



## RESEARCH ARTICLE

# Understanding the Sociocultural Impact of Intelligent Interactive Exhibition Design on Visitor Experience

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**ABSTRACT**

Under the background of the rapid development of social economy, science and technology promoted by the wave of globalization, the continuous intersection and integration of various professional fields related to spatial display design affect the development of display design theory research and industry practice in the direction of diversification. The theoretical construction of exhibition space design should be explored from a broader perspective under this background. This leads the author to think about the future development direction of exhibition space design, the spatial display design method under the influence of information technology, the interaction mode of audience obtaining and receiving information, the exhibition space design form in the information environment, and the application of Intelligent Interaction technology in spatial display design and respond to this in theoretical research.

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**INTRODUCTION****Rationale and Background****Industry background**

In the information age, the development of the exhibition design industry is influenced by new media technology, computer technology, communication technology and information technology, and the presentation form has gradually formed a huge difference from the traditional exhibition design. The traditional display mode gradually tends to be homogeneous in the current social and economic environment. At present, the application of information technology and other emerging technologies in the exhibition design industry at home and abroad has formed a relatively mature and standardized method and process, and has achieved certain results in many exhibition space design activities. Cross border research institutions that combine art and technology such as information technology, media technology and visual communication design and exhibition space design have become mature. Relevant research and experimental institutions include ART + COM in Germany, Art Research Institute in Japan and New media research center of Peking University, etc.

Worldwide, the project research on intelligent space has been gradually carried out as early as the end of last century, For example:

The research project of MIT's Artificial Intelligence Laboratory Intelligent Room aims to explore advanced human-computer interaction and collaboration technologies. Other research projects also include Microsoft's Easy Living Stanford's Interactive Workspace, Europe's Iland of GMD, UIUC's Active Space Georgia Tech's Aware Home, and the intelligent classroom of the computer department of Tsinghua University (smart classroom), IBM's blue space, etc. (Su, 2007:2)

With the gradual maturity of Internet of things technology, display resources can be reasonably allocated, the quality of display information can be optimized, and display venues can be scientifically managed. Through the information interaction between venues, exhibits, audiences and the Internet, the exhibition space environment is no longer a pure physical entity, and the relationship between people, space and information has been expanded and extended.

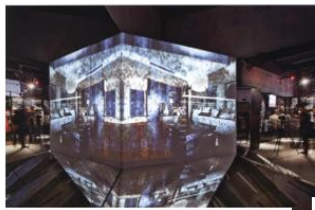


Fig.1-1 2010 China Shanghai World Expo, author shooting



Fig.1-2 2010 China Shanghai World Expo, author shooting



Fig.1-3 China Shenzhen Urban Planning Exhibition Hall, author shooting

## Academic background

Exhibition space design is an expression means to integrate various media to convey information. Its theoretical research cannot be separated from the market performance and practical achievements of the industry. Combing the current display design phenomenon is the main direction of discipline research. The application and exploration of new media interaction technology closely related to exhibition space design is the key object of current research. It is rare for the concept of intelligent space to be included in the research scope of display design discipline.

The factors involved in the enrichment and improvement of any industry and discipline are huge and complex. Only by relying on the interaction between the external environment and the internal law can it present the corresponding form. exhibition space design is no exception. Whether it is the rise of design thought or the renewal and application of science and technology, we can capture traces from its specific form. Its communication attribute also determines that it is closely related to the public as a cultural form, and the public demand also greatly affects its development direction. The new challenges, new problems and new environment faced by the current exhibition space design put forward new requirements for the improvement and development of the discipline.



**Fig.1-4 Longgang Xiexin enterprise Exhibition Center, Shenzhen, China, author design**



**Fig.1-5 Longgang Xiexin enterprise Exhibition Center, Shenzhen, China, author design**

## Research Question

This paper studies the spatial display design from the perspective of information technology, which is bound to need the necessary research on the technology itself. However, due to the differences between disciplines, this paper will discuss the following problems within the theoretical framework of exhibition space design:

- What is intelligent interactive exhibition space design?
- What are the forming factors of intelligent interactive exhibition space design?
- How to use the new technology of artificial intelligence to drive the transformation of modern exhibition space design thinking and design methods?

## Objectives

- Through the research on the basic theory of human-computer interaction and intelligent interaction, this paper analyzes the concept and characteristics of intelligent interaction exhibition space design.
- This paper analyzes the forming factors of intelligent interactive exhibition space design from two aspects of social influence and technical influence.
- Summarize the design ideas and methods of intelligent interactive exhibition space design.

