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Research on Multi-modal Intelligent Navigation and AI+AR Display Design Theory

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Abstract: ***The multi-modal intelligent navigation and AI+AR display construction space art system is a rational and logical system, and its design and construction form is open logic, and it maintains an inclusive position in the structural organization and order generation of the design connotation system. As an important branch of the field of modern art, multi-modal intelligent navigation and AI+AR display art space, as an important branch of modern art, aims to integrate artworks, audiences and the cultural meaning behind them through space planning and design, creating a unique and in-depth artistic experience. In this field, many outstanding artists and theorists have put forward their unique insights and works, which have greatly enriched the theory and practice of exhibition art space.***

Keywords: Multi-modal intelligent navigation, AI+AR display construction, Design, Theoretical research**.**

1. Introduction

Multimodal intelligent navigation and AI+AR display construction space art have explicit and implicit expressions in artistic expression: following the guiding strategy of "connotation first" in artistic creation - starting from the four implicit (rational) subsystems of the deep structure, connotation, function, and meaning of the design subject system - "construction logic", and then constructing materials and digital media arrangement based on "construction logic" on the explicit (sensory) subsystem of presenting the surface image of the system. Essentially, the process from implicit to explicit - from abstract logic to form presentation - is a theoretical hypothesis level procedural progression process, which is built on the basis of construction logic for design, integration, and innovation. In the actual process of creating art exhibition spaces, it is often presented in an explicit form.

The AI+AR exhibition "Immersive Experience" emphasizes that showcasing an art space is not just a simple physical space, but also a psychological space that allows the audience to fully immerse themselves and engage in deep interaction with the artwork. Artists skillfully use various elements such as lighting, color, sound, and materials to create a unique atmosphere, allowing visitors to feel strong emotional resonance and aesthetic experience during the visit; Cleverly utilizing light and shadow effects and spatial structure, a dreamlike artistic space has been created. The audience enters it as if they are in a dream, experiencing unprecedented interaction and resonance with the artwork. This immersive experience not only allows the audience to have a deeper understanding and appreciation of art, but also greatly enhances the infectivity and dissemination effect of art. The "interactive narrative" display art space should have a narrative nature, fully showcasing the storytelling and plot of the artwork through the design and layout of the space. During the visit, the audience can not only appreciate the beauty of the artwork itself, but also gradually unravel the story and deep meaning behind the work through clues and hints in the space. Through careful spatial planning and design, a series of artworks are connected to form a complete and tense narrative structure. During the visit, the audience needs to constantly observe and think in order to gradually understand the information and meaning conveyed by the work. This interactive narrative style not only enhances the audience's sense of participation and experience, but also makes the exhibition art space a temple full of wisdom and inspiration.

2. Model Construction based on Spatial Information Collection Technology

The primary focus of this study is to collect three-dimensional spatial information of the case space and construct a mobile remote interactive digital exhibition data multi-dimensional display interface technology. The research utilizes data collection technology, real-life modeling platform, and model editing platform, mainly for remote interactive exhibitions and remote access to display windows such as giant screens, achieving out of the box use and effectively reducing investment and maintenance costs.

2.1 Data Collection Techniques

Multi modal intelligent navigation and AI+AR display of spatial data collection are the primary steps in spatial modeling. With the continuous development of satellite technology, higher resolution remote sensing images can be obtained, which provide rich surface information. Meanwhile, the application of GPS technology also enables the acquisition of more accurate and refined geographic coordinate data. In addition, terrain and landform data, meteorological data, socio-economic data, etc. are also indispensable sources of data in spatial modeling. After data collection, data preprocessing and cleaning are important steps to ensure data quality and accuracy. This includes operations such as format conversion, coordinate unification, and outlier handling to ensure data consistency and comparability. At the same time, it is necessary to conduct a quality assessment of the data to ensure its reliability and validity. Choosing the appropriate modeling method is the key to spatial modeling. Different modeling methods are applicable to different problems and data types. For example, for classification problems, machine learning algorithms such as support vector machines and decision trees can be chosen; For regression problems, algorithms such as linear regression and random forest can be chosen. In addition, deep learning algorithms have also been widely applied in spatial modeling, such as the application of

convolutional neural networks (CNN) in remote sensing image classification.

