

Research on the Obstacles and Prospects of Human-Computer Interaction Development in the Entertainment Industry

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Abstract: With the rapid development of society, humans tend to live in an individualistic manner, with less connection to reality, and electronic devices have become necessities. Human entertainment methods are inseparable from the virtual world, and the development of human-computer interaction in the entertainment industry is imminent. However, technology, humanities, and other aspects still face many obstacles and challenges, as well as negative impacts such as privacy leaks, cyberbullying, and information overload from virtual network identities. This article analyzes the technical limitations, social and cultural constraints, and issues of connection between the virtual and real worlds that human-computer interaction faces in this field. Based on the analysis above, it is suggested that human-computer interaction technology should pay more attention to user experience, co-creation of content, personalized services, and user stickiness to meet challenges and fully utilize future opportunities. In the future, human-computer interaction technology will become more intelligent personalized, and people-centered to address the ever-evolving needs of users, providing safe, fun, and interactive entertainment experiences.

Keywords: Human-Computer Interaction, Entertainment Industry, Virtual Reality, Virtual Networks, Virtual Identity

1. Introduction

In the era of rapid digital technology development, human-computer interaction has emerged as a field of significant interest. It serves as a bridge connecting the real world with the virtual, profoundly affecting human life, work, and entertainment. The swift progression of human-computer interaction (HCI) technology has brought revolutionary changes to the entertainment industry. With the continuous maturation of virtual reality (VR) and augmented reality (AR) technologies, users' immersive experiences have become richer and more realistic. For instance, VR technology allows players to fully immerse themselves in a virtual world, experiencing unprecedented levels of gaming interactivity; AR technology merges virtual elements with the actual world, offering audiences innovative ways to watch sports events and concerts. These technologies not only change the way users interact with entertainment content but also give rise to new forms of entertainment and business models.

Against this backdrop, the combination of human-computer interaction technology with the entertainment industry is particularly important. It not only enhances user experience but also brings new growth points and innovative directions to the entertainment industry. Therefore, exploring the utilization of human-computer interaction technology in the entertainment industry and its future development trends is of significant practical importance for advancing the progress of the entire industry.

However, despite its great potential, human-computer interaction still faces many obstacles at the technological level, as well as constraints from social and cultural factors, and issues related to virtual network identities.

Given the uncertainties of the future, this paper will propose new possibilities for the development of HCI, focusing on the field of the entertainment industry. It will analyze the existing obstacles to the advancement of digital technologies and, in response to the various needs of humans in the virtual world, explore the potential for the advancement of HCI in the entertainment area.

2. Application and Development Status of HCI in the Entertainment Industry

With the swift advancement of digital technology, human-computer interaction (HCI) has turned into a vital component of the entertainment industry. The advancement of HCI technology has not only greatly enriched the entertainment experience but also driven innovation and transformation across the entire industry.

2.1. Digital Technology and HCI

Digital technology is the foundation of human-computer interaction, encompassing computer graphics, VR, AR, artificial intelligence (AI), sensor technology, touch technology, and more. The development of these technologies has transformed human-computer interaction from traditional keyboard and mouse inputs to more natural and intuitive methods, such as touch, voice, gestures, and eye movement control.

Advancements in computer graphics have led to more realistic visual effects, providing unprecedented visual experiences for the gaming and film industries. VR and AR technologies offer engaging experiences, allowing users to enter a new virtual world or enhance the real world with virtual elements through head-mounted displays and environmental sensing technologies, thus providing a richer interactive experience.

The development of artificial intelligence, particularly the progress in machine learning and natural language processing, has made HCI more intelligent. Intelligent assistants and chatbots can understand user language and intentions, offering more personalized services. Sensor technology enables devices to sense user movements and environmental changes, achieving more natural interactions.

2.2. Applications of HCI in the Entertainment Industry

In the entertainment industry, the applications of human-computer interaction are very extensive, including but not limited to games, movies, music, theme parks, online social platforms, etc.

The gaming industry is one of the areas where human-computer interaction technology is most widely applied. With the advancement of information and communication technologies, both the younger generations and those more mature have come to accept and appreciate the enjoyment of playing digital games [1]. From early arcade games to current VR games, interaction methods have evolved from simple button operations to full-body motion capture. Modern games provide players with immersive experiences through highly realistic graphics, sound, and tactile feedback.

