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FEATURES OF THE DESIGN OF VIRTUAL HUMAN INTERACTION IN THE INTERFACES OF CHINESE MUSEUM APPLICATIONS

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This paper examines the design features of virtual humans in Chinese museums and analyses their application in the design of mobile museum interfaces from the perspective of interaction design. The work explores the impact of virtual humans on cognitive functions and user behaviour in sensory, functional, and emotional dimensions. It is concluded that virtual humans as anthropomorphic interactive elements in interfaces effectively combine online and offline museum experiences, offering valuable design ideas for the dissemination of cultural information in the museum environment.

Key words: Museum Virtual Human; Interactive Design; Interface Design; User Experience; Cultural Communication; Visual Communication Design; China.

INTRODUCTION

Against the backdrop of museum digital transformation, technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) have driven innovation in exhibition and interaction. Virtual humans possess lifelike human appearances and, powered by AI, can simulate human behaviour. They interact with real people using human language and nonverbal communication methods to express and evoke emotions [1]. This study proposes the development of museum virtual humans that integrate visual identity, interactive functionality, and emotional engagement. The goal is to enhance interface recognition, optimize operational experience, and elevate users' emotional involvement within cultural contexts through interaction design.

PURPOSE

This study aims to explore how to construct a successful virtual human in interface design, one that embodies cultural affinity, multimodal interactivity, and personalized experiences. Through interaction design, it seeks to enhance visitors' experiences in cultural cognition, depth of engagement, and personalized participation.



RESULTS AND DISCUSSION

In interface design, museum virtual humans transform profound ethnic cultures and grand era spirits into approachable ambassadors that can be touched and interacted with on mobile screens. This represents not only a design challenge but also an opportunity for cultural dissemination and national image projection. This study analyses the concept across three dimensions: sensory experience, functionality, and emotional engagement.

First, at the sensory level, a culturally relatable image of the virtual human is constructed to form the primary interface memory point. The visual identity of the virtual human integrates the historical and cultural characteristics of the museum, aiming to convey cultural connotations and shape identity recognition through multiple symbolic systems including visuals, behaviour, and language [2]. Distinctive cultural symbols are distilled from the avatar's appearance, attire, and colour palette, then translated into anthropomorphic designs. This endows the character with unique recognizability and approachability, serving as an identity symbol for the museum's brand image. Simultaneously, multimodal interactions, including dynamic facial expressions, body movements, and voice narration, create an immersive, lifelike engagement space. This sensory enhancement not only boosts interface appeal but also establishes visual memory and cultural associations for users.

For example, take the virtual human “Jia Yao” launched by the Dunhuang Museum. Her visual design deeply captures the essence of Dunhuang mural art. Her prototype draws inspiration from the melodious songbird, with attire and color schemes skillfully incorporating mural elements. Combined with modern aesthetic sensibilities, this design creates an image of a Dunhuang maiden embodying both classical charm and contemporary vitality (Fig.1:a). Employing a gentle yet playful vocal tone, she serves as a guide for narrations, live streams, and cultural interactions, amplifying the digital dissemination of Dunhuang culture. This approach significantly enhances user immersion during viewing while elevating the cultural appeal and emotional resonance throughout the interactive experience.

Secondly, at the functional level, virtual humans serve as multimodal interaction hubs, integrating service modules such as knowledge bases, guided tour systems, and intelligent question-answering into a unified interface entry point. Often serving as homepage gateways or navigation assistants, virtual humans enable users to engage via voice or text. Simultaneously, they establish interactive linkages with physical museum spaces in certain scenarios. Through integrated image recognition, AR technology, and spatial positioning, they deliver blended virtual-physical experiences. Utilizing animated storytelling, contextualized narration, and gamified interactions, they guide visitors toward immersive engagement throughout their journey, enhancing the interface's overall comprehensibility and usability. For instance, the virtual human “Ai Wenwen” launched by the National Museum of China employs 3D modelling, voice synthesis, and motion/facial capture technologies to authentically recreate the image of a Han Dynasty maiden (Fig.1:b). Possessing exceptional learning and adaptive capabilities, she continuously updates and enriches her knowledge base while



providing intelligent voice-guided tours, creating an immersive exhibition experience. Drawing from the National Museum's collection of over 1.4 million artifacts, she guides global visitors through Chinese civilization, promoting the global dissemination of Chinese culture.

