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Retraction

Retracted: User Experience Perspectives on the Application of Interactivity Design Based on Sensor Networks in Digital Museum Product Display

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] J. Zhang, "User Experience Perspectives on the Application of Interactivity Design Based on Sensor Networks in Digital Museum Product Display," *Journal of Sensors*, vol. 2022, Article ID 8335044, 12 pages, 2022.

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Research Article

User Experience Perspectives on the Application of Interactivity Design Based on Sensor Networks in Digital Museum Product Display

Jingqiu Zhang

Department of Visual Communication Design, Huizhou University, Huizhou, Guangdong 516007, China

Correspondence should be addressed to Jingqiu Zhang; maka2019@hzu.edu.cn

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This paper designs a model of interactivity design in digital museum product display, constructs a sensor network model, and tests the sensor network-based interactivity design in digital museum product display under the perspective of user experience. This paper makes a museum user experience model based on sensory, behavioral, cognitive, and emotional experiences; establishes a user experience design framework; conducts specific theoretical analysis and research from four aspects; uncovers specific factors affecting museum user experience; analyzes the impact of each experience factor on user system design and possible design entry points; and proposes corresponding user system design strategies to guide subsequent design practice sessions. This paper also completes the hardware circuit and PCB board design of the wireless sensing node based on the CC2430 chip as the core. Tomcat WEB server and J2EE-based Spring MVC Web development framework are used as the leading implementation technology to complete the functions of real-time data query, network parameter setting, and historical data storage. The ideographic practice of visual representation of the digital museum is discussed around its optical system. Knowledge-based model dominates the digital museum representation, and examining the complex constitutive processes and characteristics of images involves not only the production of discursive order but also the production of presentation contexts as well as virtual spaces, which construct a new visual presentation of digital museums. However, the virtual representation practice of digital museums still has paradoxes, the absence of the sense of experience and the flatness of the virtual space, in which the audience cannot have a visual experience under this presentation.

1. Introduction

With the rapid advancement of innovative technology, artificial intelligence technology is entering our daily life and learning work. From a broader perspective, the fourth industrial revolution, based on artificial intelligence, quantum technology, clean energy, and biotechnology, is reshaping our lifestyles and communication patterns. Especially under the new concepts of "Internet+" and "Smart+," artificial intelligence technology is gradually impacting the traditional production mode. Extensive data analysis, cloud computing, intelligent logistics, innovative products, and other fields are expanding, forming a picture of the Internet of everything. Technological innovation drives the development of human business activities, production life, self-needs, and way of thinking [1]. The rational use of artificial intelligence technology in the visual experience of modern pavilions is the driving force behind this research. The contemporary pavilion is essentially a new communication orientation, which breaks the one-way communication path in the traditional sense, enriches the expression of the modern pavilion, and expands the interaction trend of visual design through the guidance of intelligent processing technology and the interactivity of human and machine [2]. It realizes the accessibility of display content and the diversity of visual experience, aims to achieve the effective dissemination of information and culture, and enhances visual communication from the spiritual level of people as much as possible. In the traditional exhibition hall display, the amount of information disseminated by culture has certain limitations. The display is primarily a two-dimensional flat display; the audience can only passively receive information through the display content; and the degree of data received cannot be controlled. The audience can only passively receive information through the display content, and the degree of information received is not controllable; both the visual and interactive aspects have a poor experience. However, the exhibition hall, under the perspective of artificial intelligence, uses new technology and new interactive means and creates an atmosphere of the exhibition hall and a new exhibition space [3]. Through the application of intelligent technologies such as virtual and reality technology, image capture, and cloud intelligence, we adopt a visual design language that conforms to the form to create a modern pavilion that meets the audience's experience, enhances the sense of novel and flexible visual experience, and presents it to the audience with a more intelligent graphic design.

In terms of the current research environment and development history, the research areas of WSNs can be broadly categorized into the following significant aspects: localization techniques, network coverage, data fusion, network security, and network topology; the research in this thesis focuses on the essential element of network coverage [4]. One of the critical references to measure the overall network quality of service (Qo S) is the degree of coverage. Due to the rapid development of the times, museums need to establish and promote civilization in addition to the primary mission of acquiring, storing, and promoting collections. With the rapid rise of the economy and the abundance of material existence, people have come to value spiritual and intellectual advancement [5]. Access to information and culture has become increasingly urgent, driving the emergence of many new industries. Museums, as places of civilization and education, have also begun to explore the growth paths of the new era. Under the effect of objective and subjective reasons, the demand for optimization of exhibition expression has become more robust. Under this influence, the museum's exhibition ideas and methods of conveying information are also different. Its main body changes from exhibits to audiences, and the resulting interactive design expression language is more integrated into the museum exhibition design [6]. Thanks to the development of the times and the progress of technology, museums can apply many theories and skills to respond to the needs of the audience in a more diversified manner and improve the effectiveness of museum displays by upgrading the display mode to complete the communication between the subject and the object in the exhibition process.

The economic form of today's society has transitioned from the era of product economy and service economy to the age of experience economy. Under the background of the experience economy, people's needs are further transformed into experiential requirements, and experience design is born, and gradually penetrates various fields related to people's production and life, and is widely used in the Internet, communication, education, and research, media, marketing, and other fields [7]. Unlike traditional product design, which focuses on "things" and pursues the functionality and aesthetics of products, the main object of experience design is the user. The design goal is not to provide products but a stage for the user to experience. Consumers get emotional and psychological satisfaction in using and paying for the whole experience process, which becomes the product in the experience design process. When the process is over, the experience will remain in the mind of consumers for a long time to facilitate brand communication and subsequent consumption [8]. The concept of experience coincides with the user's pursuit of personalization and is recognized by more and more consumers. As a public place to showcase human spiritual culture, museums are not only to learn a specific history but also for the deep-seated need to seek psychological pleasure and emotional resonance, to have a wonderful and memorable experience. Therefore, in the development of museums, applying the concept of experience design to attract visitors has become the inevitable development direction of museums.