## Research scope

This paper aims to explore the symbiotic relationship between technical factors and exhibition space design, which is an intersectional research between information technology and exhibition space design. This paper brings the content of information technology into the theoretical research system of exhibition space design and regards it as an indispensable part of exhibition space design. It discusses and analyzes the concept, characteristics and forming factors of intelligent interactive design of exhibition space, and the design method of exhibition space with the participation of intelligent information technology.

## Theoretical framework

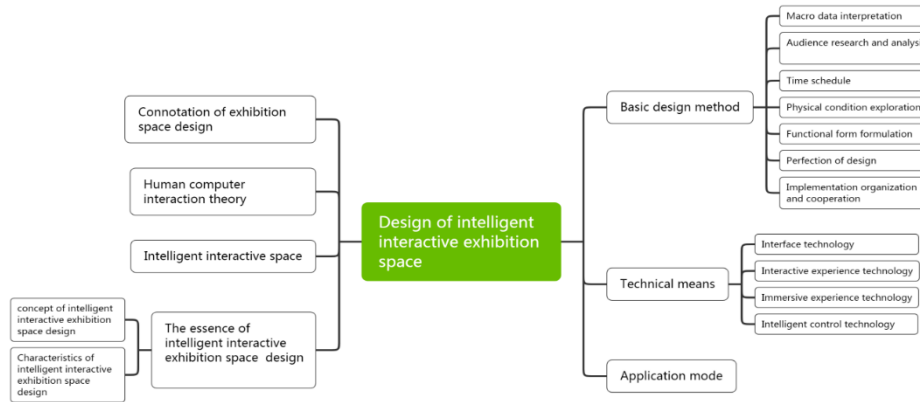


Fig.1-6 conceptual structure, author drawing

**LITERATURE REVIEW**

**Related theories**

**Connotation of exhibition space design**

Exhibition space design is a comprehensive design work that uses certain visual communication means, with the help of props, facilities and lighting technology, through the creation of display space environment. (Huang, 2020; Kanval et al., 2024) From connotation to extension, exhibition space design is no longer limited to the scope defined by the design discipline. Driven by the new design concept and the wave of technological innovation, space exhibition design has become a cultural activity integrating high-density information integration and cutting-edge technology. Through new intellectual and technological means, it has constructed a new interactive experience between people and exhibition information.



Fig.2-1 China Shenzhen Urban Planning Exhibition Hall, author shooting

**Human computer interaction theory**

Human computer interaction refers to the technology of connecting information exchange between human and computer. It provides information for people through computer output and display equipment, and people obtain corresponding feedback through input information. (Webster, 2011; Jam et al., 2017; Rashid et al., 2023) It is closely related to ergonomics and cognitive psychology. The main research content is to establish a reasonable, comfortable and efficient interactive link between people and computers. The essence is to improve the quality of communication and transformation between people and information, people and people. After decades of development and evolution, it has entered the stage of intelligent interaction and is developing towards a more intelligent, humanized and natural direction.

## Intelligent interactive space

Intelligence usually refers to artificial intelligence. It is a computer program that combines computer science and cognitive psychology to study intelligent behavior and simulate behavior function. It is based on the hypothesis between computer system and psychological cognitive reflection system. Confirmed comparability. The communication mode between human and computer is the main content of human-computer interaction. Another research field extended by human-computer interaction is intelligent space. At present, typical research projects at home and abroad include Smart Class project of Tsinghua University, Hard SCORM project of Tamkang

University in Taiwan and Cool Town of HP in the United States Project, OXYGN project of Massachusetts Institute of technology. The research results of some projects show that at present, an intelligent and spontaneous interactive information space can be realized. This intelligent information space can automatically perceive various changes in the physical space, carry out action recognition or visual tracking through embedded sensors or sensing interfaces, and can correspondingly change the recognition and response state of associated objects, the emergence of this new spatial form is a concrete practice based on the concept of pervasive computing. (Su, 2007; Farooq et al., 2010)

In this regard, relevant scholars have defined intelligent space, which refers to a physical space embedded with computer system, interactive interface, information equipment and multi-channel sensors. Because the multimedia interface control technology capabilities such as auditory recognition, speech recognition, action recognition and visual tracking are embedded in the physical space, the computer hidden out of sight can recognize the human behavior in the physical space, judge the human intention and make appropriate feedback or action. (Jia, 2007)

Intelligent interactive space is a multi-level interactive space form formed by using information technology to closely combine the functional attributes of physical space and virtual information space, identify human behavior patterns and assist in obtaining information.