After selecting the multimodal intelligent navigation and AI+AR display modeling methods, it is necessary to use the selected model to train and validate the data. By continuously adjusting the parameters and structure of the model, optimizing its performance, and improving the accuracy of prediction or analysis. At the same time, cross validation and test set validation are required for multimodal intelligent navigation and AI+AR display models to ensure their generalization ability.

After model training and validation, the output results of the model are explained and applied using multimodal intelligent navigation and AI+AR display. By visualizing and interpreting the outputs of multimodal intelligent navigation and AI+AR display models, we can better understand the patterns and trends behind the data, thereby supporting the needs of decision-making, resource management, urban planning, and other fields. For example, in urban planning, multimodal intelligent navigation and AI+AR display space modeling technology are used to predict the development trend and population distribution of cities, providing scientific basis for urban planning; In resource management, multimodal intelligent navigation and AI+AR display space modeling techniques are used to monitor the distribution and changes of natural resources, providing decision support for resource conservation and management.

2.2 Realistic Modeling Platform

One is system design. Based on multimodal intelligent guidance and AI+AR exhibition space venues, we aim to solve the current challenges. The second is technological development. Relying on multimodal intelligent guidance, AI+AR exhibition space, and cultural confidence of the venue, we empower and enhance the development of the current difficulties through intelligent interactive personalized experience design. The third is diversified driving. Interdisciplinary and professional integration, utilizing interactive technology to achieve a "sense of presence" during online and offline visits, realistically reproducing personalized interactions. Special visits during special periods have opened up new communication channels between multimodal intelligent guidance, AI+AR exhibition cultural centers, and the public. We have established a dynamic and authoritative exhibition technology path that covers special situations, deepened the exploration and research of personalized exhibitions, planned exhibition paths, and built an efficient and convenient technical communication bridge with segmentation. We aim to integrate interactive and intelligent personalized experiences into one exhibition.

3. Return the True Essence of "Connotation"

In the field of exhibition design, the connotation research of multimodal intelligent navigation and AI+AR exhibition space not only promotes technological innovation, but also fundamentally changes the way audiences interact with exhibition content. As research deepens, it is gradually recognized that these technologies are not just tools, but also bridges connecting presenters and audiences, and are key to improving display effectiveness and enhancing audience experience. Firstly, it is necessary to pay attention to the innovation of the displayed content. On the basis of digitization and interactivity, the displayed content should be more rich, diverse, and interesting. By introducing AI technology, the display content can be adjusted in real-time based on the audience's behavior and preferences, achieving a personalized display experience. Meanwhile, by combining AR technology, we can seamlessly integrate virtual content with the real world, bringing audiences an unprecedented visual feast. Secondly, it is necessary to strengthen interdisciplinary cooperation. The design of multimodal intelligent navigation and AI+AR exhibition space involves knowledge from multiple disciplines such as computer science, art and design, and psychology. Through interdisciplinary collaboration, we can integrate research results from different fields and jointly promote the development of exhibition design. For example, psychologists can help us better understand the psychological needs and behavioral patterns of our audience; Artists can provide us with unique creative and visual expressions. In addition, it is necessary to pay attention to sustainability and environmental protection. In the design of exhibition spaces, environmental factors should be fully considered, and environmentally friendly materials and renewable energy should be used. At the same time, the presentation of the content should also reflect environmental protection concepts, such as simulating real environments through AR technology to reduce damage to the actual environment.

In terms of specific implementation, we can start from the following aspects: establishing an audience behavior analysis system: by collecting and analyzing audience behavior data in the display space, we can understand the preferences and needs of the audience, and provide strong support for the innovation and optimization of display content. Design multifunctional interactive devices: Interactive devices should not only have eye-catching appearance and interesting functions, but also have strong practicality and stability. We can draw on the experience of game design, interaction design, and other fields to design interactive devices that are both interesting and practical. Integrating multiple technological means: In the design of exhibition spaces, various technological means such as projection technology, interactive touch screens, VR/AR devices, etc. can be integrated to bring audiences a richer interactive experience. At the same time, creating a unique display environment: through clever layout, decoration, and lighting design, a unique display environment can be created for the audience. In this environment, the audience can immerse themselves in the displayed content and feel a strong visual impact and emotional resonance. In summary, the study of the connotation of multimodal intelligent navigation and AI+AR exhibition space provides a new perspective to examine the field of exhibition design. By conducting in-depth research on audience behavior, designing interactive devices, integrating technological means, and creating unique display environments, we can provide audiences with a more diverse and colorful display experience, and promote the development of the display design field.