2. Related Works

The application of interactive design in museum exhibition design gives a clear advantage over traditional museum exhibitions. In digital museums, information technology is a means to provide people with different visiting experiences through flexible use of these technologies [9]. There are many types of these technologies, such as virtual reality, augmented reality, infrared sensing and sound control technology, and holographic projection technology. Their application can not only eliminate the limitations of space but also eliminate the limitations of the interface so that the location and space do not bind the exhibition, and people can also interact with the exhibits to enhance; this connection exists not only at the physical level, but also at the psychological level [10]. In the virtual digital museum, the online digital museum APP, which uses intelligent mobile devices as interactive terminals, can be realized by displaying high-definition zoomable collection maps, three-dimensional displays of collections, voice explanations, and other means. The research on interaction design and user experience has started late and lags in knowledge and creativity [11]. Since not much attention has been paid to interaction design and user experience, there are few professional research institutions. The interaction design majors in colleges and universities have emerged gradually only in the past ten years, and the design of related professional courses is not perfect. People's attention to interaction design and user experience is also because the concept of service design has been popularized in the market in the past ten years, and people realize that the experience brought by a brand's service to users can directly affect the sales of products and even the reputation of the brand [12]. A museum exhibit is a service to the visitor, and the visitor only needs a short time to judge whether he is interested in a particular story behind it. A single visit can influence whether he will continue to be willing to learn about related types of exhibits in the future.

In layman's terms, a digital museum is a museum that is presented using digital methods. Digitization refers to processing museum-related text and image materials, artifacts, and sites through computer networks and other technologies and integrating them for dissemination and sharing as media resources [13]. Compared with physical museums, the construction of digital museums relies on computer network technology and virtual reality technology, which have significant advantages in displaying collections and simulating ancient scenes. The diverse digital exhibits are conducive to protecting and preserving cultural heritage, and the virtual locations allow people to experience realistic historical images. In addition, digital museums can also play a better role in cultural dissemination and information sharing. Digital museums are an extension of physical museums. As the information industry grows and historical and cultural heritage becomes increasingly essential, digital museums also develop rapidly; they have achieved excellent theoretical and practical research results. Park K T et al. affirm the importance of authentic experience and independent inquiry in museum learning by observing participants' performance [14]. Huang C L et al.'s study found that students' interest and confidence in education were stimulated by participating in museum interpretation activities [15]. Pavithra A et al. analyze and explore the development of digital museums from the perspective of resources and users [16]. Also, in the measurement and evaluation of museum education, there are pre- and post-tests, interviews, clinical interviews, concept maps, and other measurement methods to measure the effectiveness of respondents' learning, their perceptions and interests in digital museum resources, and visitors' behaviors in exploring the learning process, leading to the analysis of the use of digital museum resources and the effectiveness of learners' learning.

In terms of user experience service, user experience is a part of product design, interaction design, or service design research, which focuses on the actual feeling that occurs when the experiencer operates a product or experiences a service and completes a specific task in a particular context. De Belen R A J analyzes the definition of user experience and user experience hierarchy, combines the concept of symbiosis, and points out that the symbiotic design strategy to enhance user experience mainly follows the product design, manufacturing, and usage process [17]. Barnacle-Naya V EPI user experience element model systematically analyzes the construction of an Internet platform by following user experience and clarifies that the psychological expectation and behavioral process in the experience process are a linkage and systematic experience process [18]. Ahn S H analyzes the media factors in the museum tourism experience and designs a system of examination carrier of tourism activities, tourism environment, and tourism services [19]. With the deeper exploration and enrichment of the experience design theory, the economic activities that start from life situations and aim at changing consumer behavior through the shaping of user sensory experience and self-cognition constitute the experience economy, which provides a new research perspective for cultural and creative production services [20]. Experience design is an emerging interdisciplinary discipline that includes psychology, human-computer interaction, and information technology. It requires comprehensive research that considers the relevance of cultural and creative consumers and stakeholders of artistic and innovative products and focuses on the pain points of consumer needs when designing product services with the application of online technologies and commercial exchanges in online creative entity stores; the research content of experience design has been growing through related literature. Still, little has been done in developing cultural and innovative products in museums in the Shanghai industry, prompting the author to combine them systematically to help broaden the research field of experience design.

3. Modeling Sensor Network-Based Interactivity Design in Digital Museum Product Display

3.1. Sensor Network Model Construction. A wireless sensor network is a self-organizing system with multihop communication transmission mainly consisting of sensor nodes and aggregation nodes. A sensor node is a miniature embedded system integrating multiple sensors and communication devices. In addition to sensing the surrounding environment, a sensor node must perform data fusion and forwarding, but it usually has limited energy storage, communication capability, and computational capacity [21]. Due to the self-organizing nature of wireless sensor networks, each sensor node in the network must have specific sensing, communication, and processing capabilities to collect practical information from changes in the surrounding environment, transmit data to and from neighboring nodes, and process the information. The system network nodes are divided into coordinator nodes and router nodes, and terminal nodes; all nodes contain microcontrol unit (MCU) circuits, radio frequency (RF) circuits, power supply (power) circuits, sensor (sensor) circuits, and some other peripheral courses and modules; the coordinator nodes also contain RS232 serial communication circuits: The sensor network node hardware composition is shown in Figure 1.

Through the study of wireless sensor networks, scholars often need to analyze mathematical models of the sensing capabilities of sensor nodes, and the following two standard sensing models are available.

(1) Binary sensing model: In the study of WSNs problems, the mathematical model is often simplified by approximating the sensing range of a node using the circumference of a circle. The binary sensing model describes the sensing range of a node as a circular region in a two-dimensional plane with the sensor node position as the center and the sensing radius (sensing radius) as a circular region of R_s. The sensor node's properties determine the size of the sensing radius R_s. From the introduction, for any point in the two-dimensional plane $s(x, y)$, the probability that the issue lies within the sensing range of some sensor node v is

$$p_{(v,s)} = \sum \frac{d(v+s)}{d(v-s) \times R_s}, \tag{1}$$

where $d(v, s)$ represents the Euclidean distance (Euclidean metric) from node v to any point $s(x, y)$, and assuming that