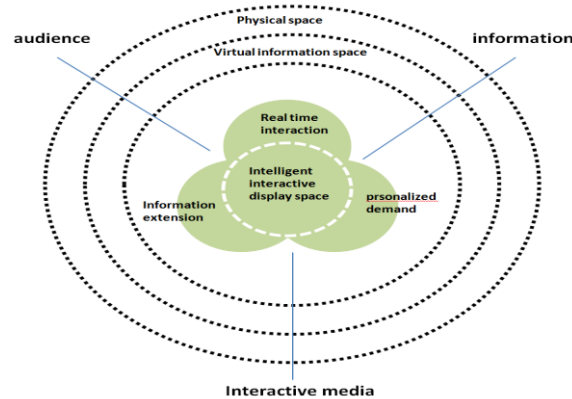


Fig.2-2 China Shenzhen Urban Planning Exhibition Hall, author shooting

## The essence of intelligent interactive exhibition space design

### Concept of intelligent interactive exhibition space design

The transformation process of information media in traditional exhibition space design reflects the continuous changes of connotation and characteristics in different times and social environments. The design of exhibition space in the information age has its unique characteristics. The spatial environment and virtual information are connected into a complete information dissemination system. The form of exhibition space is a new model formed by the superposition of virtual information space and physical entity space based on intelligent interaction technology, which is differentiated and derived from the original functional definition, this kind of exhibition space has the flexibility and adaptability that the traditional display space does not have.



**Fig.2-3 Conceptual framework of intelligent interactive display space, author drawing**

Intelligent interactive exhibition space design refers to the comprehensive information media and exhibition space formed by using Internet of things technology, computer system integration technology, human-computer interaction technology, communication technology, multimedia technology and visual communication design

Combine art, integrate and optimize information resources by intelligent means, and form a multi-level, multi-dimensional and extensible interactive exhibition space form relying on three-dimensional solid space, to achieve a design mode to meet the personalized communication and needs of the public.

The author believes that the design of intelligent interactive display space is a new design method and mode driven by information technology in this field. Therefore, this concept includes multiple levels of content.

First, technical support is a necessary condition for the design of intelligent interactive display space. Without the intervention of technology, intellectualization and interactivity will be impossible. Technology can adjust combine a large amount of information in the space and communicate with the audience through a friendly interactive interface.

Secondly, it must rely on the creation of media under the environmental conditions of physical display space and materialize the display information at different levels in form with the help of the structure, layout, interface and modeling of physical space. If it is separated from the basic conditions of physical space, the pure virtual information space will have no significance.

Finally, meeting the personalized needs of the audience is the main goal of intelligent interactive display space design. The previous multimedia video, audio, image, picture, text and other information are transformed into a part of the virtual space in a limited way under a specific mode, and the audience will directly participate in the process of deconstruction and reorganization of the display information.

To sum up, intelligent interactive display space design is a creative activity in the information environment, a result of complex collective intelligence, and one of the forward development directions of display space design art in the technical context.

### **Characteristics of intelligent interactive exhibition space design**

#### **Real-time interactive**

Interactivity is one of the important characteristics of intelligent interactive display space design. The so-called real-time interaction is embodied in the time factor of information dissemination, which

includes real-time reception and real-time feedback. Although the exhibition space activities are procedural and limited by the principle of time, contemporary space exhibition design is no longer satisfied with the transmission mode of specific

information in fixed places. During the visit to the intelligent interactive space exhibition, thanks to the intervention of information technology and media technology, the audience's real-time access to information and multi-level communication are no longer limited.



**Fig.2-4 China Shenzhen Urban Planning Exhibition Hall, Intelligent interaction design, author shooting**

**Fig.2-4 China Shenzhen Urban Planning Exhibition Hall, Intelligent interaction design, author shooting**

### **Pluralistic openness**

Openness is the basic feature of traditional display space design. The essential attribute of intelligent interactive display space design determines that the formation of display space form cannot be separated from the interaction between physical facilities and information facilities. It has stricter requirements for the internal functional environment of display space, and the resulting spatial interface will be more diverse, complex, flexible and open. The multiple openness of intelligent interactive display space design is mainly reflected in the openness of display space; The openness of space and media interface; Openness of display information; The openness of the design process includes four aspects.

### **Multidimensional ductility**

Extensibility is the main feature that distinguishes intelligent interactive display space from traditional display space. Its connotation is mainly reflected in three aspects: the scalability of display space, the scalability of communication time and the scalability of information.

