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Research Article

Digital Design of Smart Museum Based on Artificial Intelligence

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Today, as the soft power of culture is becoming more and more important, it is very important to pay attention to the learning and dissemination of culture. As the carrier of this process, the use of advanced technology to improve the museum is of great significance. This paper studies the digital design of smart museum based on artificial intelligence in order to explore the application of smart museum in artificial intelligence, analyze the spatial design of smart museum by using digital technology, explore a feasible method to give full play to the function of smart museum, and put forward some suggestions on the spatial design of smart museum. The design of the smart museum is no longer restricted by time and space and uses digital technology to double use virtual things and dynamic space. Through the detailed analysis of the application of artificial intelligence and digitization in the spatial design of the smart museum, combined with the information decision tree algorithm and data heterogeneous network algorithm, this study constructs the model of the information processing architecture of smart museum and the requirements of digital museum and makes a decision-making analysis of the comparison results of existing data. It includes the digital design of smart museum display technology, display effect, and other display-related contents. Analyzing the impact of smart museum on the object can provide data support for the feasibility of digital space design of smart museum based on artificial intelligence. The results of regression data processing show that the spatial visual sense of digital design wisdom museum is very strong, reaching the level of 5.0, and the picture aesthetic effect is up to 4.8.

1. Introduction

With the rapid development of science and technology after entering the 21st century, coupled with the development of computer human-computer interaction theory, and the concept of interaction design gradually gaining popularity, it has become a hot new topic in the design field, and the field of exhibition space design has also begun to seek interactive design methods, further emphasizing the participation and interactivity of the display and serving the fundamental purpose of the display activity. In today's society, the development of Internet technology has had a profound impact on all aspects of social life [1, 2]. More and more companies are integrating Internet elements, introducing the Internet, and creating the emergence of new business forms of the "Internet" [3, 4]. The emergence of the Internet of Things has further expanded the Internet, which can communicate and exchange information between any objects. Therefore, it has undergone technological changes in many industries, and the application of related technologies in traditional industries has been expanded. As a traditional center of cultural and technological display and dissemination, museum buildings are becoming more and more intelligent in many activities. The Internet of Things (IoT) and smart space technologies supports the creation of smart museums based on digital infrastructure and information systems that have been deployed in modern museums. Smart museum is a specific application of building intelligence in the field of culture and expo; it is more scientific, more standard, and more specific, and the goal is clearer [5, 6]. AR technology has begun to be exploratively applied to virtual explanations, "restoration" exhibits, and "resurrection" exhibition objects, such as the "Seeing' Yuanmingyuan'" digital experience exhibition held by the China Garden Museum. 26 scenic spots including Qinzheng Qinxian, using modern digital technology to reproduce the overall layout of the "Yuanmingyuan."

The development of the times, the advancement of science and technology, and digital technology will become the foundation of social development in the 21st century. The introduction of digital technology has provided a new world for the protection of cultural property [7]. How to make use of advanced multimedia and virtual reality technology to enrich the research on the digitization, streamlining, and safety protection of ancient Chinese cultural heritage is a very important and beneficial choice. People have gradually realized that museums play a role in promoting the development of the cultural industry of the entire society. At the same time, the country is also increasing its investment in the construction of museums. A museum is a fixed place for exhibition and research of cultural relics. Cultural relics are the precious wealth of a country and a clan. The application of artificial intelligence technology in museums focuses on intelligent navigation, face recognition and image recognition, intelligent search, intelligent maps, machine translation, etc. Fully embody humanity, education, culture, and artistry, and integrate these into the entire design system. How to make static exhibits “live” and how to make traditional museums “live” has become an important research topic facing museums [8].

Many scholars at home and abroad have conducted a lot of research in related fields, such as smart museums and artificial intelligence digital design. The purpose of the research conducted by tom Dieck et al. is to investigate the demand of visitors for the development of wearable smart glasses augmented reality (AR) applications in museum and art gallery environments. Interviews were conducted with 28 art gallery visitors and used affinity graph technology to analyze the interviews. The survey results show that when developing and implementing wearable AR applications in museums and art galleries, content requirements, functional requirements, comfort, experience, and resistance are important [9]. Korzun et al. developed an ontological model for the needs of studying the history of daily life. Wiki Technology is applied in the smart space architecture of the smart museum. Wiki has implemented a system that supports ontology. Experts use this system to extract and express knowledge hidden in museum collections. The authors discuss possible semantic algorithms for data mining in the museum semantic network [10]. Ryabinin and Kolesnik are committed to the development of automated independent scientific visualization modules based on chip systems with custom tangible user interfaces. This type of module can be used as an interactive exhibit in a so-called smart museum. The scientific visualization support in the generated software is based on hardware graphics acceleration through OpenGL ESAPI [11]. Based on the SciVi adaptive multiplatform scientific visualization system, Kolesnik and Ryabinin are committed to developing tools that allow museum staff to use the Internet of Things (IoT) technology to create interactive exhibits and propose a unified software and hardware solution to enable users without in-depth electronics and programming knowledge; various devices can be assembled and interconnected through the principle of construction set [12]. The Farrow structure in the standardized signed digital (CSD) space is an effective method for designing real-time adjustable finite precision variable digital filter (VDF). Bindima and Elias use a multiobjective artificial bee colony (MOABC) optimization algorithm with an integer search space to find the best Farrow subfilter coefficients. In addition, a new low-complexity implementation method of limited precision VDF using the minimum spanning tree method is proposed [13]. In the framework of digital forensics (DF) and digital investigation (DI), the purpose of the evidence analysis stage is to provide objective data and make appropriate interpretations of these data to help form possible hypotheses for later use as evidence in court elements. The purpose of Costantini et al.’s research is to explore the applicability of artificial intelligence (AI) and computational logic tools—especially answer set programming (ASP) methods—to the automation of evidence analysis. As a proof of concept, in this article, a simple ASP program is used to demonstrate the formalization of actual investigation cases and how this method leads to the formation of practical investigation hypotheses [14]. Gonzalez et al. described an interactive museum exhibition that showed the avatar of Alan Turing, introducing artificial intelligence and Turing’s pioneering test of machine intelligence to museum visitors. The purpose of the exhibition is to attract and motivate children’s visits, hoping to stimulate their interest in computer science and artificial intelligence and prompt them to consider pursuing future studies in these fields. The exhibition interacts with visitors, enabling them to participate in a simplified version of the Turing test, which is short and informal to accommodate the limitations of the five-minute exhibition [15]. It is undeniable that these studies play an important role in filling the literature knowledge of the wisdom museum and the construction of the wisdom museum. However, careful inspection found that these studies were conducted under a general concept, and there was almost no mention of detailed studies, such as the digital space design of museums.