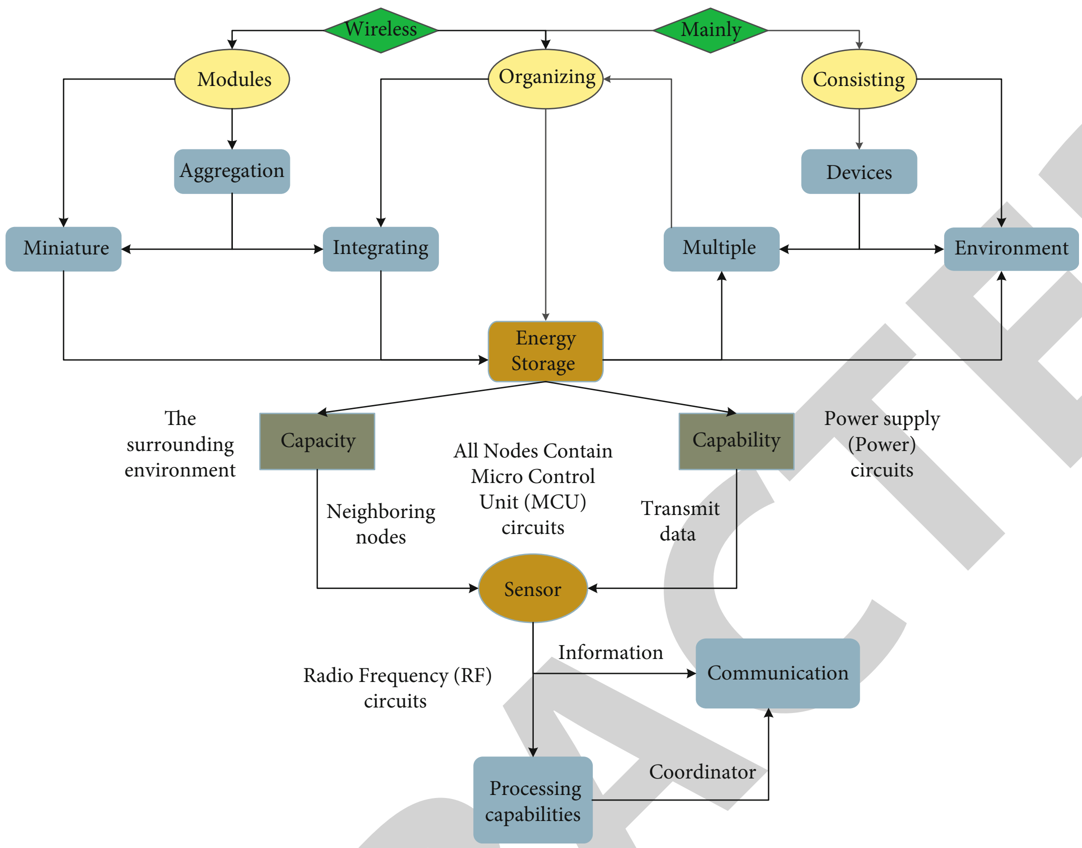

Figure 1: Sensor network node hardware composition.

the coordinates of the sensor node v are (x_i, y_i), then

$$d(v-s) = \sum \frac{(y_i + y)^2}{(x_i + x)^2} + \sqrt{x_i - x}. \quad (2)$$

The binary sensing model is simple in structure, easy to use, and reflects the sensor node sensing to the maximum extent without loss of generality, and is one of the most used probabilistic models known for wireless sensor network coverage problems.

(2) Probabilistic sensing model: Since there are many uncertainties in the actual situation, and the binary sensing model of sensor nodes is too idealized, which makes the nodes have a little difference in perception, while the probabilistic sensing model (PSM) is based on it, it is closer to the actual situation, and the analysis of the real problem is more accurate. The study of the real problem is also more accurate. As with the binary sensing model, the probabilistic sensing model for any point in two-dimensional space $s(x, y)$ located in the sensing region of node v is

$$p(v-s) = \sum (e + \mathrm{ad}) \times d(v-s), \quad (3)$$

where α represents the decay coefficient of the sensing capability of the sensor node, from the above equation, and the perceived energy of the node gradually decreases as the distance $d(v, s)$ increases, when $d(i, p)$ it is 0, $p_{(v,s)} = 1$. However, the assumptions of the above model are too harsh for realistic situations. The model is modified, and the modified probabilistic perception model is as follows:

$$p(v+s) = \sum \frac{\sqrt{\lambda_1 - a_1}}{e(a_2 - b_2)} + \lambda_2 \times \sqrt{R_s - r_e}, \quad (4)$$

$$a_1 = \sum (r_e + R_s) \times d(v, s), \quad (5)$$

$$a_2 = \sum \frac{d(v-s)}{\sqrt{r_e + R_s}}. \quad (6)$$

The parameters in the formula $r_e (r_e < R_s)$ are error parameters representing the sensor node's error coefficient to determine the boundary value of the monitored event; λ_1, λ_2, β_1, and β_2 are measurement parameters associated with the node's characteristics, respectively. The sensor module senses each indicator in the environment, digitizes it, transmits it to the processor, and is the data source for the entire environmental sensor network [22]. According to the analysis of the needs of the museum system, we measure only the two most important indicators that affect the protection of cultural relics—temperature and humidity—using the sensor model DHT11, a module with two sensors integrated with the coincidental piece of temperature and humidity. The temperature and humidity can be converted into electrical and current signals, and the current model can be converted to analog-to-digital via an ADC circuit. An analog-to-digital converter, or A/D converter, or ADC for short, is usually an electronic component that will be converted into a digital signal. A typical analog-to-digital converter converts an input voltage signal into an output digital signal. Since the digital signal itself has no real meaning but only represents a relative size, therefore, any analog-to-digital converter needs a reference analog quantity as the standard for conversion, and the more common reference standard is the maximum convertible signal size. The output digital signal represents the size of the input signal relative to the reference signal. Since calibration data is stored, the corresponding temperature and humidity information can be directly transmitted in digital-woo models. The sensor has a single bus structure that greatly simplifies the hardware circuit design and software program implementation of the sensor module, making it an ideal temperature and humidity sensor for this system.

3.2. Interactivity Design in the Digital Museum Product Display Model Design. In recent years, due to the increasing development of information technology, many new concepts have been introduced into museums, and technologies such as digitalization, virtualization, big data, and cloud computing platforms have been gradually introduced into various fields of museums, which can effectively enhance the display and interactivity of museum cultural communication and continuously expand the social functions of museums. We can understand the "Internet of Things" as a "network of things connected to things." From the perspective of the composition of the museum, the application of the Internet of Things is the collection, exhibits, environment, services, intangible culture, and visitors, which are contained in the network of each object for the integration of information and information interaction, a virtual form of the actual existence of a close combination. For the museum's materialization, is the museum within the scope of any object, people or things, people and things, things, and things, all establish an information interaction integration of dense, dynamic network interaction, genuinely realizing the "big museum" core also concept. From the museum's display function, through the Internet of Things to establish the overall network space, the museum will serve the object "people" and "things," "things" and "things" between the information [23]. Make the "things" in information interaction a comprehensive intelligence, so as to meet the needs of human and social development to the maximum extent. The formation process of the digital museum is shown in Figure 2.