In the film industry, the application of human-computer interaction technology enables audiences to participate in the movie story through interactive movies or augmented reality applications, experiencing different plot developments. In addition, the use of digital special effects technology has greatly enhanced the visual impact of films.

In the music industry, the application of human-computer interaction technology is reflected in all aspects of music creation, performance, and appreciation. For example, music software that can be controlled through touch screens and gesture recognition allows users to create and edit music more intuitively. At concerts, augmented reality technology can provide additional visual and auditory information to the audience, enhancing the live experience.

Theme parks and live entertainment events are increasingly utilizing human-computer interaction technologies, such as using AR technology to allow visitors to see the reappearance of historical scenes when visiting historical sites, or adding interactive games in amusement parks to increase visitor engagement and fun.

Online social platforms enrich people's social experiences through various interactive technologies, such as video chat, virtual gifts, and emoticons, making interactions between users more vivid and interesting. The application of HCI technology is reflected in all aspects of the entertainment industry, greatly enhancing user interaction and engagement.

Overall, the application prospects of human-computer interaction technology in the entertainment industry are broad. However, to achieve wider application and better user experience, challenges in technology, cost, and content creation, bring people a richer and more diverse entertainment experience.

3. Development Challenges of HCI in the Entertainment Industry

With the rapid advancement of technological innovations, human-computer interaction (HCI) technologies have witnessed an increasing application in the entertainment industry, ranging from VR to AR, and to AI-driven personalized entertainment experiences. HCI technologies are reshaping the future of the entertainment industry. However, despite the promising outlook, the development of HCI in the entertainment sector still encounters various impediments.

3.1. Technological Limitations

Current HCI technologies still face numerous issues. The first is the limitations of hardware devices. Technologies such as VR and AR have high demands on hardware equipment. Although there are various VR and AR devices available in the market, they generally suffer from high prices, complex operations, and low comfort levels. For example, prolonged use of VR headsets can lead to symptoms such as dizziness and eye fatigue in users. Due to the discrepancies in visual data gathered by people's organs and eyes, users may face the danger of developing virtual motion sickness, which is recognized as cyber motion sickness [2]. Moreover, technical indicators such as device resolution, refresh rate, and latency still need further improvement to achieve more realistic experiences. Lyu, Z. points out, that on the Metaverse gaming platform, users assume a digital persona to engage in a wide variety of activities, but there will continue to be lags in synchronization with the actual world [3].

Software development is also one of the challenges faced by HCI technologies. Software is key to realizing interactive entertainment experiences. However, developing high-quality interactive entertainment content is costly and time-consuming. Furthermore, to achieve more natural and intuitive HCI, complex algorithms and substantial data support are required. Currently, technologies like natural language processing and image recognition still have limitations and cannot fully meet the needs of the entertainment industry. According to Jian et al., the bottom of a moving object is easily obscured by other things, due to the current imperfections in the proposed object location

algorithm [4]. The computational algorithms are yet to become robust enough to handle the fast-paced and ever-evolving demands of the entertainment sector, where intermittent occlusions pose a challenge to object-tracking systems.

The rapid development of HCI technologies has also led to a lack of standards and compatibility issues. Devices and software produced by different manufacturers often cannot communicate with each other, which limits the coherence of user experiences and the proliferation of entertainment content. The lack of unified technical standards makes it difficult for developers to build cross-platform applications, thus hindering the widespread application of HCI technologies in the entertainment industry.

3.2. Constraints of Social and Cultural Factors

Despite the unprecedented entertainment experience provided by human-computer interaction technologies, users' acceptance of them varies. Some users may be skeptical about new technologies, and concerned about privacy leaks and data security issues. The increasing prevalence of visual content and the rapid growth of social media platforms have started to open up numerous avenues for potential attacks and dangers [5]. For instance, VR and AR devices need to collect users' biometric information such as facial expressions and eye movements, which requires strict security measures for processing and storage of such sensitive data.

Secondly, users from different social and cultural backgrounds have varying preferences for entertainment content. Human-computer interaction entertainment products need to consider cultural diversity and regional differences to meet the needs of global users. However, as human-computer interaction technology becomes more widely applied in the entertainment industry, related laws and regulations are also constantly improving. For example, issues such as the ownership of virtual property and behavioral norms in virtual worlds require clear legal definitions. However, because human-computer interaction has given rise to many new things, the current policies and legal safeguards for human-computer interaction are not yet complete. This may lead to users' rights not being protected, thereby affecting the promotion and use of human-computer interaction entertainment products.