The public space for exhibitions is the space for visitors to use and activities during or after the visit. It mainly includes public walkways in the exhibition hall, passageways for the disabled, stairs and other passage spaces, and communication rest spaces. The design of public space is more free and flexible than information space, and it can make full and effective use of public space to create a high degree of safety, freedom, and comfort for the audience. The public space of the museum embodies the fusion of its humanistic atmosphere and its architectural artistic expression. In addition to meeting the needs of visitors, public space is also a key part of the sequence of exhibition spaces. As field experience has become the focus of architectural design, museum buildings, as an integral part of cultural construction, should also explore space design from a new perspective. This research uses the spatial digital design of modern museum buildings as a tool to track the development of museum space, preliminarily constructing a contemporary museum site design process from the perspective of digital design and providing certain technical support and practical guidance for current and future museum design. The decision-making model of the simulated information tree is analyzed and researched step by step from artificial intelligence data processing, artificial intelligence and smart museum space design internal and external spatial hierarchy arrangement, operability, education and other functions, and visitor experience. Based on the visitors and cultural relics in the exhibition, through analyzing each bit of data, the technology is to find the law from a large amount of data, mainly including data preparation, law search, and law expression, three steps that can ensure the authenticity of the data sample and the representativeness of the sample. The use of related technologies for data acquisition includes the relevant parameters of the current development of museums in our country, the connection between different visitors and objects, and the application value of digital space design. On this basis, a comparison of the space gains before and after the application of digital design is carried out. The innovation of the research perspective lies in the demonstration of the feasibility of the digital design of the space, not only from the perspective of cultural relics display, but also from the perspective of visitors.

2. Construction of the Smart Museum

2.1. Artificial Intelligence and Smart Museum Design. The current exhibition interface of the museum is more diversified than the plain white square wall in the past. The curved wall, the texture with cultural characteristics, and the fractured architectural space can all create a diversified sense of place to achieve the best coordination with the presentation theme. Due to the static, one-way, fixed, and internal characteristics of traditional museum exhibits, the display of intangible cultural property has certain limitations [16]. The emergence of artificial intelligence has endowed the exhibition with the characteristics of power, interactivity, and virtualization in the digital age, and the museum display space has changed. The existence of a museum, on the one hand, is a collection of historical relics. It is better for contemporary people to appreciate the artistic value and charm it brings. As an external medium, the exhibition space is the core of the museum. Through the application of artificial intelligence technology, we can achieve 3D design; whether it is in space design or cultural relic display and display, we can make the best use of the material. The exhibition design of the exhibition space is directly related to the gradual development of many museum works. The display design of the museum's exhibition space has evolved from the initial placement of objects to a combination of pictures and texts. With the changes of the times and the continuous development of information technology, it has brought new functions to the exhibition design of museum exhibition spaces. In the entire internal space, all art designs and expressions are for a common purpose-exhibit. How to display wonderful props and how to apply high-tech installations are displayed and whether they convey the meaning of the exhibits to the visitors is discussed. This is the purpose of the exhibition design of the museum's exhibition space. In order to make a full contribution to the construction of the museum, the design of the museum space played a role in it. The design of the museum's display space requires professional talents to make elaborate productions based on the rational arrangement of auxiliary facilities and a full understanding of the "needs," to make a replica with the proper proportions in the museum, or to use interactive media and electronic image output. Use scientific and technological means to carefully design the space display environment to create a new visual focus and the best artistic effect. We must improve the various functions of the museum and also make them suitable for contemporary social progress. The new exhibition space form of the museum has played the primary linking function in the engineering design process. The diversified display forms not only enable visitors to increase their enthusiasm, initiative, and creativity after sightseeing, but also receive education and truly get an artistic enjoyment [17].

Wisdom museum is the fusion of knowledge and art form. The museum displays a wealth of content, innovative methods, and brings an excellent viewing experience to the audience so that the traditional museum breaks through the inherent closed restrictions and bursts out new vitality [18]. With the advent of digital technology in the 21st century, the world has entered a hot period of digital multimedia development. The innovation and innovation of digital technology and the continuous change of interactive display technology have been very popular and recognized by the public in the new era, and the display methods of museums all over the world are also facing new changes. As a collection of spiritual civilization, famous science and culture, and symbols of man and nature, digital multimedia has entered the design territory of the Physical Ecosystem Museum, providing visitors with more diversified services through technology and technology systems. The digital status system is based on human needs and combines multiple scientific experiences to create a new interactive learning curve. That is to say, in the wisdom museum, the related knowledge of cultural relics is regarded as countless points on the curve, and the visitor is like standing on the coordinate axis in this process. While digital technology has brought information explosion to mankind, it has also brought revolutionary changes to many other fields, such as the development of animation multimedia, human-computer interaction, virtual reality, and other technologies. The high-tech digital design is the exhibition of the world museum. Even the development of the world today has contributed. This is a mirror of the progress of human society and should be regarded as a sign of human development [19]. Compared with smart museums, from the perspective of user groups, smart museum buildings are more to provide visitors with functional objects, which can provide visitors who enter the museum with a better experience and participation, as well as the integration of more wisdom. The artistic understanding of museum works so that museum managers can easily operate all electrical equipment in the museum and monitor environmental data in an orderly manner to ensure the safe storage area of exhibits [20].