The information architecture is the "information guide" of a product, classifying and organizing information so that the user can find the information he needs intuitively and quickly. When starting the information architecture design, it is essential to design a system that allows the user to find information easily, either through a top-down or bottom-up approach to create a classification system. The framework layer design focuses on placing buttons, search boxes, pop-ups, and other components in the interface. In this layer, designers must refine the structure further; turn abstraction into concrete; finalize interface design, navigation, and information design framework; and output the product prototype. It is not considering visual factors for the time being but only forming an overall framework of the interface so that users can see the most important things as soon as they come; the navigation design needs to design the way of jumping between pages for users based on their customary operation paths so that users can "walk through the product freely," and the information design is the micro information architecture, focusing on the presentation of information on specific pages. The presentation layer addresses the perceptual representation of the product, which is everything the user can see [24]. The interface's first impressions are the overall design style, font size, navigation color, image selection, and how information elements are grouped and arranged. In the presentation layer, all the content and functions established in the previous strategy, structure, scope, and framework layers will be met by the specific design and presented to the user in a coordinated and beautiful visual form. A successful presentation layer design must have a unified style tone, an attractive layout, follow specific color and size specifications, and not too many useless details, all based on providing users with a practical, fast, and easy to use experience. Interaction design can meet more requirements, for example, smart speakers can not only meet the auditory experience, but also meet the voice interaction experience; It can also adapt to the differences of product audience groups, continuously iterate and replace products, and has a long life cycle.

Sensory experience refers to the user's experience of seeing, hearing, smelling, touching, and tasting; emotional expertise refers to the user's inner feeling and emotional reaction when purchasing or using the product; thinking experience refers to the user's interest and corresponding thinking and cognition caused by participating in some heuristic links during the consumption process; behavioral expertise refers to the knowledge gained from the user's behavioral interaction with the situation; related experience refers to the comprehensive experience that includes sensory, emotional, thinking, and action. The associated experience is a complete experience that provides for sensory, emotional, reflective, and action aspects. The classification of user experience is of great significance to the design of museum tour systems guided by experience design theory. In a museum, visitors first perceive the exhibits and the surrounding environment and then interact with the presentations and the surrounding environment by walking around, forming corresponding thoughts and cognition, and generating personalized perceptions and emotional tendencies. This paper proposes a user experience model based on sensory-behavior-cognition-emotion for museum users. In designing the museum desktop guide system, it is necessary to fully consider the audience's all-around experience and corresponding needs and explore the design aspects of the guide system to improve the visiting experience in all aspects. The museum user experience model is shown in Figure 3.

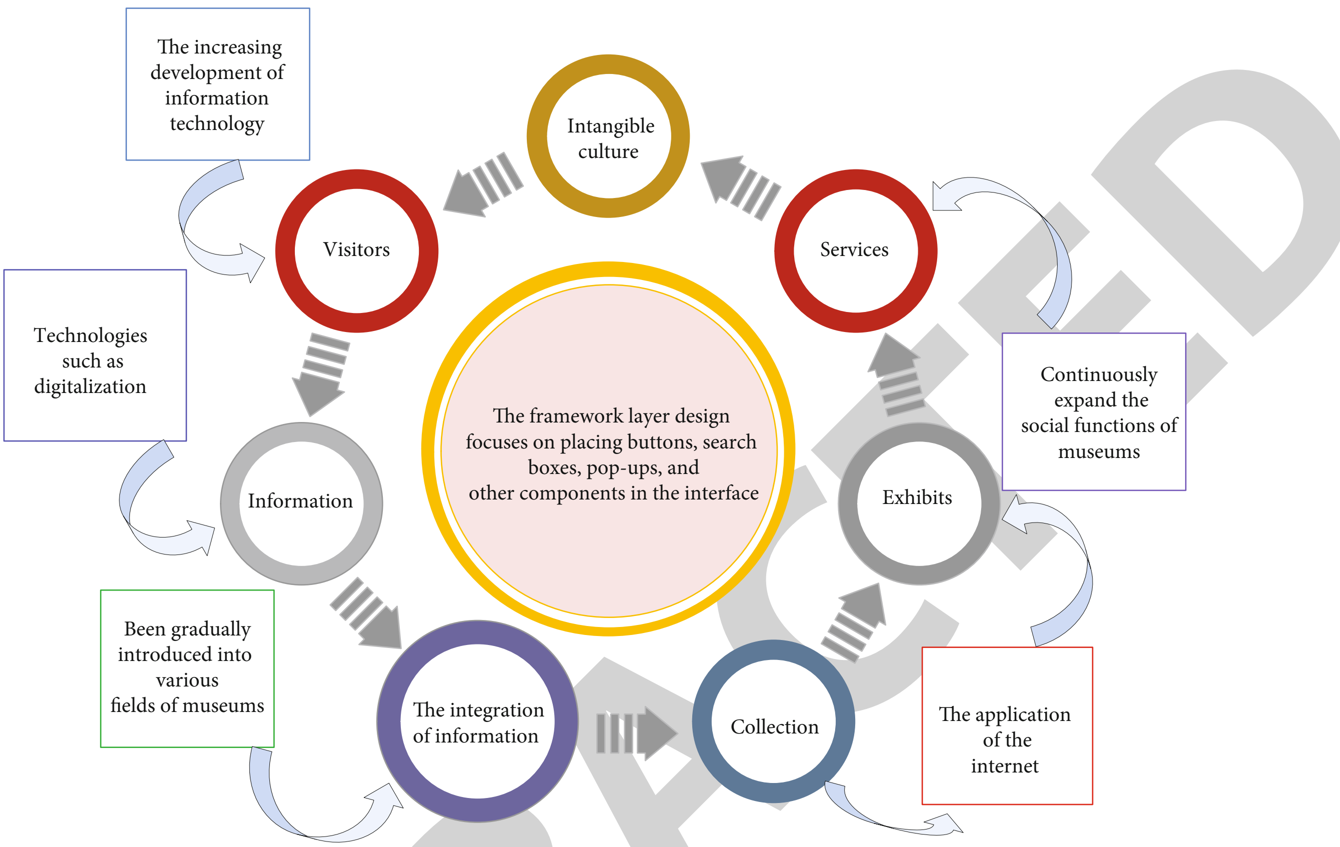

Figure 2: The formation process of a digital museum.

