Analysis of the Influence of Digital Technology on Virtual Idols from the Metaverse Perspective

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Abstract: With the rapid development of digital technology, "metaverse" has gradually entered the public's field of vision, and has begun to build metaverse platforms in various fields. As one of the products of the metaverse, the virtual idol is becoming more and more popular, not only becoming the object of many fans, but also becoming the new darling of the industry. The new digital technology has not only updated the form of virtual idol, but also affected the creative method and participation mode of virtual idols with continuous changes, so that fans have a more immersive "star-following" experience. The interactive behavior and emotional cognition of fans are also constantly changing with the development of digital technology. This paper will summarize the role of digital technology in the transmission of virtual idols, explore the role of digital technology in the relationship between virtual idols and fans, and look forward to the influence trend of the development of digital technology on virtual idols through analysis.

1. Introduction

In recent years, with the rapid development of media technology and digital technology, the concept of "metaverse" has gradually entered people's vision. METAVERSE, combination of the prefix"meta" (implying transcending) with the word" universe", describes a hypothetical synthetic environment linked to the physical world [1]. In today's terms, the metaverse is the realm of computer-generated, networked extended reality, or XR, an acronym that embraces all aspects of augmented reality, mixed reality and virtual reality (AR, MR and VR) [2]. The "metaverse" has emerged in academia, entertainment, e-commerce and other fields, and gradually shows its prominent position to the public. Local governments have also introduced policies on the "metaverse" related industries, and more and more metaverse products have emerged in an endless stream. While bringing people a new immersive experience and feeling, they have also changed people's cognition of the traditional "cyberspace". As one of the metaverse products, virtual idols have gained a large number of fans and traffic, but they are also affected by the development of digital technology.

1.1. Metaverse and Virtual Idol Concepts Explain

1.1.1. A Metaverse Built with Multiple Technologies

He term of "metaverse" is not a new concept, but in our current environment. It is closely related

to the space in which we live in. The metaverse is a post-realistic universe, an eternal and persistent multi-user environment incorporating physical reality. In the assumption of the metaverse, the concept of space is strengthened, and the corresponding and mapping relationship between the virtual space and the real space becomes direct [3]. On September 13, 2022, the Examination and Approval Committee for Science and Technology Terms of China, Namespaces of the National Committee for Science and Technology, held a seminar on the concepts of the metauniverse and core Terms, and reached consensus on the names and definitions of the three concepts, including "metauniverse". After in-depth discussion and communication, experts defined "metaverse" as: "the virtual world constructed by human using digital technology, which is mapped from or beyond the real world and can interact with the real world". In the metaverse world, various of digital technologies are integrated, such as artificial intelligence technology, human-computer interaction technology, three-dimensional modeling technology, speech synthesis technology, virtual reality technology, augmented reality technology, etc., through these digital technologies to realize the connection between the virtual world and the real world, open the joint space of digital technology and users.

1.1.2. A Multi-technology Synthetic Virtual Idol

With the construction of the "meta-universe" platform. Technology update and iteration upgrade, virtual idol has been borned, obtained extensive attention from all walks of the public, attracted a large number of traffic and fans. Therefore, the industry of virtual idol become market blue ocean. The Chinese Science and Technology Nomology Committee named "digital characters created by using digital technology that are close to human images" as "digital people". As the most popular products among digital people, virtual idols, as a production of technology and society, frequently appear on various social platforms and are widely attended in various major media [4]. For example, YexiLiu, a virtual idol on Douyin, received 3.604 million likes and has 8.335 million fans so far. Another example is the virtual idol "TianyiLuo", in addition to releasing her own songs, also opened online and offline concerts. In 2021 and 2022, she also performanced on the stage of CCTV Spring Festival Gala and CCTV Lantern Festival Gala. Virtual idols not only appear online, but also appear around us through holographic projection technology, enabling fans to have unprecedented star-chasing experience and advanced immersion experience. As a new type of network product and idol form, virtual idol is completely different from traditional idol. Users and fans can not only watch images, music and videos released by virtual idols through the network, but also can meet the audience through virtual reality technology and augmented reality technology. For example, the virtual idol girl group A-Soul teamed up with PICO video to create A VR live concert about the virtual idol, which attracted A large number of A-Soul fans. They enjoyed a two-dimensional dream interaction with their idols through VR. For example, the audience could participate in the interactive link through the glow sticks in their hands to close contact with their idols while watching. This powerful appeal has opened a new mode of communication between idols and fans, attracting a large number of young people who are keen on the two-dimensional culture. Since the official announcement of the "A-SOUL Wonderful Universe" VR concert, an exclusive cooperation between PICO Video and the virtual idol girl group A-SOUL, the news has been rapidly brewing. The topic about the concert has broken through the 50 million topic reading mark on Weibo in only 4 days. In addition, they also used special days such as Singles Day to unite and quickly realized the myth of breaking the circle. For example, virtual idols such as Miku Hatsone, Tianyi Luo and Triku Ai are also packed offline concerts. Holographic projections shape their movements and actions on the stage, the sound comes from synthesis software, making the stage a sea of support lights.