2.2. Digital Algorithm of Space Design. Multimedia interactive display equipment was added to assist the exhibition in the museum, and special activities were carried out to attract tourists. Some newly built museums have also begun to seek the harmony between space and environment and exploration and breakthroughs in interactive display spaces. In order to attract and capture the attention of the audience, through augmented reality, mobile technology, and interactive walls, new art displays can found a promotional point of view. This application enables the focused ultrasound to be projected through the interactive surface and directly act on the user's hand, generating multiple feedback points at the same time and giving them different tactile attributes, which can give visitors the most realistic experience. Digital "advanced on-site exhibition" combines the virtual space in the physical exhibition space of the nature museum with virtual reality technology to provide complete information of the exhibits and improve the scientific experience of visitors [21]. Virtual touch mainly focuses on the combination of the vividness of cultural relics display and the authenticity of user experience, which can solve the time and space constraints of cultural relics and carry out construction and restoration functions. When visitors view and visit the smart tower, they wear position settings, helmets, stereo glasses, and other equipment to view and use the laser arrow to point to the display, select the content, touch the display of interest, and obtain a large amount of additional information. The information transmission rate of the display may be expanded, and the interaction between visitors and the display is improved, making full use of the multiple reproducibility of the digital display; the information of the display is transmitted to individual visitors, forming a new way of self-transmission, which solves the lack of flexibility in the physical space display of the smart museum and the lack of emotion in the virtual space display of the smart museum [22].

The space inside and outside the museum building is directly used for display, exhibition, or related areas. It mainly includes prologue hall, exhibition hall, exhibition room, passing hall, lounge, passage, staircase, and external exhibition space. Traditional museum displays mostly use cabinets, showcases, display tables, templates, etc., to convey information to the audience. This method is to convey the unique information of exhibits and cultural relics, without planning the amount of information that the audience can accept [23]. Doing so may also directly lead to the failure of information transmission. In order to solve this drawback, the interactive application of space design is necessary. In addition to the application of artificial intelligence in sensory simulation, a more important application is to simulate the thinking and analysis process of the human brain, that is, the application of game and logical reasoning, the induction and processing of information, and so on. Visitors, interactive display, and information dissemination are the three elements of interactive applications. Artificial intelligence is used to incorporate these data into mobile information systems. The behavior tree-driven artificial intelligence decision model uses behavior trees or other models to make decisions. The first step is to make decisions in advance. Process the various information of the space design of the smart museum to adapt it to models, such as behavior trees [24]. This smart museum information processing architecture model is shown in Figure 1.

Take the display of cultural relics, according to the characteristic types of cultural relics, the relevant information in the area is displayed, and the relevant information of each cultural relic is different. This area is the result of combining a single area. The network heterogeneous algorithm in the application space is used to simulate various parameters. The museum administrator, as the receiver of information, sends information to each level, and the head node of each level confirms it. This process can be expressed as follows:

$$M(i) = \begin{cases} \dfrac{a}{1 - a^{*}(t\bmod(1/a))}, & i\forall\alpha, \\ 0, & \text{whatelse}, \end{cases} \tag{1}$$

$$P_i = \left\langle \begin{array}{l} j \bullet p_c + j \bullet \beta_{fs} \times n^2,\ n \le n_0 \\ j \bullet p^c + p \bullet j_\varepsilon \times n^4,\ n > n_0 \end{array} \right. . \tag{2}$$

Among them, the size of M is divided with a and i; all nodes i randomly generate a random number a, j is the number of rounds of current information transmission, and p is the set of nodes. Equation (2) mainly represents the power consumption of information network data [25], n_0 is the critical distance, when the node distance is less than the critical distance, the process is a free space model, and β_{fs} is the power consumption. The overall consumption of a cycle is calculated as follows:

$$M_{\text{all}} = \frac{[(n-1) \otimes N/2]}{j \bullet M_{fs}} \times M_j. \tag{3}$$

M_{fs} is the initial position of the network node in the multihop mode. Ordinary nodes are standardized according to the strength of the signal, and they are as follows:

$$\frac{P}{i}(i-u) < P_{si} < \frac{P}{i}(i-u+1), \tag{4}$$

$$\text{range} \ge \frac{\sqrt{j^2 + U^2}}{\sqrt{u_i^2 + a^2}} \le r. \tag{5}$$

The relationship between the network range and the signal strength U decreases as the power of the ordinary node a increases. The network transmission data range between adjacent ordinary nodes meets [26]

$$\sqrt{\left(u_i^* + u_{i-1}^*\right)^2 + U^2} \le r, \tag{6}$$

$$\sum_{i=1}^{r} \sqrt{u_i^2 + U^2} \ge \frac{R}{r} - 1, \tag{7}$$

where u_i^*, u_{i-1}^* is the degree of adjacent interval, and the characteristic value is first received during the data transmission process, and the second judgment is performed. The sending probability of the node's working status adjustment can be expressed as [27] using spatial interpolation:

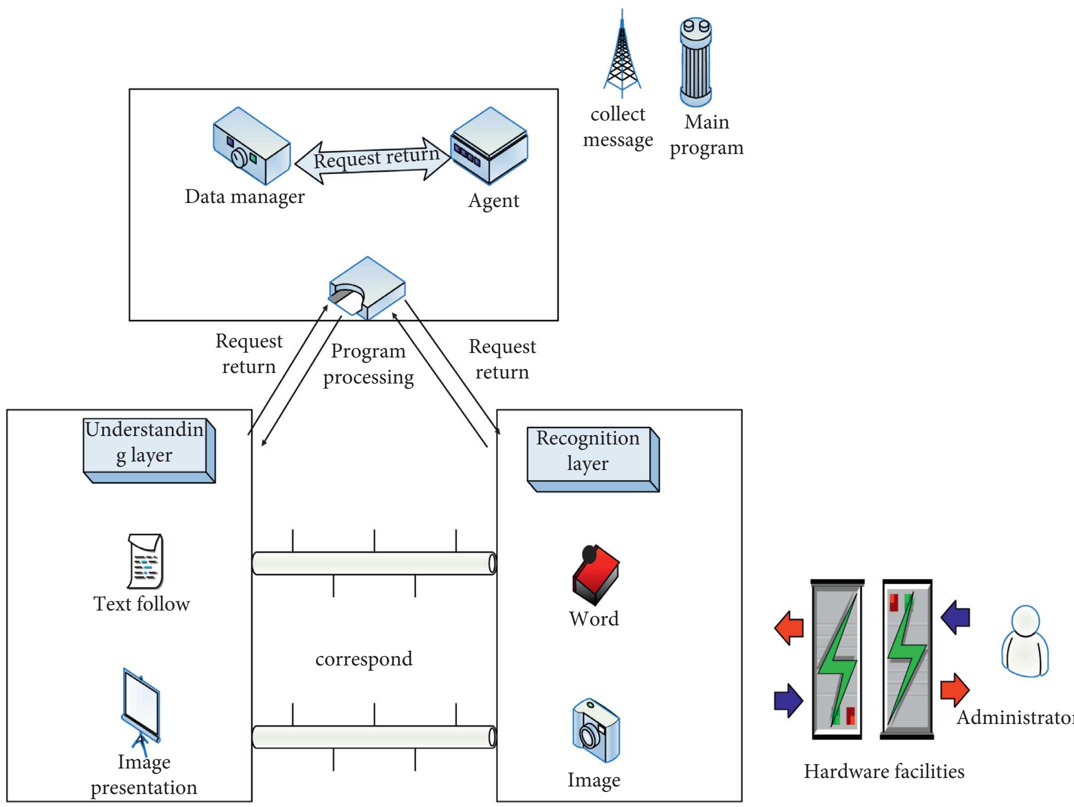


Figure 1: Information processing architecture of smart museum.

$$\lim_{i\longrightarrow\nabla} p = \left[\frac{1}{\sqrt{i\phi}} \sum_{i=1}^{u} (\alpha_i - \beta_i)\right] \le r - i, \tag{8}$$

$$p = \frac{1}{\sqrt{2\pi}} \int_{-\nabla}^{i} \iint_{p-1} i^{-(2/u^2)}, \tag{9}$$

$$\sqrt{\frac{\alpha_{-i} - ip}{ip(1-u)\bullet i}} \le \frac{2\pi}{1-i}. \tag{10}$$

The random distribution variable sent every time is α, where $\beta = p_{-\nabla}$ and $i^{-(2/u^2)}$ are normally distributed. The objective function of spatial interpolation is [28]

$$G_u = \sqrt{i}\left|g_i - g_0\right| + \max\left[u_{i+1} - u_i\right]. \tag{11}$$

Among them, g_i is the fitness of a single node, and G_u is constructed through a certain form. At this time, the flow of information is transformed from one-way to two-way [29], using f_1, f_2, f_3 to represent visitors, interactive display, and information dissemination, and the weight coefficient is H_i to represent the following:

$$f_i = \sum_{i=1} H_i f_u (h_1 + h_2 + h_3). \tag{12}$$

The condition for the establishment of this formula is to cover the entire range of network nodes. In order to achieve a concise and efficient classification effect, the spatial form of the smart museum is designed to expand the information gain through the proposed scope definition parameters [30]. The first thing to be clear is the information level of each type of exhibit in the museum. The expected amount of these information levels can be expressed by the following formula:

$$W(x_1, x_2, \ldots x_3) = \sum_{i=1}^{m} p(x_1)\log_2 \frac{1}{p(x_1)}, \tag{13}$$

$$T(X) = \sum_{i=1}^{m} p(x_1)\log\left(\sqrt{\frac{1}{p(x_1)}} - k\right), \tag{14}$$

where k is any positive number, which defines that the amount of information of exhibit x satisfies $T(X)$. Collect the sample data value of the information level of all exhibits, and record the corresponding sample target as $|y_1|, |y_2|, \ldots, |y_n|$. The expected value of information gain in this classification situation can be expressed as follows:

$$T\left(A\left|\left|y_1\right|, \left|y_2\right|, \ldots, \left|y_n\right|\right.\right) = \sum_{i=1}^{n} p(A_1)\log_2 \sqrt{\frac{1}{p(a_1)}}, \tag{15}$$

$$T(X \mid y_1 = Y) = \sum_{i} (x_1 \mid y_1) \frac{1}{p(x_1 - y_1)}, \tag{16}$$

where x and y are unrelated variables and both have finite values and $p(x_1 - y_1)$ is the probability condition of the classification attribute [31]. Select the split attribute through the information gain criterion to obtain a high information gain value and introduce the parameter of the viewer's interest level ϑ; then, there is

$$T_1(A|Y) = \sum_{i=1}^{m}[p(A_1) + \vartheta], \quad (17)$$

$$T_m = \sum_{i}^{m-1} p(Y_1|x_1)\log_2 \frac{1}{p(X_i - Y_i)}, \quad (18)$$

where $A|Y$ is prior knowledge. This usage transforms the knowledge of decision tree from three-dimensional space design to two-dimensional, which can overcome the bias of gain multivalue. Collect the information of a single exhibit into a subset; then, there are

$$\overset{1}{x} = -\sum_{i=1}^{f} \frac{|x_i|}{|x|} \times (x_1, x_2, \ldots x_m), \quad (19)$$

$$F \geq f \pm \sqrt{f} + i^* (\forall m + m^*). \quad (20)$$

Here, $|x_i|/|x|$ is the weight value of the ith partition and ∇m^* is the variable factor of the exhibit, such as shape, weight, and area.

3. Experimental Analysis of Digital Space Design of the Smart Museum

The Internet of Things technology allows physical "things" to be connected to each other, and the entire world is connected through the Internet. In the museum, the integration of "people-collections-exhibitions" is realized, and a new model of museum management and operation is created. With the advent of the digital age, digital media has moved from the field of technology to the field of design and slowly entered the daily life of human beings. The rapidly developing society not only improves the material life of human beings, but also promotes the progress of spiritual and cultural life, thereby promoting the development of cultural activities. As a public space with special culture and planning-education, museums are also deeply loved by people. The museum management system, which directly serves visitors, has also achieved success in digital media design under the premise of satisfying basic services, providing a powerful interactive experience and information expansion for the museum management system. Digital virtual reality technology is used in the exhibition. The audience creates special light and shadow effects through real-time simulation and real-time communication through multiple attractive channels, such as vision, touch, hearing, smell, and taste, and uses computers and other related digital devices to have an impact on the real world. High-level simulation allows visitors to ignore the difference between reality and illusion. Attention should be paid to the combination of new media technologies and perspectives, the use of virtual technologies and the integration of physical perspectives. The design requirements for this process are shown in Figure 2. Looking at museums in the era of big data, you can find that more and more museums have joined the digital operation model, using overall big data for analysis, combined with the development of the Internet, and through a series of digital technology means such as mobile terminals, websites, etc., to enhance the art museum's extensibility, reaching the development model from museum digital construction to digital museum.