The exhibition hall nowadays is no longer a commercial act but a kind of display act that gives it rich connotation to meet the needs of the human spirit and emotional communication and enhance cultural knowledge. For an item to be displayed in the exhibition hall, it needs to build a bridge between the audience and the physical exhibits through an interactive space and visual elements that match its temperament; for cultural exchange, it needs a design that combines optical channels and senses to transmit information; for a regional display, it needs to share and promote the unique local customs and customs through various channels of situational interaction. The visual design of a region needs to transmit and promote the great local traditions and culture through a variety of situational interaction channels, reflecting its authenticity from content to form [25]. The visual design of the modern exhibition hall itself is an abstract concept that needs to be connected through a multichannel design environment combined as a carrier. At this stage, pavilions contain museums with rich knowledge content, exhibitions of commercial nature, display spaces for large-scale events, and landscape spaces that provide appreciation. The visual design of the exhibition hall is not only single lingering on the surface of the discharge and display of objects, but also, through the interaction of visual information in various forms of space, it creates a realistic visual experience that integrates specific situations. The human eye never stays on the objective things you already know but will constantly pursue new things that change and develop. For what we are more familiar with, because we are too familiar with it, we are used to it so that we can keep it; at the same time, because of familiarity with it, it will produce aesthetic fatigue, hope for new changes to break this monotony, and want to change it. In the design of the exhibition space, we based on visual design elements, combined with the intelligent platform, emphasizing the mutual combination of optical channels and human eye senses to enhance the brilliant visual experience scene, which is the visual experience to be pursued in the exhibition space, and only in this way can we strengthen the efficiency of human and human, human, and information communication. With the visual information of the exhibition hall space, the audience's interest can be improved. It is the first human step for the audience to enter the visual experience. Through the first visual language communication between the exhibition space and the audience, graphic design can enhance the curiosity and interest of the audience so that they can participate in it. In an exhibition space, you can understand the information the area needs to convey and quickly receive the information in the instructional layout. So, a series of visual symbols modification in the Design of the exhibition hall so that the audience could have a sense of visual impact and then quickly capture the accurate information, and at the same time feel a sense of truth after getting the news. Only then will the audience's understanding of participation be improved. Therefore, a one-way and uncreative space is inevitably impersonal and dynamic. Designers must add

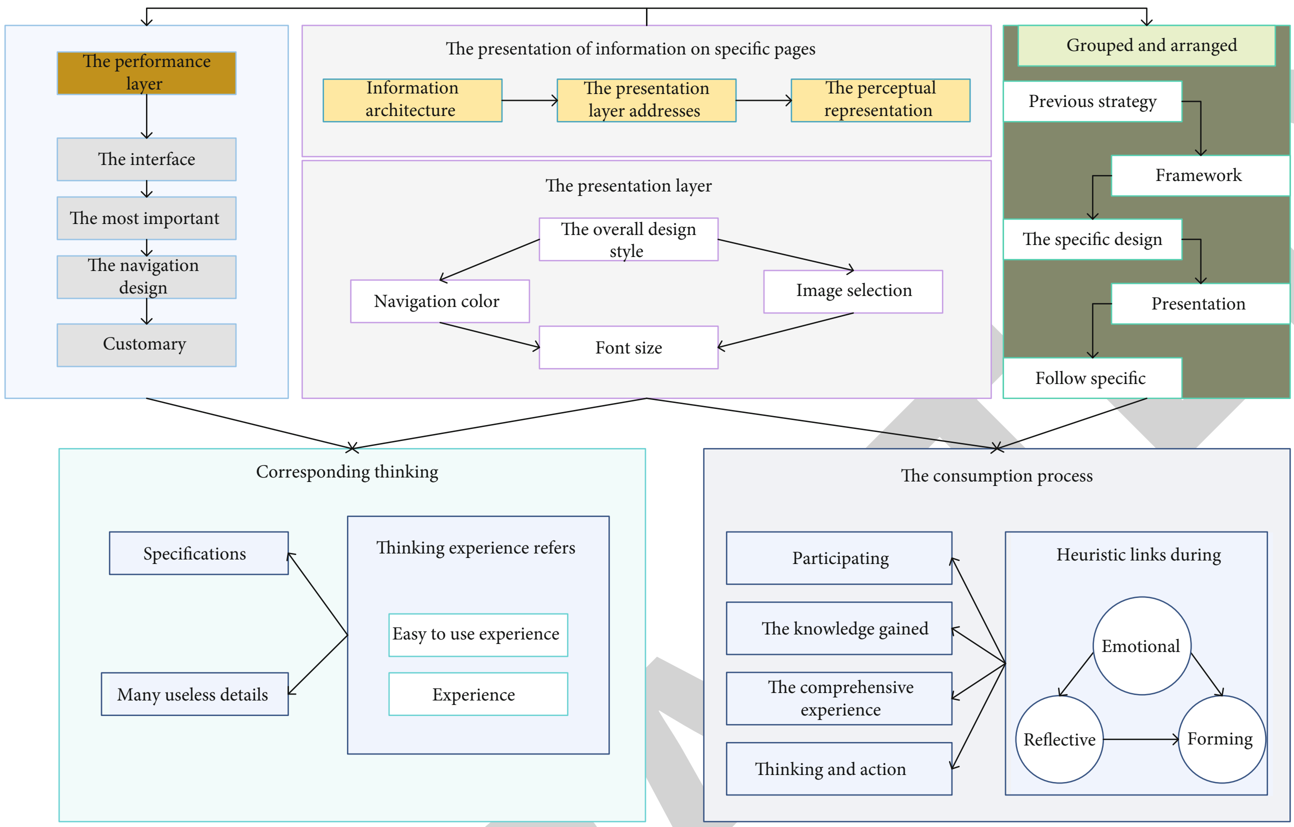

Figure 3: Museum user experience model.

diversified communication elements to the pavilion arrangement in a multidimensional space and inject interactive modules that can mobilize visual experience. Only those graphic designs that are real, imaginary, rhythmic, and dynamic can meet the audience's sense of spiritual participation.