Virtual information space requires that physical display space must reserve corresponding extension space for basic components, functional modules and infrastructure (including equipment, lines and interfaces) to meet the needs of information media update and information quantity growth.

With the mature application of network and communication technology, the time attribute of spatial display design activities has been redefined. The audience obtains and feeds back information through visual scanning, wireless transmission through intelligent terminals. Even if the display activities have ended, the information dissemination will not be terminated. It will be transformed into virtual information through digital technology and continue to exist on the Internet or other virtual platforms, Audiences can still continue to communicate through a variety of ways, and use the

Internet to publish and share on the platform to form secondary communication. After the visit is terminated, the information is stored to form digital data and produce permanent value. With the mature application of network and communication technology, the time attribute of spatial display design activities has been redefined. The audience obtains and feeds back information through visual scanning, wireless transmission through intelligent terminals. Even if the display activities have ended, the information dissemination will not be terminated. It will be transformed into virtual information through digital technology and continue to exist on the Internet or other virtual platforms, Audiences can still continue to communicate through a variety of ways and use the Internet to publish and share on the platform to form secondary communication. After the visit is terminated, the information is stored to form digital data and produce permanent value.

Through the examination of the current situation of display design, although the audience can freely control the choice of display information, the audience is still a passive receiver because the information itself is limited to a specific range. In the display design of intelligent interactive space, information is received, fed back and transmitted at the multi-dimensional level. The audience participates in the process of information manufacturing and communication and becomes an integral part of communication activities.

### **Previous studies**

Many intelligent space research projects (Smart X) have been carried out internationally. MIT's Artificial Intelligence Laboratory began a research project called Intelligent Room in 1996. Its purpose is to explore advanced human-computer interaction and cooperation technology. The specific goal is to establish an intelligent room to explain and enhance the activities. By installing multiple cameras, microphones and wall projection in an ordinary meeting room and living room shadow and other facilities, so that the room can identify the actions and intentions of the people in it, and help people work and live better by taking the initiative to provide services. Other studies include Microsoft's Easy Living, Stanford's Interactive Workspace, European GMD's Iland, and UIUC's Active Space, Aware Home of Georgia Tech, Smart Classroom of Computer Department of Tsinghua University, Blue Space of IBM, etc.

From the research of these intelligent spaces, we can see that the interaction mode between human and machine has also changed greatly. From the era of "knob and dial" of complex instruments and meters to the new computing mode - pervasive / ubiquitous computing, the intelligent interactive space is developing towards a more humanized direction. For example, Don Norman's "invisible Compute" ; CMU's Aura plan; EU's "Disappearing computer" program; Oxygen program of MIT; HP's Cool Town program. They all realize the integration of information space and physical space through binding or spontaneous interaction.

There are two ways to realize binding: one is to add a label for each object that can be automatically recognized by the computer. The label can be based on bar code, infrared and RFID. For example, HP's Cool Town plan is to create a bar code with URL information on all objects in the physical world. The correspondence between its representations on the web, so as to establish a digital city. The other is to directly embed certain sensing, computing and communication capabilities in the object, so that it can be used in both physical space and information space, such as the Interactive Table plan of MERL laboratory; Things that think project of MIT Media Lab; Smart classroom of Tsinghua University, etc.

Spontaneous interaction uses the state change of information space to map to physical space. Its main form is that digital information can be seamlessly superimposed in physical space and can be displayed on various electrical appliances that have been widely used at present. For example, E-Ink is studying electronic paper, and Everywhere Display of IBM Research Institute.



The information space automatically detects the change of state in the physical space, so as to change the state of the corresponding object or trigger some events. This is implicit human-computer interaction. There are two ways to realize it:

- through sensors: the TEA plan of the European Union, embed sensors in daily appliances such as coffee cups, furniture and mobile phones;
- Through the multimodal perception interface: Smart Classroom of Tsinghua University, we use visual tracking, pose recognition and other methods to judge the current context in the classroom.

The research of these systems is challenging the traditional interaction mode, trying to restore the most natural human interaction mode in human-computer interaction.

## **RESEARCH METHOD**

The development of space display design industry and discipline construction have been constantly updated and transformed, and the perfection of the theoretical system is far from meeting the corresponding requirements. With the passage of time, new display means are more and more accepted by the public. The novel interactive participation mode makes the display space show geometric information growth per unit area. The concept of spatial display design also needs to be interpreted from a more macro and comprehensive perspective. A clear understanding and analysis of information media is the driving core of the continuous development of spatial display design, and it is a problem that needs to be seriously considered in the theory and method of industry and discipline.