Digital design is nothing more than fitting a variety of data. As far as cultural relics are concerned, scenes can be restored and displayed, which will undoubtedly provide a sense of picture to a large extent and greatly improve user experience. In the current Internet era, museums use digital technology to convey cultural information to the audience more clearly and intuitively, allowing the audience to have a deeper understanding of the material carrier of culture. In the lighting control module of the exhibition hall, the scene mode can only achieve simple unified control of all lamps and lanterns in the whole exhibition hall. It is worth mentioning that the virtual museum enables the audience to have an interactive experience in the virtual and real environment, which improves the efficiency of the audience's visit. Use relevant technology to obtain data; collect data on the number of art museums in our country and the number of exhibitions and the proportion of the number of museums in various regions of our country in the past 6 years, as shown in Tables 1 and 2.

According to related research and analysis, the information transmission speed of images is much faster than that of text, and the area of graphic expression is smaller than that of text. The design of the artificial intelligence museum is dynamic, and the impact of the intelligent museum on visitors is analyzed. The data is shown in Figure 3.

The gradual improvement of the museum and the discovery of the new world concept make it more functional. While cultural communication, leisure and entertainment, and office facilities meet the rational use of different groups of people, the space performance also has a deeper artistic significance. The architectural space of the museum determines our social and cultural life, and it constitutes a public leisure place for social life. Space is an independent concept of freedom in science. The formation and transformation of field concepts in science have a contradictory impact on life sciences such as mathematics, physics, and psychology, and directly affects the creation and transformation of life concepts in art. The spatial structure determines the visual outline presented by the space, and the form performance divides the hierarchical attributes of the overall space, as shown in Figure 4.

In the era of rapid development, audiences no longer need to look for an authority, but to conduct a communication, a dialogue, and an experience. Museums can provide such a platform for communication and experience. Whether in the design of exhibitions or in the planning and implementation of educational activities, we need to fully embody the concept of communication and interaction between the museum and the public, as well as serving the public. The museum display design should not set templates and follow the form. Each museum should have its own outstanding features and display methods. The interaction between the historical materials behind the exhibits and the space design of the museum will enhance the appreciation of the exhibition and make visiting the museum more

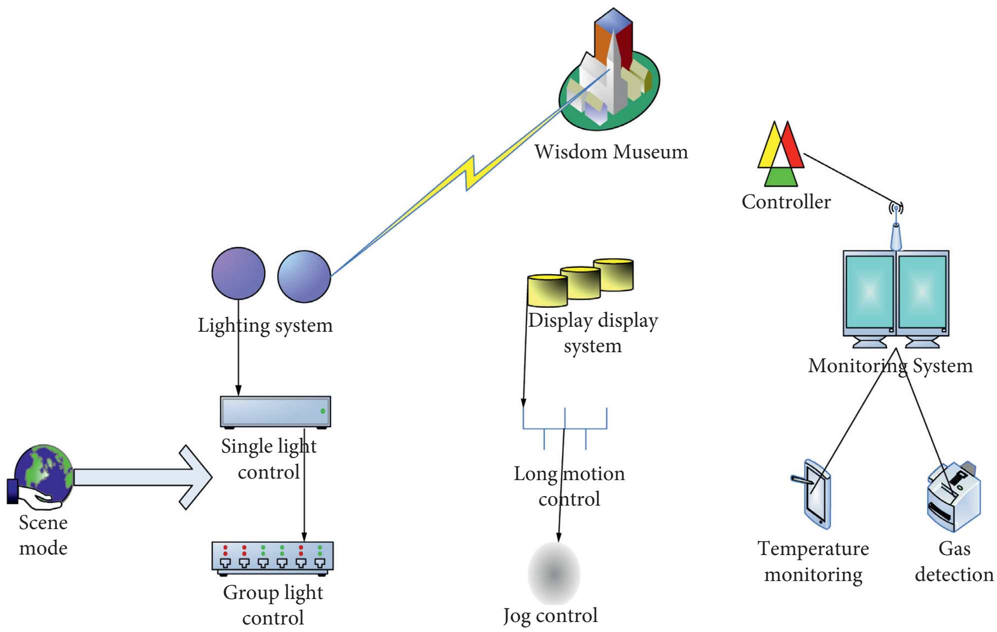


FIGURE 2: Digital museum sector demand.

TABLE 1: The number of art museums and exhibitions in our country in the past six years.

Time	2015	2016	2017	2018	2019	2020
Number of art galleries	57423	65432	59678	59082	57340	59236
Number of exhibitions	102341	130987	120354	11789	12302	12804

TABLE 2: Proportion of the number of museums in each region (1 : 1000).

Area	Quantity	The proportion
Northern region	7469	37.24%
Southern region	10143	57.21
North-west region	996	4.98%
Qinghai-Tibet area	14	0.57%

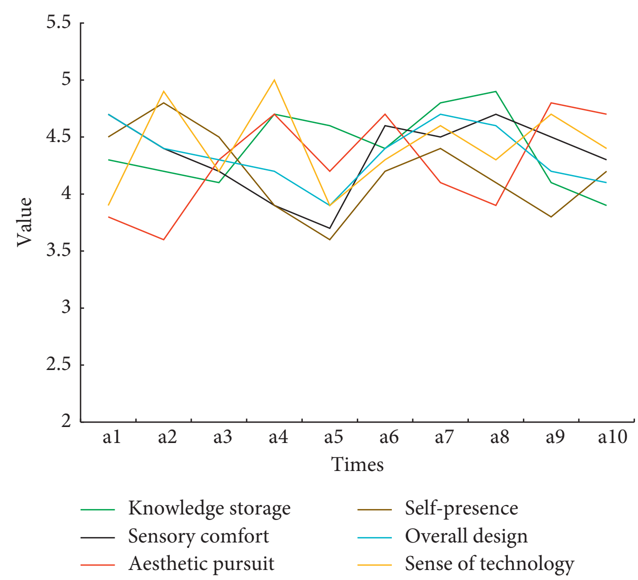
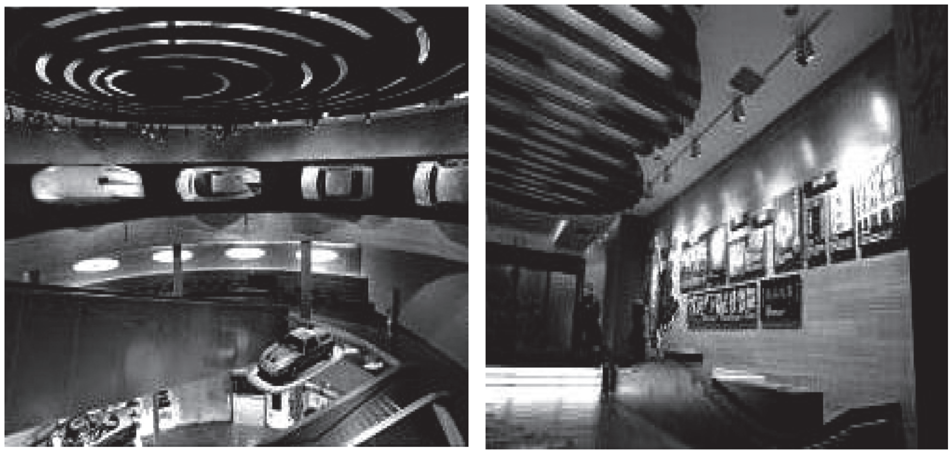