2. Technology Empowerment: The presentation of Virtual Idols

2.1. 3D Modeling Technology: Competed Cross-space Narration from 2D Plane to 3D Space

The original virtual idols were born in the two-dimensional world. Many images of virtual idols were two-dimensional comic characters appearing on the Internet at the beginning. After 1990, the 3D modeling technology has been greatly improved and matured. It is no longer the original rough production image. The update of technology has also accelerated the automation process of 3D modeling technology. When 3D modeling technology applied in virtual idols, the original 2D images breaked through the wire-frame expression mode consisting of only points and lines, and began to appear the concept of surfaces. The appearance of solid model enhances the authenticity and stereo of 3D imaging, which makes the application range of 3D imaging wider. Through the establishment of solid model, more accurate and closer to real life data support can be provided for experiments [5]. The avatar of the virtual idol began to have a sense of space in this way, and the whole character and scene became more full. The application of 3D modeling technology determines the picture quality and viewing degree of virtual idols, so that fans can see more beautiful three-dimensional images of idols, increase visual effects, enhance the experience of fans, and to a certain extent, it can realize the viscosity of fans.

2.2. Speech Synthesis Technology: Reached the Two-way Interaction between Emotion and Creation

Speech synthesis technology refers to the conversion of speech into text, emotion and other information carriers that people can understand [6]. The speech synthesis function module includes three parts: text analysis, prosodic modeling and speech synthesis. Therefore, the speech synthesis technology of the virtual idol will first select the appropriate prosody modeling results, through the original speech database, extract the relevant speech primitives corresponding to it, and then use the specific speech synthesis technology to adjust and modify the prosody of the speech primitives, according to the sex, age, personality of the virtual idol, and in the end, the sound of the virtual idol was produced. In addition, engagement of fans can be improved through speech recognition technology. For example, the start-up company of initial generation of virtual idols-"Hatsune Miku" and "TianyiLuo" -proposed a high degree of maneuverability for users to modify virtual idols, and gave users a space to create actions and contents of virtual idols. Users can create their own unique sounds for their idols by inputting lyrics and notes, using the synthesis engine provided by VOCALOID and other software, and can also directly generate songs [7]. Fans are no longer pure idol appreciators in this mode, but more appear in virtual idols as a part of creators, becoming one of the expressors of virtual idols' content and form. This new channel of human-computer interaction broken the traditional way of star-chasing, realized the emotional dependence between idols and fans, and maked fans had a more immersive star-chasing experience.

2.3. Dynamic Capture Technology: Competed the Upgrade from no Personality to Virtual Personality

Dynamic capture, also known as motion capture, can record the movement of the observed object -person, object, or animal- through various of technical means, accurately measure and record all kinds of motion trajectories and postures of the moving object in the actual three-dimensional space in real time, and reconstruct the motion state of the object at each time in the virtual three-dimensional space. Some of the creators of virtual idols which known as "Vtuber", by using motion capture technology, appear in the virtual idol as a certain person, and completely by expressing themselves

to present the virtual idol vtuber. For example, sketch actress MingCai is the Vtuber of the virtual idol "Nanako". They shouted that "it is unbelievable", the dimension wall has broken" and so on when fans knowed that "Nanako" was acting by MingCai, and also said that "Nanako" through MingCai's dubbing and action interpretation, the virtual idol which has white hair on the screen seem start to play sketch at the next second. The virtual idol is based on dynamic capture technology to complete the upgrading of personality. The creator can be incarnated as the virtual idol itself for immersive interpretation, and can interact with fans in real time, building a space of virtual and real integration. In this space, not only the creator can perform, but also the fan users can give real-time feedback according to the creator's performance, and the creator can adjust the time according to the user's feedback to form an interactive upgrade. This new technology of human-computer interaction makes the virtual idol transform from a flat comic image, who without personality, to the real presence of the creator, which gives the virtual idol emotion and life. Whether it is the creator's real personality display or the fixed personality display of the role he plays, it gives "vtube" great imagination and creation space. This is an emerging way of interaction between humans and machines.

2.4. Holographic Projection Technology: Open up the road of immersion from network to reality

Holographic projection technology is a virtual imaging technology that records and restores three-dimensional information. It is a technology that enables the naked eyes to see 3D images without any auxiliary equipment [8]. It can get rid of the shackle of the solid medium through the optical principle of recording and reproduction, and realize the three-dimensional clear visualization in the air. Holographic projection technology plays a very important role for the presentation of virtual idols on the stage. It will completely put the virtual idols in the virtual form in the network directly around us, breaking the constraints of the virtual world and coming to the real world. It brings great visual enjoyment and shock to the fans, and can make people completely immersed in the current stage scene. The artistic effect of the stage has been greatly improved, creating a fantasy stage which like a dream and real presence. For example, virtual idol TianyiLuo not only holds her own offline concerts, but also actively appears on major media platforms to sing to everyone. They can even perform on the same stage with real idols, becoming a new interactive ceremony between fans and virtual idols. In addition to fans paying attention to virtual idols, new audiences also paying attention to virtual idols when TV programs propagandize about them, so that virtual idols are no longer limited to the quadratic meta group, and reached the cross-circle communication effect.