4. The Mechanism of "Connotation" - "Prototype and Projection"

With the increasing status of "people" as tourists, multimodal intelligent guidance and AI+AR exhibition spaces also hope to enhance the activity of exhibition activities through their own participation, thereby improving the understanding of exhibits. The exhibition activities in multimodal intelligent guidance and AI+AR interactive exhibition spaces are influenced by various factors. Efforts should be made to mobilize all senses of tourists to participate in the information dissemination process of the exhibits, so that tourists have the possibility to describe the content of the exhibits and express themselves, which is an effective solution. Education and Information Transmission: Exhibition space activities may aim to educate, convey information, or showcase specific themes. Whether it is exhibition space, technology exhibition, art exhibition or other forms of exhibition space, their purpose is to convey specific knowledge, history, culture or artistic information to the audience.

However, the achievement of these goals does not solely rely on traditional display techniques and modes. In today's rapidly developing digital technology and artificial intelligence, there are more possibilities to innovate display spaces and enhance tourist engagement and experience. Firstly, a multimodal intelligent navigation system is a powerful tool. It provides tourists with more comprehensive and in-depth exhibition information by combining visual, auditory, tactile and other sensory experiences. Secondly, AI+AR display technology has brought new possibilities to display spaces. Through augmented reality technology, tourists can see display content that transcends reality, providing a more authentic and vivid experience. The addition of AI technology enables real-time adjustment and optimization of display content based on tourists' behavior and feedback, further enhancing tourists' participation and satisfaction. Finally, in terms of education and information transmission, multimodal intelligent navigation and AI+AR display technology can more vividly and intuitively display knowledge, history, culture, or artistic information. Through virtual reality technology, tourists can immerse themselves in historical events, art works, and gain more profound and authentic feelings. This immersive experience not only enhances tourists' interest in learning, but also helps them better understand and remember the displayed content. In terms of cultural exchange and social interaction, multimodal intelligent navigation and AI+AR display technology can provide tourists with richer and more interesting social interaction experiences. Through virtual social platforms, tourists can engage in real-time communication and interaction with other tourists, sharing their visiting experiences and feelings. This social interaction can not only deepen the friendship and connection between tourists, but also promote communication and integration between different cultures.

In terms of entertainment and experience, multimodal intelligent navigation and AI+AR display technology can bring tourists more exciting and interesting experiences. Through virtual reality technology, tourists can participate in various virtual games and interactive experience activities, obtaining a more realistic and exciting experience. This form of entertainment not only brings joy and relaxation to tourists, but also stimulates their creativity and imagination. In terms of product display and sales, multimodal intelligent navigation and AI+AR display technology can provide merchants with a more intuitive and vivid way of product display. Finally, in terms of social awareness and change promotion, multimodal intelligent navigation and AI+AR display technology can more intuitively and vividly showcase social issues and change needs. Through virtual reality technology, tourists can gain a deeper understanding of the severity and urgency of social issues, thereby arousing their attention and thinking. Meanwhile, AI technology can also intelligently analyze and process feedback and opinions from tourists, providing valuable references and suggestions for relevant institutions and organizations.

In summary, multimodal intelligent navigation and AI+AR display technology have brought revolutionary changes and innovations to exhibition spaces. They can not only enhance tourists' participation and experience, but also promote the development of education and information transmission, cultural exchange and social interaction, entertainment and experience, as well as product display and sales. In the future, with the continuous advancement of technology and the expansion of application scenarios, we believe that these technologies will bring more surprises and possibilities to exhibition spaces.

In summary, multimodal intelligent navigation and AI+AR display demonstrate that the immersive experience of digital technology is a structure of force, and this structure comes from the tension created by "space". It not only has significance for the display content itself that possesses this structure, but also for the general content of real displays and virtual experience spaces. In the process of multimodal intelligent navigation and AI+AR display, the content of the original framework system is enhanced through excessive enhancement, including increasing the depth of exhibits, richer multidimensional perception digital technology, and rich media content. The excessive framework content forms a "space" through interactive forms, and brings people into the emotions expressed in the design through the "energy" related to physical experience.

