becomes activated. Subsequently, when the resident sees the complete projection of the same series of works in the community square, the aesthetic experience reaches its peak. Afterward, when the resident sees other residents' interpretations and secondary creations on the community forum, the aesthetic understanding deepens. Finally, the resident may actively participate in a new round of creation of the narrative, thereby becoming a reproducer of aesthetic education. Each link in this chain relies on the accumulation of experience from the previous link, and it simultaneously provides the cognitive and emotional foundation for the subsequent links. The chain generation driven by cross-media narrative transforms community aesthetic education from isolated aesthetic events into an experience sequence with intrinsic logical connections, and it significantly extends the duration and penetration depth of the aesthetic education effect<sup>[5]</sup>.

### ***3.3 An Adaptive Regulation Model for Community Aesthetic Education Effects Based on Dynamic Feedback***

The dynamic feedback mechanism is built upon the real-time collection and processing of residents' behavioral data in the community aesthetic education system. These data include residents' interaction frequency with public art works, dwelling time, operation types, emotional response indicators, and subsequent spontaneous sharing behaviors. The system continuously obtains the above data through sensor networks and terminal logs, and it fuses multi-source heterogeneous information into quantifiable aesthetic education response indicators. Unlike static evaluation, dynamic feedback does not rely on periodic questionnaires or external assessments; instead, it captures the state changes of recipients in real time during the aesthetic education process, thereby forming feedback signals with high temporal resolution.

The adaptive regulation model takes the dynamic feedback signals as input and the parameter adjustment of aesthetic education content as output. The model has built-in aesthetic response thresholds and regulation algorithms: when the system detects that the interaction popularity of a public artwork has significantly decreased, or that the average dwelling time has fallen below the set interval, the model determines that the match between the current content and the community's aesthetic needs is insufficient, and it automatically triggers content replacement, interactive interface optimization, or narrative rhythm adjustment. Conversely, when a certain type of work elicits strong emotional responses and frequent sharing behaviors, the model increases the distribution weight of similar works or extends their display period. This regulation is not a fixed execution of rules; instead, it continuously fits the response patterns of the community aesthetic education system based on machine learning, allowing the regulation strategy to evolve dynamically with the evolution of community cultural genes. The core value of the adaptive regulation model lies in its transformation of community aesthetic education from a preset one-way output into a responsive co-evolutionary system, maintaining a dynamic balance between aesthetic supply and community demand without relying on external instructions<sup>[6]</sup>.

## **Conclusion**

This study has systematically examined the operational logic of public art participation in community aesthetic education under the digital background from the dimensions of theoretical correlation, communication mechanism, and integration model. At the theoretical level, digital

attributes enable public art to break through the limitations of physical carriers and one-way communication; the connotation of community aesthetic education shifts from “receiving established works” to “participating in the co-construction of meaning”; the aesthetic education function of space shifts from static giving to dynamic negotiation; and the reception mode expands from physical perception to a parallel path of virtual presence. At the communication mechanism level, interactive interfaces and immersive experience construct a closed-loop perception-action cycle; algorithmic distribution achieves a dynamic adaptation between aesthetic education content and community cultural genes; and asynchronous co-presence and emotional bonding give rise to a community aesthetic community grounded in aesthetic resonance. At the integration model level, the resource topological network under the digital twin framework breaks through the hierarchical limitations of traditional classification systems; cross-media narrative drives the chain generation of aesthetic experience; and the adaptive regulation model based on dynamic feedback endows the aesthetic education system with the capacity for responsive co-evolution. Based on the above findings, future research can further explore the differences in the aesthetic education effects of digital public art in different types of communities and their moderating variables, integrate multimodal perceptual data such as eye tracking and galvanic skin response for quantitative assessment of aesthetic education effects, investigate the interaction mechanisms between the virtual aesthetic community and the physical community structure, and develop adaptive algorithm models for community aesthetic education and test their response characteristics to different cultural genes in simulation environments. The advancement of the above directions will deepen the theoretical construction and technological realization of public art participation in community aesthetic education under the digital background.

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