3.3. Connection Between Virtual and Reality

Human-computer interaction technology enables humans to connect the real world with the virtual one, serving as a bridge for communication between world civilizations. However, the issues brought by the virtual network and the impact of virtual identities on humans cannot be overlooked.

In the virtual network, people often have one or more virtual identities. These identities may be vastly different from those in reality, offering users new ways of self-expression, but they can also lead to confusion about identity. The relations and experiences mediated within this space of 'virtual reality or real virtuality', in the context of anonymity (lacking direct interaction with others or feedback) seem to be unreal, exerting no visible or immediate influence on the actual lives (identity) [6]. On one hand, virtual identities provide a space for people to escape the pressures and constraints of reality. In the virtual world, individuals can create an image entirely different from their real-life selves and try out new roles and behaviors. This experience, to some extent, satisfies people's curiosity and desire for exploration, enriching their spiritual world. However, an over-reliance on virtual identities can also lead to a disconnection from the real world. When people spend excessive time and energy in the virtual world, indulging in the satisfaction that virtual identities bring, they may gradually neglect interpersonal relationships and responsibilities in real life. They may become indifferent and ill-adapted to real-life social interactions, finding it difficult to establish and maintain genuine, stable relationships. Additionally, virtual identities can also lead to deviations in self-

perception. In the virtual world, people can easily receive praise and recognition, which may cause them to overestimate or underestimate themselves. If they become excessively engrossed in the false praise from the virtual world, they may feel a significant disparity upon returning to reality, leading to psychological imbalance and anxiety.

In the virtual network environment, cyberbullying has become an increasingly serious issue. Firstly, anonymity causes some people to lose their moral restraint, attacking others online, believing they will not be held accountable. Nixon, C. L. explains a typical phenomenon in cyberspace, referred to as the "disinhibition effect". Perpetrators of cyberbullying never engage with their targets face-to-face, which can result in a potential lack of comprehension concerning the comprehensive consequences of their actions, thereby diminishing important sensations of personal accountability [7]. This anonymous protection makes some people more audacious, posting extreme and malicious remarks. Secondly, the rapid and widespread dissemination of information causes the impact of cyberbullying to expand rapidly. A negative remark can spread across the entire network in a short time, causing significant psychological pressure and reputational damage to the victim. Furthermore, the aggregation effect of the internet easily leads to group attacks. Once someone initiates an attack on an individual, it can easily trigger numerous uninformed netizens to join in, creating strong public opinion pressure. Cyberbullying causes great harm to the victim's physical and mental well-being, potentially resulting in depression, anxiety, or even suicidal thoughts. At the same time, cyberbullying also disrupts the harmony and stability of the online environment, affecting the public order, customs, and level of civilization of society.

The problem of information overload brought by the virtual network has also become a significant obstacle to interpersonal interaction. In the entertainment industry, users are surrounded by a vast amount of entertainment content, from movies, and music to games, live streaming, and various forms of entertainment information are endless. This makes it difficult for people to choose and obtain valuable entertainment content. Excessive information reduces their engagement and participation in individual entertainment projects, thereby affecting in-depth communication and interaction based on shared entertainment interests among people. Additionally, the influx of unverified content and misinformation further complicates the issue. Users are frequently exposed to false news, manipulated media, and misleading information, which not only distracts them from authentic entertainment experiences but also undermines the trust and credibility of the sources they rely on. Not only exposure to actual misinformation can distort people's credibility ratings, but potentially also the heightened salience of misinformation as an imminent threat might trigger a deception bias, obstructing the default truth bias [8]. This proliferation of fake content can lead to a cynical and distrusting audience, hindering the development of genuine connections and shared experiences that are essential for fostering a sense of community within the entertainment sector.

The risk of privacy leakage in the virtual network also hurts interpersonal interaction. On entertainment platforms, users often need to provide a large amount of personal information to enjoy personalized services and experiences. However, once this information is improperly obtained or leaked, it may cause trouble and even danger to users. For example, exposure to personal entertainment preferences and social relationships may lead users to have concerns and unease in interpersonal interactions, not daring to truly express their thoughts and feelings, thereby hindering sincere and in-depth communication.

The virtual network provides individuals with novel avenues for social interaction and entertainment experiences, but it also brings issues such as cyberbullying, information overload, and privacy leakage, which largely affect the acceptance and usage of HCI technology.