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References

[1] Jiayao (Lilith) Gao. Museum Survival in China during the COVID-19 Pandemic[J]. Global History Dialogues,2021.

[2] Fürstenau B, Pilz M, Gonon P. The Dual System of Vocational Education and Training in Germany—What Can Be Learnt About Education for (Other) Professions[M]. International Handbook of Research in Professional and Practice-based Learning,2023.

[3] Huang Song. Overseas museums under the epidemic: raising funds while developing online. Art Review, 2020 (3): 29-32.
[4] Overseas countries have also launched "cloud exhibitions" [J]. International Museum of Art, 2020.
[5] Q &A. Art Institute of Chicago[J]. Art Institute of Chicago, 2019(1):126-134.
[6] Wang, Z., Yan, H., Wang, Y., Xu, Z., Wang, Z., & Wu, Z. (2024). Research on autonomous robots navigation based on reinforcement learning. arXiv preprint arXiv:2407.02539.
[7] Jiang, L., Yu, C., Wu, Z., & Wang, Y. (2024). Advanced AI framework for enhanced detection and assessment of abdominal trauma: Integrating 3D segmentation with 2D CNN and RNN models. arXiv preprint arXiv:2407.16165.
[8] Wang, Z., Zhu, Y., Li, Z., Wang, Z., Qin, H., & Liu, X. (2024). Graph neural network recommendation system for football formation. Applied Science and Biotechnology Journal for Advanced Research, 3(3), 33-39.
[9] Zhu, Z., Wang, Z., Wu, Z., Zhang, Y., & Bo, S. (2024). Adversarial for Sequential Recommendation Walking in the Multi-Latent Space. Applied Science and Biotechnology Journal for Advanced Research, 3(4), 1-9.
[10] Wang, Z., Zhu, Y., He, S., Yan, H., & Zhu, Z. (2024). LLM for Sentiment Analysis in E-commerce: A Deep Dive into Customer Feedback. Applied Science and Engineering Journal for Advanced Research, 3(4), 8-13.
[11] Yao, J., & Yuan, B. (2024). Research on the Application and Optimization Strategies of Deep Learning in Large Language Models. Journal of Theory and Practice of Engineering Science, 4(05), 88-94.
[12] Yao, J., & Yuan, B. (2024). Optimization Strategies for Deep Learning Models in Natural Language Processing. Journal of Theory and Practice of Engineering Science, 4(05), 80-87.
[13] Xu, X., Yuan, B., Song, T., & Li, S. (2023, November). Curriculum recommendations using transformer base model with infonce loss and language switching method. In 2023 5th International Conference on Artificial Intelligence and Computer Applications (ICAICA) (pp. 389-393). IEEE.
[14] Xu, J., Jiang, Y., Yuan, B., Li, S., & Song, T. (2023, November). Automated Scoring of Clinical Patient Notes using Advanced NLP and Pseudo Labeling. In 2023 5th International Conference on Artificial Intelligence and Computer Applications (ICAICA) (pp. 384-388). IEEE.
[15] Ren, Z. (2024). VGCN: An Enhanced Graph Convolutional Network Model for Text Classification. Journal of Industrial Engineering and Applied Science, 2(4), 110-115.
[16] Ren, Z. (2024). Enhanced YOLOv8 Infrared Image Object Detection Method with SPD Module. Journal of Theory and Practice in Engineering and Technology, 1(2), 1–7. Retrieved from https://woodyinternational.com/index.php/jtpet/article/view/42
[17] Ji, H., Xu, X., Su, G., Wang, J., & Wang, Y. (2024). Utilizing Machine Learning for Precise Audience Targeting in Data Science and Targeted Advertising. Academic Journal of Science and Technology, 9(2), 215-220.
[18] Ma, Y., Shen, Z., & Shen, J. (2024). Cloud Computing and Hyperscale Data Centers: A Comparative Study of Usage Patterns. Journal of Theory and Practice of Engineering Science, 4(06), 11-19.

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