4. Analysis of Results

4.1. Analysis of the Application of Interactive Design of Sensor Networks in the Display of Digital Museum Products. The museum environment monitoring system based on a wireless sensor network consists of a wireless sensor network subsystem based on ZigBee technology and an upper computer display query subsystem. The system's regular operation consists of the sensor network subsystem collecting and transmitting data and the display query subsystem displaying, querying, storing, and other functions. The system is divided into the deployment of sensor network nodes, the establishment of the network, the deployment of web services, and the start of services [26]. System testing is also focused on two subsystems, including hardware testing of network nodes, sensor data acquisition testing, sensor data transmission testing, and testing of serial data transmission, to pure service testing. Assume that the monitoring area of the mobile sensor network is a square area of 100×100 m and discretized into 100×100 pixels, 55 sensor nodes are randomly placed in the area, the sensing distance of each sensor node R_s is 20 m, and the communication distance R_c is 20 m. The parameters of the IBAS algorithm are step size $\delta = 2 * R_s$, $\mu = 0.95$, and the maximum number of iterations 500, as shown in Figure 4, after the network coverage image and after the optimization of the IBAS algorithm. If the distance between nodes is less than or equal to the communication radius, they are mutually neighboring nodes.

To further verify the performance of the IBAS coverage optimization algorithm, the proposed particle swarm algorithm and the representative PSO_DAC algorithm with improved dynamic acceleration factor are used. Homotypic and isomorphic, the number of sensor nodes is 45, the sensing radius is 10 m, and set in the same target area of 100* 100 m with the maximum number of iterations of 500. The coverage of the mobile sensor network with the IBAS algorithm reaches 91.21%, which is 11.18% better than the standard PSO algorithm, 8.71% better than the improved PSO_ DAC algorithm, and 4.34% better than the standard BAS algorithm, and the network coverage is significantly improved. The uniformity of the IBAS algorithm is 33.61%, which is 9.59%, 6.51%, and 5.01% higher than the PSO algorithm, PSO_ DAC algorithm, and standard BAS algorithm, respectively, which means the overall network coverage is more uniform. The above experimental results are output as images to observe the coverage effect more intuitively. The visual coverage effect graphs are obtained

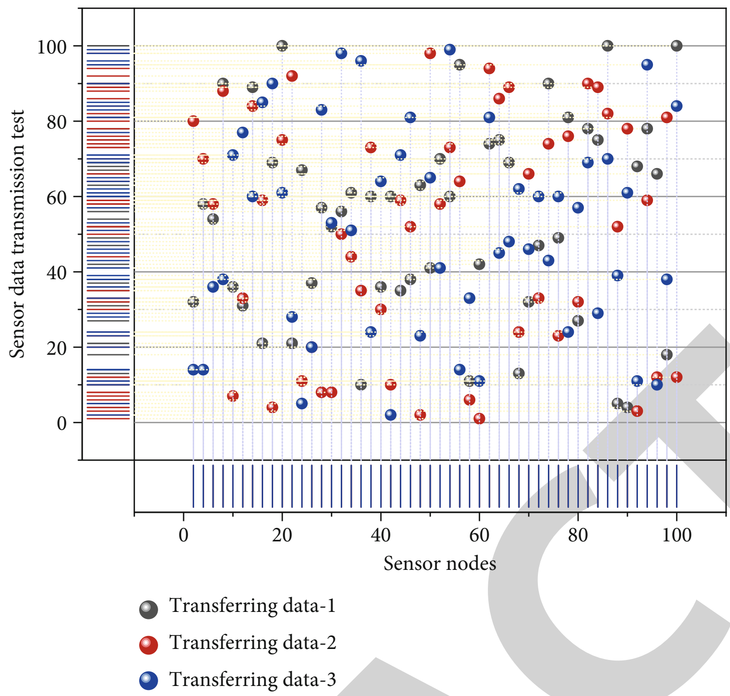

Figure 4: IBAS algorithm optimization overlay.

after 45 initial sensor nodes are deployed and optimized by the PSO algorithm, PSO_ DAC algorithm, and BAS algorithm. The optimized coverage for the same number of nodes is shown in Figure 5.

The blank area gradually disappears from the optimized coverage maps corresponding to several algorithms. The node distribution tends to be even after using the intelligent algorithm for optimization, among which the IBAS algorithm proposed in this paper has the best optimization effect. As shown in Figure 6, the IBSA algorithm can converge stably and reach the maximum coverage of the algorithm, and the range in the final area is stable at 91.21% with a uniform rate of 33.61%; the standard BAS algorithm can reach the definitive coverage of 86.87% with a constant rate of 28.60%; the PSO algorithm can easily fall into the local optimum; and as a result, the final coverage does not exceed 85%, but only the PSO_DAC algorithm, on the other hand, uses the dynamic acceleration factor to improve the local search ability on the basic particle swarm algorithm. Although the coverage rate is improved, the experimental results are still unsatisfactory, only 83.50%, and the uniformity rate is 27. 46%.

4.2. User Experience Perspective of Sensor Network-Based Interactivity Design in Digital Museum Product Display Implementation. Data model analysis is to abstract the corresponding variables from the complicated and confusing display world to achieve a picture of the real world. There are five standard data analysis models: the PEST analysis model, the 5W2H analysis model, the logic tree analysis model, the 4P marketing theory model, and the user behavior analysis model. Data model analysis is the way to realize a comprehensive and perfect system, and it is also essential to work in software development. The establishment of the data model should be based on the actual needs, analyze the relationship between the accurate data, accurately grasp the inner connection between the data, and organize the meaningful data in an efficient form. It mainly displays whether the sensor node is working correctly and whether the voltage is standard and other information. The sensor's working status is mainly displayed, and the corresponding parameters can be configured for the sensor [27]. Under the same configuration and the different nodes, the coverage and uniformity of the IBAS algorithm are higher than the PSO algorithm, PSO_ DAC algorithm, and BAS algorithm. The IBAS algorithm can improve the range of mobile sensor networks more effectively than other algorithms, both when the number of nodes is large and when the number of nodes is small. The IBAS algorithm has a more substantial local search capability, better network coverage, and more uniform coverage. The coverage comparison for different node numbers is shown in Figure 7.