Based on the relevant theoretical achievements of communication, semiotics, information theory, interactive design, digital media art, design aesthetics and design psychology, this paper analyzes the basic characteristics, application direction and value of intelligent interactive display space design. Mainly through the reading summary of literature, comparative research in related fields, achievement analysis of practical cases, field investigation, participation in actual project practice, basic data interview and investigation, this paper puts forward a reasonable systematic analysis and conception of the display design method of intelligent interactive space.

### **Analysis on forming factors of intelligent interactive exhibition space design**

The emergence, development and change of exhibition space design must be affected by social and technical factors. The key factors affecting its change towards intelligent interaction include three aspects: the reconstruction of cultural mode, the reconstruction and integration of audience behavior mode reconstruction of media technology.

#### **Reconstruction of cultural mode**

When it comes to cultural connotation, spatial display design, as the carrier of information communication, is inseparable from the discussion in the context of technology. It uses technology as a means to spread information, and technology reversely affects the characteristics of the times of spatial display design. Therefore, the basic attribute of space display design belongs to both the cultural category and the technical category.

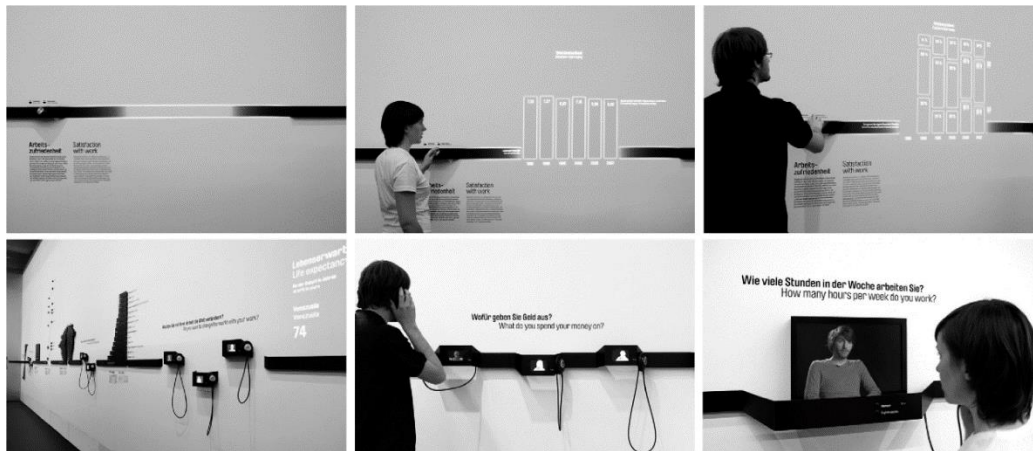
With the breakthrough of technology, the design of exhibition space is constantly changing, the efficiency and quality of information dissemination are higher and higher, and the functions are richer. As an information medium, it has reached a height that cannot be surpassed, imitated and used for reference by other media.

Culture is a complex of historical factors. Display space design is a subculture phenomenon in the process of human development. This phenomenon will gradually enter the cultural field after historical precipitation. It not only expands the connotation of culture, but also brings change and

produces a force to change the main culture. This shows that in the historical process of society, spatial display design will not only be continuously affected by various fields of society, but also gradually cross integrate with them as a cultural phenomenon and become a subsystem affecting the social process. The pluralistic and open characteristics of space display design in today's era have changed its dominant position as a communication carrier for a long time and turned to be dominated by the public. The transformation of role makes it begin to seek to become a service carrier with perfect function and humanization, forming the functional transformation in the cultural context.

### Reconstruction of audience behavior model

In the environment of intelligent interactive display space, the needs of audience groups become more diversified than before, resulting in the complexity of display space activities from the aspects of design, management, maintenance and expansion. Firstly, due to the differences in the social environment, cultural level and values of the audience, there are different levels of needs, which have higher requirements for the quality of information dissemination, integration and interactive experience of display space activities. Secondly, the interactive behavior of the audience in the process of information reception and information transmission highlights the internal value of display space activities, and it is particularly necessary to study the behavior psychology of the audience. Thirdly, the audience's participation in the construction and reorganization of the information field affects the process of information dissemination. The audience occupies the central position of the whole exhibition space activities, and the information media and space form will be created around the specific needs. Therefore, the cognition of the complexity of the audience's behavior is a necessary way to understand the formation factors of intelligent exhibition space design.



**Fig.3-1 The health data visualization and interaction interface of the German Health Museum changes the audience's behavior of receiving information. The picture comes from the art + com home page**

### Reconstruction of comprehensive technical factors

The reconstruction of technical factors of intelligent interactive exhibition space design can be summarized as the reconstruction of media technology based on virtual level in theory.