FIGURE 3: The impact of smart museums on objects.

interesting and rich. The internal space of the museum includes exhibition space, public space, transportation space, and leisure space, as shown in Figure 5.

The virtual tactile sensation under the application of artificial intelligence is mainly reflected in digital showcases, e-books, etc., which is different from the real experience of physical touch. The digital showcase technology is attached to the screen through a new holographic nano touch film to sense the movements of the user's fingers. Precisely locate the position and direction of the user's finger. Nowadays, ultrasonic tactile feedback technology can also be used to let users feel the virtual shape and strength of the simulated environment. The digital museum provides visitors with a full range of exhibit information retrieval, feedback, and other functions. Direct interaction with the exhibits breaks the traditional display method of static display and can effectively convey the information of the exhibits. Therefore, virtual touch is an innovation expressed in digital context. The feelings and experience of visitors are included in the consideration of the design of the exhibition space, reflecting the design concept of taking visitors as the center. This combination is shown in Figure 6.

With the gradual deepening of the concept of space perception, it has gradually become the focus of space display in the museum space experience. Interactive experience pays attention to the effectiveness of information dissemination while perceiving, which enhances the interest and perception of the space. Visitors to the virtual museum can quickly jump from any floor of the exhibition hall to another floor, switch from one exhibition area to another,



Independent distribution Integrate with work area

Figure 4: External space design. (a) Independent distribution. (b) Integration with work area.

Figure 5: Composition of internal space.

and the viewing efficiency can be improved. Internet users can open their travel plans at any time, calmly avoiding the crowded people and limited access time in reality. Data statistics are made on the composition of different groups of people's interest in museums, as shown in Table 3.

The museum space takes the functional attributes as the basic manifestation of the spatial form and takes the popular, expressive, hierarchical, and creative design guidance of the museum space design as the entry point for its social attributes. Through the rational planning of the spatial order, familiarize yourself with the composition of the space and the organization and arrangement of the order of time and space; then the processing of function and spatial form is the main appeal of structural space, and the regulation of single-space form and the processing of multispace combination are analyzed separately. From the perspective of visitors, a comparative analysis of the advantages and improvements in different aspects before and after the digital design of the

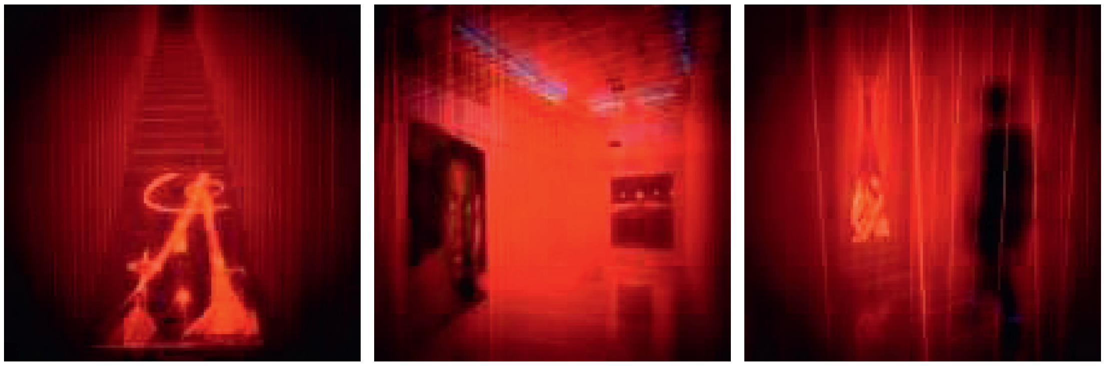


Figure 6: Virtual digital display.

Table 3: The composition of different groups of people's interest in museums.

Museum type	Schoolchildren	College students	The masses of society
History and folklore	31.29%	13.26	21.24%
Art	27.43%	33.21	32.83%
Military	22.74%	35.58	27.32%
Celebrity homes and memorials	18.54%	17.95	18.16%

smart museum is carried out. The first is to show the design aspect, as shown in Figure 7.

With the advent of the information age, the museum has undergone tremendous changes in all aspects, whether it is from early planning to display design methods, ways of thinking or means of expression, and has formed many new era characteristics, such as interactive design, humanization design, network engineering, virtual reality, scene reproduction, etc. With the advent of the information age, museum display design has transformed from a traditional single display cabinet to a comprehensive display method integrating technology and new technology. The development of computer technology has enabled the acquisition of virtual reality technology, multimedia technology, and network technology widely used. People have higher and higher requirements for the quality of life. With the development of the museum business, people have gradually realized the importance of the development of human interaction experience. Traditional methods can no longer meet the needs of visitors, so they have paid attention to the transformation of interactive experience. From the data in the above figure, it can be seen that both the digital design of the picture and the interactivity of the image have been well recognized. Technical data are shown in Figure 8.

The planning and layout of the exhibition hall space will affect the visitors' first impression of the space, forming a preconceived image and determining the emotional tone of the exhibition experience. Different museums have different exhibition spaces with different sizes, performance themes, and expression purposes. Out of the satisfaction of functionality, the layout of the exhibition space should be designed based on the principle of highlighting the content of the exhibition, highlighting the theme, and satisfying the principles of diversified display and demonstration exchanges. In order to study the improvement of the smart museum, data analysis is carried out from the scarcity of cultural relics, the value of cultural relics, the protection of cultural relics, and spatial factors, as shown in Figure 9.