Based on the research on the museum product experience design method, the visual experience of online products accounts for the most significant influencing element. The sensory experience of an online product platform is improved from graphic design; i.e., the five experience elements of user experience are reflected through brand color, logo design, interface layout, functional design, and product visual effect, and the core function points of the platform are grasped for in-depth primary and secondary function level analysis and information structure setting. Different platforms operate in different ways and follow the visual design norms to carry out the unified design of the platform visual style, highlighting the artistic and cultural characteristics of the museum. In the experimental area, 140 low

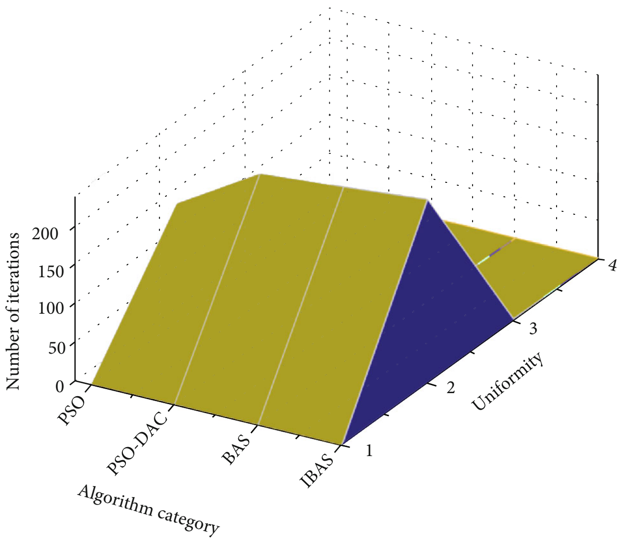

Figure 5: Optimized coverage with the same number of nodes.

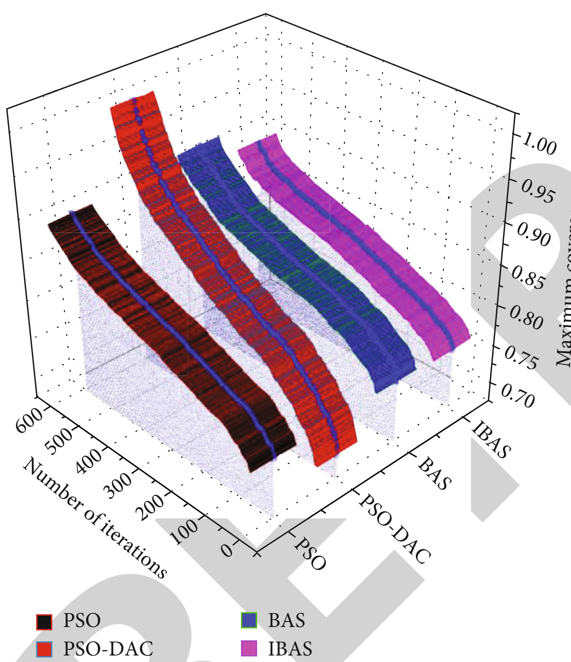

Figure 6: Comparison of convergence of different algorithm iterations.

communication performance nodes S and 80 high communication performance nodes S2 were randomly deployed, and the number of relay nodes required by GA-RD, IWGA-RD, and LWGA algorithms was compared while changing the radius Rs2 of high communication performance node S2. The results are shown in Figure 8, and it can be seen that when the radius Rs2 of the increased communication performance node S2 is 30 m, the GA-RD algorithm requires the same number of relay nodes as the IWGA-RD algorithm, and the LWGA algorithm requires the least number of relay nodes; when Rs2 is 30 m ~ 50 m, the number of relay nodes needed for the GA-RD algorithm decreases slightly, and the LWGA algorithm and IWGA-RD algorithm decrease significantly; when Rs2 is greater than 50 m, the number of relay nodes required by GA-RD algorithm is almost unchanged, and the number of relay nodes required by LWGA algorithm and IWGA-RD algorithm keeps decreasing; when Rs2 is 50 m ~ 130 m, the number of relay nodes required by IWGA-RD algorithm is reduced by about 25% compared with GA-RD algorithm. When Rs2 is more excellent than 90 m, the number of relay nodes required by IWGA-RD, LWGA, and GA-RD algorithms maintains the above trend, and the difference is more prominent.

As an intelligent product, digital museum interactivity design takes digital cultural and creative products as the carrier, emotional computing as the core feature, and natural interaction, intelligent agents, Internet of Things, and cloud computing services as the auxiliary. The intelligence is also expressed in its design implementation, as it not only includes interaction and experience design, multimedia performance design, and spatial environment design but also covers the categories of functional module design and product software and hardware structure design and puts forward higher requirements on the diversity of the design team's capabilities and the scientificity of design methods. Compared with traditional design methods, the intelligent design process has many advantages: First, based on the information collection, public opinion analysis, and audience insight capabilities of thoughtful museums, it can more accurately and efficiently locate the emotional and interactive cultural and creative user groups, conduct user profiling, and define the artistic and creative functions according to the needs and preferences of users. Subsequently, the intelligent design process provides designers with many practical tools. For example, relying on the data brought by museum visitors, AI can help designers filter elements suitable for artistic and creative design from the massive collection of resources, which not only makes design elements and design results more in line with users' interests and expectations but also helps expose users to cultural and cultural contents beyond museum exhibits and exhibitions, furthermore, using AI for the content generation to reduce repetitive workload and improve design development efficiency. Based on pattern recognition, AI can evaluate design prototypes and results, thus becoming a rapid testing tool. In addition, obtaining users' emotional feedback through the moving interactive text can further validate the design and improve the iteration and serialization of the invention. In conclusion, using the design process of expressive interactive creations helps establish intelligent design capabilities and achieve a scientific and creative design approach in developing museum-based products.