The first is the Internet of things. The Internet of things is the information exchange means of the Internet of things. Its basic architecture is mainly composed of three layers: perception layer, network layer and application layer. It mainly realizes the basic application by intelligent perception and identification, information collection and processing, automatic control, access network and infrastructure.

Secondly, cloud computing is a technology model based on digital technology and network technology. Integrating virtual information resources through the Internet to achieve the

comprehensive utilization of computing and storage is based on the development of processor technology, broadband Internet technology, storage technology, virtualization technology and automatic management technology. It has the characteristics of high scalability, resource virtualization and automatic control, massive data processing ability, low cost and transparency. Because it contains the concepts of Storage Cloud and computing cloud, it will provide strong technical support for the virtual information space in the design of exhibition space.

Finally, pervasive computing is a new model in the field of computer technology. Its main idea is based on the integration of network space, physical space and anti-interference computing.

Through the judgment of the future application of this kind of technology, the paper believes that the technical problems of intelligent interactive space display design can be solved, but because these new technology models themselves are also in the stage of continuous exploration, how to specifically combine with space display design needs to be discussed. According to the current situation, how to organically combine these complex technical problems with exhibition art still needs to be solved by many parties. At the same time, based on the premise of continuous improvement and development of technology, intelligent interactive space display design will become a reality relying on the support of this kind of new technology.

## **Methods and means of intelligent interactive display space design**

### **Basic design method**

Space display design is a comprehensive design activity. The preliminary preparation stage occupies a very important position in the whole design process. This stage is usually called planning design, which includes the investigation, analysis, research, judgment, sorting and optimization of the involved contents. The preliminary planning stage of intelligent interactive space display design will include the following seven contents.

### **Macro data interpretation**

Such materials are usually divided into background materials and reference materials. Background materials are macro materials showing space design activities, covering regional cultural background, social development trend and design trend orientation. The interpretation of such materials will provide background reference for design activities. Reference materials are intuitive materials related to the design activities of the exhibition space, reflecting the purpose, scale, content, plan, nature and other contents of the information disseminator and the exhibition space activities. They usually appear in the form of design scripts. The designer must sort them out through information charts or other information visualization methods, On the basis of this research, we can fully understand the overall positioning of exhibition space design activities and form a direction guidance for the next design work.

### **Audience research and analysis**

Because the intelligent interactive space has a very close relationship with the audience experience, the attention to the needs of the audience will become the focus of the preliminary work of the design, in order to objectively grasp the psychological laws and behavior patterns of the audience and provide objective data reference for the design work. This is a very tedious work. Due to the influence of complex factors such as region, age, personality, professional class and education level, we must effectively use the existing audience research results, classify and analyze the relevant data obtained through questionnaires, observations and interviews, and find out their common characteristics. Only in this way, the information media design and interactive experience design of exhibition space can be targeted.

### **Time schedule**

At this stage, the designer will comprehensively consider the time factor. In the process of space display design, the concept of time is divided into design time and implementation time. Therefore, after analyzing, evaluating and integrating the data in the early planning stage, a strict time schedule can be formulated, which is an important reference for controlling the whole design workflow and progress. In addition, due to different types of space display activities and different time requirements, the design contents such as scheme planning, scheme implementation and organization cooperation are also required to be more refined and accurate.

### **Physical condition exploration**

exhibition space design activities, but also the necessary condition for the development of design schemes. Therefore, it is very important to pay attention to and investigate the place. As a designer, the key contents include: the internal and external environment related to space display activities. If the internal environment is based on architectural space, the basic elements include column grid, roof, ground, partition, traffic, lighting, lighting, circuit, ventilation management, fire-fighting facilities, water supply and drainage system, power distribution Hard elements such as auxiliary facilities. At the same time, the requirements of intelligent interaction also need to pay special attention to the construction of network communication infrastructure. The basic elements include control room, basic wiring, various reserved interfaces, etc.

Due to the limitations of different environments and technical conditions, there will be contradictions between the actual situation and design requirements, which will have different effects on the design work. Continue to study and solve such contradictions according to the actual design needs.