Finally, on an emotional level, virtual humans serve as an emotional bridge connecting users with museums. Often using cultural narratives as their medium, they combine language, movement, symbols, and environment to create diverse roles [3], such as cultural ambassadors, volunteers, and artifact conservators. Users proactively select interaction partners based on personal interests and cognitive preferences, thereby forming autonomous, personalized experience pathways. Through communicative and interactive cultural dialogues, audiences gain immersive experiences while absorbing knowledge. This enhances cultural cognition and user engagement, fostering profound historical awareness and emotional resonance. It also elevates identification with museum brands and cultural content, ultimately transforming functional usage into emotional belonging. For example, image design of the virtual human “Jing Hui” launched by the Capital Museum blends blue-and-white porcelain cultural elements with modern aesthetic expression, appearing as an elegant woman in a qipao (Fig.1:c). She provides services such as artifact narration and intelligent question-and-answer. Through animated storytelling, she guides users into the museum's collection narratives and cultural restoration sites. Her vivid explanations convey the stories and emotions behind the artifacts, allowing users to appreciate the preciousness and vitality of cultural heritage while learning.



Fig. 1. China's museum applications with virtual humans: a – Dunhuang Museum; b – National Museum of China; c – Capital Museum.

In summary, the design of virtual humans in mobile interfaces adopts a strategic structure that synergizes sensory, functional, and emotional dimensions. This approach establishes a design paradigm within interface expression and interactive practice that integrates visual appeal, functional value, and emotional connection. It reflects the evolving trend where museum virtual humans are becoming central visual icons and interactive vehicles.



CONCLUSIONS

This study demonstrates that virtual humans, as interactive elements within museum mobile interfaces, enhance user experience through sensory presentation, functional organization, and emotional expression. Serving not only as interactive components but also as emotional bridges connecting the public with cultural heritage, virtual humans drive profound transformations in museum public cultural services. In the future, with the continuous advancement of digital technology, museum mobile platforms will play an increasingly significant role in cultural preservation, educational outreach, and international dissemination. Through multidimensional interaction and cross-platform collaboration, virtual humans construct perceptible, connective, and co-creative cultural experience spaces for users. Simultaneously, they leverage utilization to promote conservation, driving the sustainable development of museums and China's outstanding traditional culture.

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ЮАНЬ Боя, СКЛЯРЕНКО Н. ОСОБЛИВОСТІ ДИЗАЙНУ ВЗАЄМОДІЇ ВІРТУАЛЬНОЇ ЛЮДИНИ В ІНТЕРФЕЙСАХ МУЗЕЙНИХ ДОДАТКІВ КИТАЮ

У статті розглядаються особливості дизайну віртуальних людей у китайських музеях та аналізуються їх застосування у проектуванні мобільних музейних інтерфейсів з точки зору дизайну взаємодії. У роботі досліджується вплив віртуальних людей на когнітивні функції та поведінку користувачів у сенсорному, функціональному та емоційному вимірах. Зроблено висновок, що віртуальні люди як антропоморфні інтерактивні елементи в інтерфейсах ефективно поєднують онлайн- та офлайн-досвід відвідування музеїв, пропонуючи цінні ідеї дизайну для поширення культурної інформації в музейному середовищі.

Ключові слова: музейна віртуальна людина; інтерактивний дизайн; дизайн інтерфейсу; досвід користувача; культурна комунікація; дизайн візуальних комунікацій; Китай.