Different levels of space correspond to different spatial scales. The intensity and openness of the behavior determine the opening and enclosure of the spatial scale. Similarly, the spatial scale will give rise to different behaviors and activities. The beginning of the museum exhibition is similar to the design of the museum, it is difficult to determine the individual of the museum exhibition design. For example, in a collection hall, the exhibition appears only to keep the exhibits on the booth and show them to the public. The audience can only see the position and angle of the exhibits. Therefore, it is difficult to have a space for communication and interaction between people and the exhibits. The value of cultural relics cannot get full play. According to the various factors of the space design of the smart museum, such as visitors, exhibits, internal and external environment of the building, and social needs, a comparative analysis is carried out, as shown in Figure 10.

The museum exhibition space is a part of the entire museum's indoor space. In addition to the exhibition space, the museum's internal space also includes other functional spaces, such as office space, equipment space, and storage space. Compared with the outdoor space environment, the size of the indoor enclosure space is regulated. Therefore, it is relatively necessary to deal with the relationship between the local space (here refers to the exhibition space of the museum) and the overall space of the building in a limited space. Through the realization of the three-dimensional virtual display, the public can clearly see the physical shape and decoration information of the collection as well as written records, fulfilling the public's wish to "bring the cultural relics home," and visit the pre- and post-stage museum education activities for the audience. The realization of this has a huge impetus. The results of the data

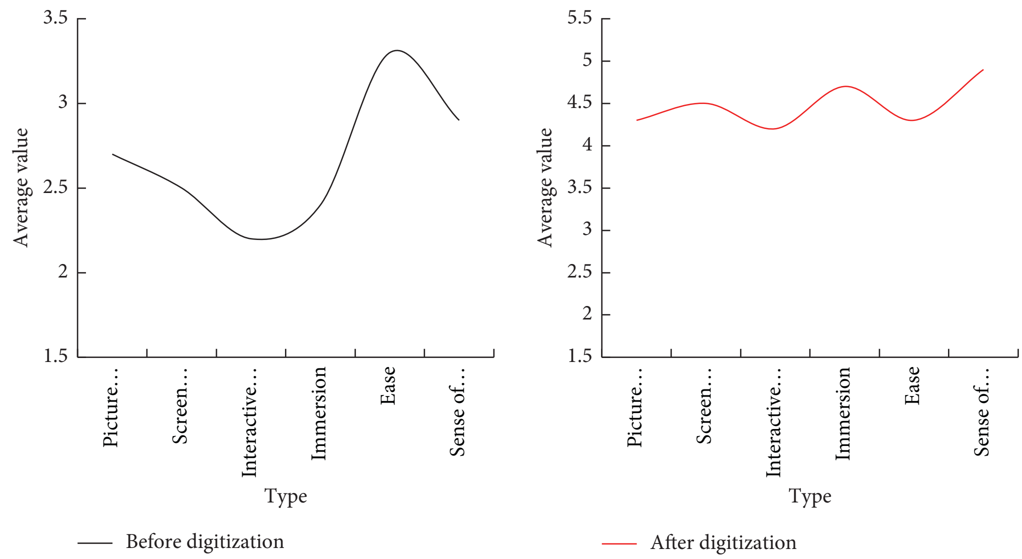


Figure 7: Before and after showing the design.

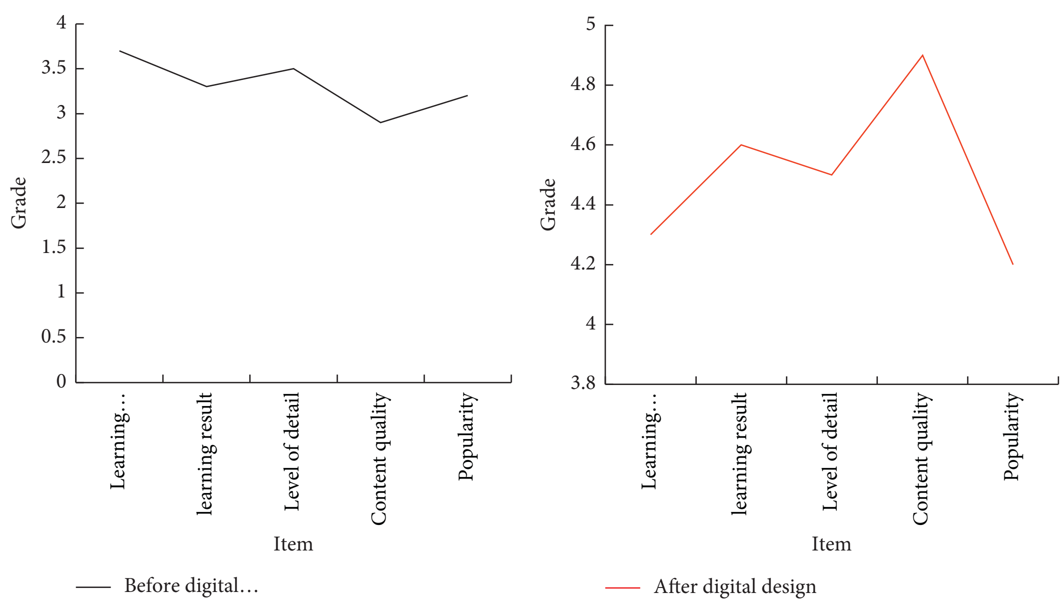


Figure 8: Before and after showing the technology.