### **Functional form formulation**

Any space exhibition activity must consider the size of the space, the relationship between space and space, and the detailed current situation of infrastructure. The function space of intelligent interactive space display design also covers information space, transition space and auxiliary space. The proportion of physical display or static display in the information space will be greatly reduced, and the display information will appear in a digital interface in the form of viewing, listening and touching, which will be visually transformed through digital information, the functional significance of functional space will be further expanded. The auxiliary space will increase the data center and rest area to form the auxiliary function area. Therefore, on the premise of clarifying the above design requirements, understanding the basic characteristics of intelligent interactive space and fully integrating the real intention of information disseminators, the plane layout, facade form, moving line arrangement, display props, color tone, lighting and other design work shall be carried out according to the traditional space display design method. Any space exhibition activity must consider the size of the space, the relationship between space and space, and the detailed current situation of infrastructure. The function space of intelligent interactive space display design also covers information space, transition space and auxiliary space. The proportion of physical display or static display in the information space will be greatly reduced, and the display information will appear in a digital interface in the form of viewing, listening and touching, which will be visually transformed through digital information, the functional significance of functional space will be further expanded. The auxiliary space will increase the data center and rest area to form the auxiliary function area. Therefore, on the premise of clarifying the above design requirements, understanding the basic characteristics of intelligent interactive space and fully integrating the real intention of information disseminators, the plane layout, facade form, moving line arrangement, display props, color tone, lighting and other design work shall be carried out according to the traditional space display design method.

### **Perfection of design**

The design part includes the overall planning design and sub item design. The overall planning design is an outline content, which comprehensively designs the style, layout, basic form, transition space and color tone of the whole exhibition activity at the macro level. Under the framework of the overall planning and design, the sub item design is the specific design of each local area in the space, including the specific design of props, local tone, lighting mode, space layout and so on. After repeated deliberation, the contents of each part of the scheme form a final decision and design specification. After the scheme at the level of art design is demonstrated and approved, the follow-up work is technical design. It is a method to express the design intention by using technical language. It is an important basis and guarantee for the implementation of design. It usually appears in the form of technical drawings.

### **Implementation organization and cooperation**

In the design implementation stage, the implementation organization plan must be reasonably arranged because it involves the basic exhibition arrangement project and the implementation project of intelligent interactive technology. Due to certain errors between the technical drawings and the actual situation, and the strong professionalism of the technical implementation, it often needs continuous adjustment and modification in the implementation process, so the design for reasonable coordination between engineering and technical teams, strict organization plan must be formulated to avoid mistakes in the implementation process.

### **Analysis of technical means**

At present, the application of multimedia interactive technology in the field of Exhibition space design has changed the behavior and perception mode of the audience and reorganized the information communication order. The transmission, transmission and reception of information will no longer be limited by the fixed information module but pay more attention to the connection between more extended information in the process of communication, so as to form an information data network with hierarchical relationship. The initiative of information reception and expansion will be handed over to the audience to participate in the construction, reorganization and re dissemination of display information. The application means will include intelligent interactive technology platform and software and hardware equipment.

### **Interface technology**

At present, the digital multimedia interactive media in the space display environment is usually composed of touch screen, projection, LED display and other hardware facilities. Its intelligence, coordination and adaptability are far from the requirements of intelligent interactive space. According to the current development trend of display media, the main interface technologies of intelligent interactive space include:

- The multi-channel interactive projection system is a large screen display system composed of multiple projectors. Compared with the ordinary projection system, it has larger size, wider field of vision, more display content, higher display resolution, and more impact and immersion visual effects. It can meet the needs of intelligent interactive space for the superposition of physical space interface and information interface. It is to realize all-round real-time interaction.
- Multi touch LCD screen, which has been used as the display medium since 1971, has been widely used in various fields, such as TV, mobile phone and so on. Multi touch technology is "an input technology controlled by computer users through finger and screen touch image application." It is a technology realized by human-computer interaction technology and hardware equipment. It can directly send instructions on the screen of various electronic products through fingers, so as to get rid of traditional input devices (such as mouse, keyboard, etc.) and carry out computer human-computer interaction operation.

### Interactive experience technology

Interactive experience technology is a technology mode based on sensing device and interaction. It mainly triggers the transmission of information through the induction of audience behavior. At present, the mainstream technical means is to realize the virtual audio-visual effect by using infrared induction technology and multimedia video and audio technology. Firstly, it obtains the visitor's actions and transmits them to the computer for analysis and processing, and the internal application program performs the interaction effect driven by the captured signal.