4. Insights and Future Prospects of HCI in the Entertainment Industry

4.1. Insights

The application development of HCI in the entertainment industry should focus on integrating with the future progress of the entertainment industry. The development of the entertainment industry emphasizes intelligence, personalization, and being people-oriented. Stephanidis et al. note that the design of intelligent systems capable of working in genuine harmony with users is forecasted to be a pivotal success factor for intelligent technologies. To this end, the role of intelligence is to assist humans, to foresee their needs, to identify and respond to human emotions, and to enhance human safety [9].

User experience is the core of human-computer interaction development; only by meeting users' social and emotional needs can the market be won. Human interaction should promote the co-creation and sharing of content, transforming users from passive recipients to active participants; provide personalized services, offering unique experiences for different users; and enhance user stickiness, forming a stable user base through social interaction.

4.2. Future Prospects

With the continuous advancement of technology, the utilization of human-computer interaction technology within the entertainment industry has seen a surge in popularity, showing tremendous market potential and diverse needs. The following content will explore the predictions of future development needs in the entertainment sector.

4.2.1. VR and AR Entertainment Experiences

VR and AR technologies afford users a fresh immersive experience. In fields such as gaming, tourism, education, and art, VR and AR technologies are creating unprecedented interactive experiences. For example, VR games enable players to fully immerse themselves in a virtual space, while AR technology possesses the capability to overlay digital information onto the real world, thereby affording users a more enriched interactive experience. With the maturation of technology and the reduction of costs, it is expected that within the next few years, VR and AR will become significant growth areas for the entertainment industry.

4.2.2. Smart Homes and Home Entertainment

As the Internet of Things technology develops, smart home systems are gradually becoming widespread. The application of human-computer interaction technology in smart homes allows users to control various devices in the home through voice, gestures, or touch screens, thereby achieving a more convenient and personalized home entertainment experience. For example, smart speakers can respond to user voice commands to play music, news, or control other smart devices. In the future, with the advancement of artificial intelligence technology, smart home systems will become more intelligent, and better able to understand user needs and habits.

4.2.3. Interactive Esports

Esports has become a global entertainment industry, and human-computer interaction technology will bring new changes to this field. Esports represents one of the first examples of a phenomenon moving from an online medium to integrate with the analog real world [10]. By using more advanced input devices and interaction technologies, players can immerse themselves more deeply in the game world, enhancing the playability and entertainment value of the game. For example, with full-body motion

capture technology, players can directly translate body movements into actions of the game character, thus obtaining a more realistic gaming experience. In addition, spectators can also participate in the viewing and interaction of esports through human-computer interaction technology, enhancing the viewing experience.

4.2.4. Personalized Entertainment Content Recommendation

With the development of big data and machine learning technologies, human-computer interaction technology can provide users with more personalized entertainment content recommendations. By analyzing user viewing history, search records, and social behaviors, the system can recommend content that users might be interested in, thereby increasing user satisfaction and stickiness. For example, streaming platforms like Netflix and Spotify have already used recommendation algorithms to suggest movies and music to users. In the future, as technology continues to advance, recommendation systems will become more accurate and intelligent, better meeting users' personalized needs.

5. Conclusion

Human-computer interaction technology is developing rapidly and is increasingly applied in the entertainment industry. While virtual network environments provide convenience and entertainment for people, they also bring many challenges and issues. In addition to technological and humanistic limitations, the anonymity of online violence and the rapidity of information dissemination have led to serious psychological and social problems. Information overload makes interpersonal interaction difficult, and the risk of privacy leaks further affects trust and a sense of security in the virtual space. These problems not only affect users' mental health but also negatively impact the acceptance and usage of human-computer interaction technology.

However, despite the relentless progression of technology, the field of HCI still has extensive potential for application within the entertainment area. VR and AR technologies will give users immersive entertainment feelings, smart home, and home entertainment systems will become more intelligent and personalized, interactive e-sports will enhance the engagement of players and spectators, and personalized content recommendation systems will enrich and satisfy the user experience. To address current challenges and fully leverage future opportunities, the development of human-computer interaction technology should pay more attention to user experience, promote co-creation and sharing of content, provide personalized services, and enhance user stickiness.

In the future, the use of human-computer interaction technology in the entertainment industry will focus more on the principles of intelligence, personalization, and people-oriented, to meet the constantly changing needs of users. Through continuous technological innovation and optimization, human-computer interaction technology is expected to provide users with safer, more interesting, and interactive entertainment experiences, while promoting social harmony and stability.

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