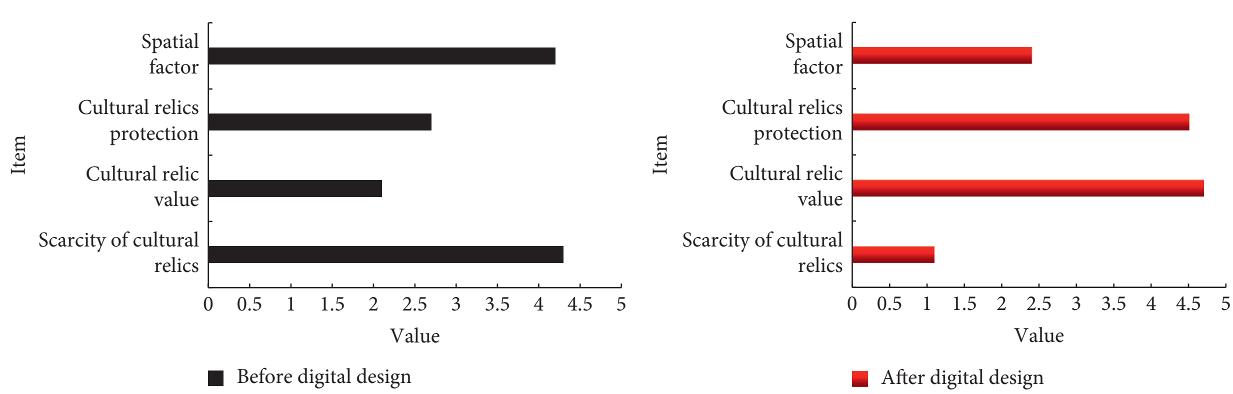


Figure 9: Improvement of the smart museum.

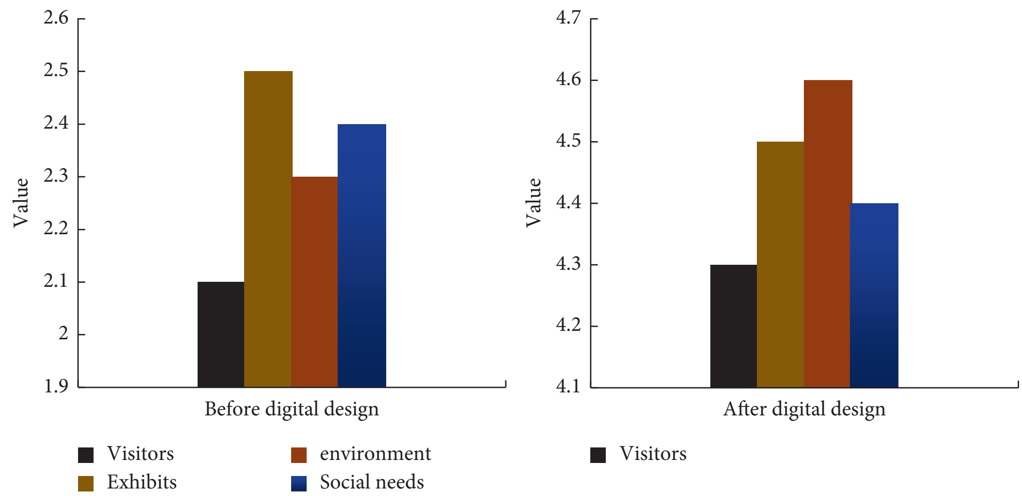


Figure 10: Overall evaluation of each factor.

analysis and processing of the audience's evaluation of the digital smart museum are shown in Table 4.

The museum's space design should not only grasp the theme, but also pay attention to the virtual reality and size of the space design so that the exhibition space has a sense of rhythm. A space full of rhythmic changes can not only meet the needs of different themes, but also increase the interest of the space and strengthen the psychological experience of the audience during the visit. The many displays of modern museum space form reflect the rich changes in its structure and practice, as well as the new trends in the art field. The research on the museum space art form design is a process of continuous improvement, which requires continuous improvement under the integration of the elements of the new situation.

4. Discussion

With the development of science and technology, digital display has been widely used in museum buildings. The digital design of the exhibition space not only expands the cultural connotation of the exhibition in the cultural museum, but also allows visitors, listening, touching, and other scenic spots to feel the cultural information brought by the exhibition and fully absorb knowledge. In the era of digital technology, the combination of multiscenic spot design technology and virtual reality for museum security and cultural communication is not only a breakthrough in historical development, but also the requirement of the development of the times. Exploring the intelligence design of the virtual museum of the intelligence museum can provide inspiration for the research of relevant intelligence museum activities and help to establish a visiting area of the intelligence museum with extensive scientific experience. The rapid development of new technology and its successful application in the field of museum digital display not only provide space for the innovation of museum display system, but also provide new technical reference for us to learn digital display methods. According to the functional characteristics of the field art method, the discussion is carried out layer by layer in three stages, and then the visual effect of the definition effect of space art is constructed through the representation of the diversity of world forms. Finally, use the space art techniques to decorate works of art, create an artistic aesthetic space, and apply it to the spatial structure design of the museum, so as to attract tourists and give them a wonderful artistic experience.

Table 4: The overall evaluation of the digitalization of the space design of the smart museum.

Project	Schoolchildren	College students	The masses of society
Systemize	8.6	8.9	8.8
Unconventional	8.9	8.2	8.9
Associate	8.7	8.5	9.3
Interactivity	8.3	9.1	9.7

5. Conclusion

Visitors play a very important role as a medium for museum architecture and digital design projects. Visitors' satisfaction with museum visits, that is, humanization, has become an important driving force for the development of modern museums. Starting from improving the efficiency of information dissemination and realizing the fundamental purpose of museum exhibition activities, the starting point is to promote the comprehensive development of the museum into a public welfare institution integrating research, exhibition, education, entertainment, and other functions and expound the dynamic space interactive design theory of the museum. The development of new technology has fully promoted digital design, provided more ways, and implemented it under specific circumstances. The immersive sense of interaction required by the museum needs to be further improved in the hardware to realize it. After all, audiences use new interactive methods in the virtual environment to adapt to the community itself, which not only gives them an immersive feeling, but also introduces a good learning experience. To achieve interaction and inspiration, the most important thing is not to design museums and exhibitions in 3D, but to achieve virtual behaviors that suit people. This requires capturing all the physical movements of the audience and transferring them to the virtual reality application, and then reacting to the situation of the audience and the process of transferring to the virtual scene in the virtual museum, and then determining the interaction between the audience and the audience or other things. In the museum building, historical exhibits are static. With the addition of new technology, technology presents differences in exhibits. As a new way of exhibition, the digital design exhibition method uses human nature to have a sense of mystery for the unknown. You cannot help but want to touch it, explore its psychology, guide visitors to participate in it, and choose their own feelings, and choose the exhibits you are interested in, deeply understand their cultural connotation and artistic value, and enrich your cultural quality and knowledge.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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