**Fig.5-1 Level green exhibition space in autostadt theme park in Germany, picture source: <http://60designwebpick.com/>**

### Immersive experience technology

The experience technology represented by 4D and 5D experience modes can provide the audience with visual, auditory, tactile, taste and olfactory stimuli, with rich expressiveness. At present, the mainstream expression is stereo image system, Usually, two machines in a group of projectors play the images with parallax between the left and right eyes respectively, and project them onto the screen after polarization. After the audience wears polarized stereo glasses, the left and right eyes see different images of the two projectors respectively, so as to obtain the stereo image with depth of field and make people feel immersive. It is usually used in the way of collective participation. The interactivity of immersive experience is relatively weak, and the investment requirements are relatively high, but it can create shocking visual effects for the audience's senses and bring new visiting feelings.

### Intelligent control technology

Intelligent control technology is mainly aimed at the connection and control system between information interface and computer, lighting control and induction control in space display environment. It is the "brain" of intelligent interactive space. It can perceive the environment, make decisions and control. In the future, intelligent control technology will move towards the ability to analyze, organize data and transform data into structured information understood by machines; the ability to select optimization behavior in complex environment so that the system can continue to work under uncertainty. (Shi, 2009)

Because space display activities require instant communication between information and audience, it is usually installed in interactive equipment or distributed in the control center of space to transmit and transmit signals through communication network technology.

### Application mode of intelligent interactive display space design

The mutual penetration and combination of modern science and technology make science and technology tend to be integrated. This has expanded the field of technological activities. Technological progress involves all fields of human activities. The material means in technological activities include not only the original hardware such as tools and equipment, but also the software

that uses computers to control activity programs and processes. (Xu, 2007) In the previous design work, the technical content is only used as a supplement to the design work. In the process of intelligent interactive space design, it is necessary to quantify the intelligent interactive technology, simulate the hypothetical objectives and discuss the feasibility and technicality. Therefore, the proportion of technical content will be greatly increased, which is related to the advantages and disadvantages of interactive experience and display information dissemination effect. Several key technical modes mentioned above are the important foundation of intelligent interactive technology. Based on the current research results and the concept of intelligent interactive space display design proposed in this paper, the author divides the application architecture of intelligent interactive technology in the field of space display design into: foundation support layer, application support layer, control management layer, display experience layer There are five levels of formal expression.

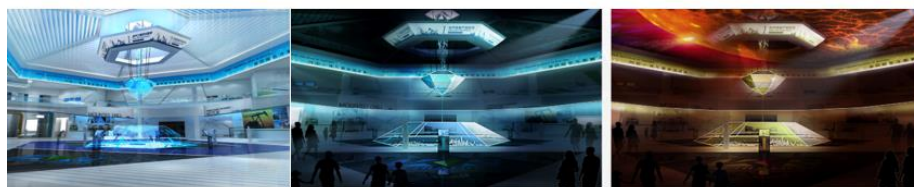
The basic support layer mainly refers to the basic environment construction and supporting exhibition arrangement of the exhibition space, including: overall space display design, generic cabling, power distribution, intelligent lighting, security monitoring, fire protection, network communication, wireless network, intelligent terminal and other systems.

The application support layer includes cloud computing platform and Internet of things application technology.

The exhibition experience layer mainly refers to the exhibition arrangement and implementation, system integration and space construction of the interactive experience area in the exhibition space environment. Its content includes the exhibition arrangement, construction and system set of each scene in each exhibition experience zone.

The formal expression layer mainly refers to the expression of the exhibition experience in each exhibition area, including the interactive demonstration system of the relevant scene experience exhibition area, video 3D animation, and the planning and production of the actually running cloud platform application system; Real scene access of other relevant application systems and graphic guide system in the experience exhibition area.

The ultimate purpose of the analysis and combing of intelligent interactive technology is to apply it to the space display design activities, and create an infinite information world in the limited space environment with its support.



**Fig.5-1 China Kerui Group Exhibition Center, Intelligent interactive device, author design**

## CONCLUSION

With the continuous change and innovation of social thoughts and science and technology, more new things will emerge, and many current ideas will get new interpretations with the development of the times. The collision between the concept of exhibition space design and the idea of new technology has changed its original appearance. This is the product of the combination of science and technology and the times. It will inevitably participate in social changes with the brand of the times. The future exhibition space design will face more diverse and unpredictable challenges. Under the environment of mutual influence and interaction of different fields and disciplines, it has opened a new mode of information dissemination.

Exhibition space design needs to integrate new technical concepts to obtain stronger vitality. The intervention of intelligent interactive technology has made fundamental changes in the design of exhibition space. It reinterprets the concept of time and space, deconstructs and reconstructs people's cognition of the world, greatly improves the efficiency of information dissemination, enriches people's visiting experience, and opens a new direction for the development of exhibition design.

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