5. Conclusion

As an emerging type of museum, the digital museum is not only a continuation of the physical museum but also a product of visual culture, reflecting the visualization trend of contemporary society. Digital museums present new graphical images under this new optical regime, and transmutation

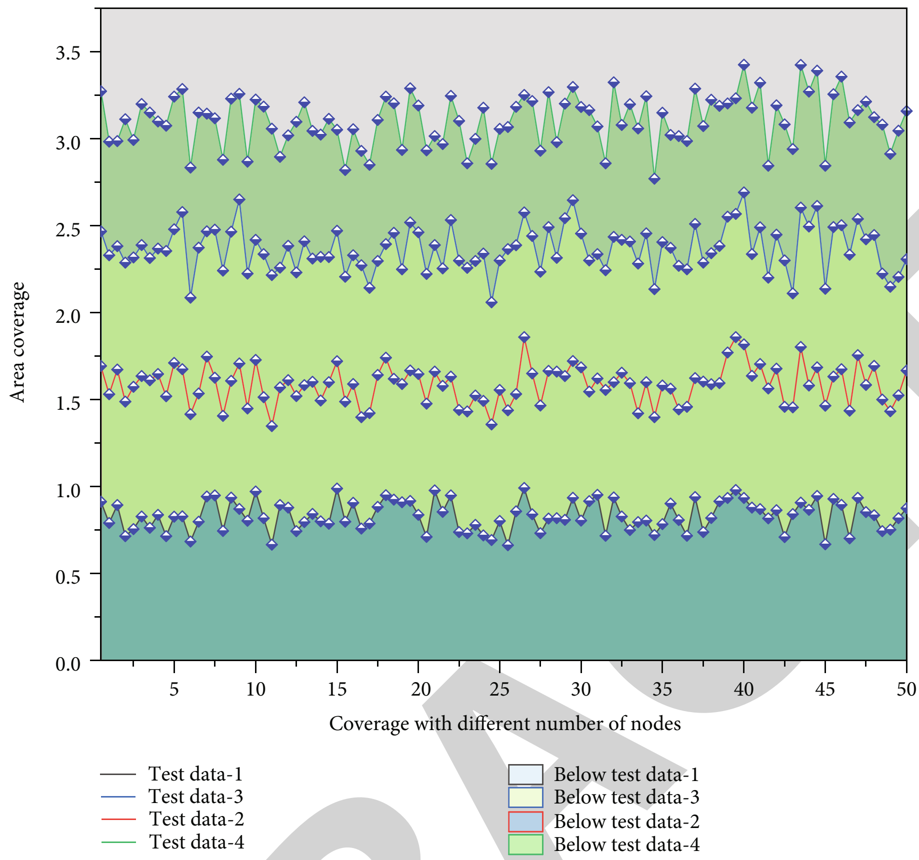

Figure 7: Comparison of coverage for different numbers of nodes.

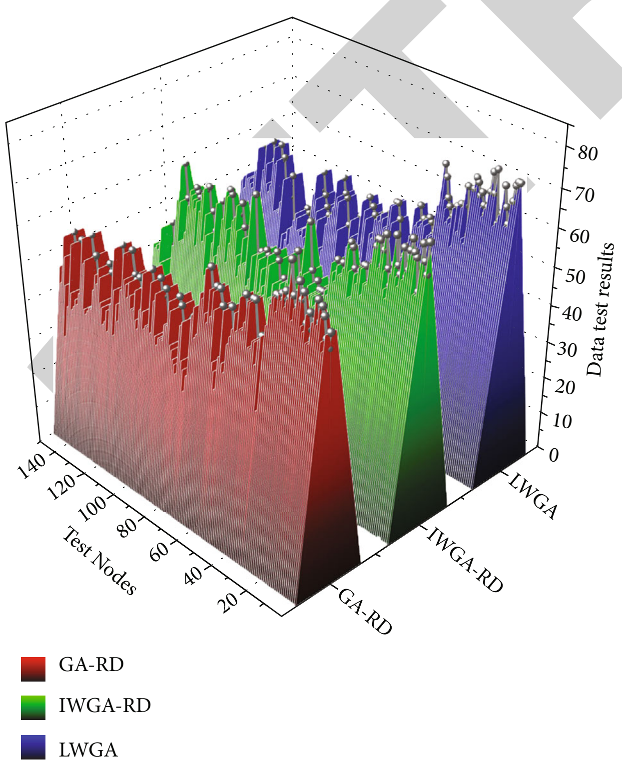

Figure 8: Data test results of interactivity design in digital museum product display.

of aesthetic experience occurs in the audience's perception of the new visual ideas. The study concludes that digital museums are knowledge-based representations that positively affect the construction of the visual experience of viewers and students. Because of the nature of the digital medium, viewer perception is in a state of distracted sweeping experience. However, the lack of students' knowledge storage and excessive focus on the visiting experience in visual interaction activities lead to homogenization, simplification, adventure, and entertainment in constructing the audience experience. It is hoped that future museum education activities will focus primarily on aesthetic perceptual learning, enhancing deeper understanding and insight. This paper is based on a ZigBee wireless sensor network containing class H nodes: coordinator nodes, router nodes, and terminal data collection nodes. Based on the analysis of the Z-stack protocol coincidentally, the process of network establishment is clarified, as well as the method of data transmission. The data structure of the transmitted data is defined, and the program design of the coordinator, router, and terminal data collection points is completed to realize the formation of the network and the transmission of data. In this paper, we have made some exploratory attempts to explore the expression form and presentation characteristics of interactive design in the museum display. However, due to my lack of knowledge, I am unable to grasp the complexity of the audience and the diverse nature of interactive language expressions, so my knowledge of interactive design is not sufficient, and therefore, this paper is unable to form a systematic study of interactive design in museum displays; the category is in a constant state of renewal, and a more systematic interactive language expression should be involved in museum display design in the future, and through continuous design practice, museums can more optimally fulfill their functions of information communication and cultural dissemination and promote the development of museum display design in a better direction. The exploration of the application of products in digital museums also provides a basis for effectively improving the quality of museum services for the public and the design and research of digital museums.

In this paper, we have made some exploratory attempts to explore the expression and presentation characteristics of interactive design in museum displays. However, due to my lack of knowledge, I cannot fully grasp the complexity of the audience and the diverse nature of interactive language expression. I cannot get the complexity of audiences and the diverse nature of interactive language expression, so my knowledge of interactive design is insufficient. The category is in a state of constant renewal, and a more systematic study of interactive design in museum displays should be developed in the future. In the future, a more systematic interactive language expression should be involved in museum display design. Continuous the scope of interactive design in museum display is in a constant state of renewal. Through ongoing design practice, museums can more optimally fulfill their functions of information communication and cultural dissemination and promote museum display design in a better direction. Museum display design should be developed in better order. Interactive design with participatory and experiential characteristics has become one of interactive design with participatory and experiential features and has become one of the necessary forms of museum display and will be the future development trend of information dissemination means.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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