3. Human-computer Interaction: The Way of Innovation for Virtual Idols

3.1. Stylistic Variations: from Quadratic forms to "Anthropomorphic" Avatars

In his book Avalanche, American science fiction writer Neil Stephenson mentioned the "supermeta-domain", which is to achieve a perfect simulacra of postmodern society by surpassing virtual reality, and to strengthen subject experience and personality and give rise to intersubjectivity through "avatar" [9]. When people enter the so-called "super-meta-domain" space, they cannot completely separate themselves from the nature of individual subjects in the real world, but project their own emotions, subject characteristics and certain traits into the "virtual body", forming a kind of "avatar" of human-machine coexistence.

When appreciating virtual idols, fans project their emotions onto them, giving birth to a subject imagination of virtual idols, satisfying their emptiness in the real world and other emotions, obtaining emotional satisfaction, and acquiring a highly immersive experience when watching and appreciating them. For fans, there may be a certain emotional fracture crisis in the real world, while for idols with

fixed images and stable "human design", and then virtual idols can generate more lasting emotions with fans and maintain long-term association with fans. Therefore, fans project their emotions onto their virtual idols, making themselves as "avatar" in the virtual space, and make up for their shortcomings in the real world through this emotional imagination. For virtual idols, the changes from flat comic characters to three-dimensional space images through digital technology can bring more novel feelings to fans, breaking the constraints of the original space, and truly realizing closer contact with users. "vtube" also makes the virtual idol which from a completely mechanized production of the metaverse products begin to have their own personality and characteristics, and their looks and actions can also become more lively and vivid with the act of "vtube". So that "vtube" can become a virtual idol and virtual idol also become a "personified" image.

3.2. Crossover Integration: from the Minority to the Public

The original virtual idols were only active among teenagers, especially the youth who were keen on the two-dimensional culture. With the rapid development of a variety of short video platforms and social apps, virtual idols have more opportunities into the public's view. In addition to new media platforms, many virtual idols also began to enter traditional media platforms one after another. Major media launched relevant virtual idols and invited the most popular virtual idols to the stage or perform with real idols, attracting a large number of TV audiences. Various of fields also began to launch their own virtual idols, for example,in the field of games, League of Legends launched the virtual band KDA, the four members of the band have corresponding roles in the game. In this way, users can learn about the existence of KDA through the corresponding game characters while playing the game, and then start to pay attention to the virtual idol. Besides, League of Legends also introduced the corresponding game character's KDA skin in the game, so that players can enjoy the game. League of Legends also published the KDA peripheral on its official website, and through the KDA interaction with players, they can draw four images of the characters. This high level of engagement not only allows players to learn more about the virtual idol, but also increases user engagement. For example, users have established a hypertalk about KDA on the Weibo platform, in which the number of posts has reached 4235, and the number of reads has reached 220 million. This cross-platform communication has greatly improved the public's awareness and familiarity with virtual idols. Virtual idols are no longer exclusive to the two dimensional circle, but have entered the public life.

3.3. Symbiosis between Virtuality and Reality: Human-computer Interaction Enabling Metauniverse Construction

Now MR Technology, as one of the key technologies of the metaverse, has become a key to open the cyber world. It's not just the mixture of virtual and the real, but also work and play, body and mind that are being mixed [10]. Through these emerging digital technologies, the metaverse is extending human's senses from the real world to the virtual space by using MR Technology, XR mixed reality, motion capture and other human-computer interaction technologies. The metauniverse enables the full and real avatar experience to be realized, so that people can devote themselves to it more easily. "Vtube" in the metauniverse can play virtual idols by different sets. Fans can also play new identities in the virtual world and the real world, so that it can break through the constraints of real time and space to find new social environments. The theory of "media is the extension of human" put forward by McLuhan has been realized to some extent. As the carrier of information, the virtual idol has broken the barrier between virtual and reality. Moreover, fans also broken the restrictions of time and space, further shorten the distance between human and media, so that virtual idols can frequently appear in various fields, and active in the public vision. The upgrading of metaverse technology is directly related to the development of virtual idols. At present, as a part of the

construction of the metaverse, virtual idols can only "come out" from the virtual screen through digital technology, whether they can further develop in the future depends on the update and iteration of metaverse technology.

4. Conclusion

Virtual idols can be regarded as the product of the explosive development of digital technology. As a bridge between virtual idols and the real world, they lead a large number of fans to change the original "star-chasing mode", and now they can pay full attention to online and offline integration. What virtual idols bring to the public is not only immersive scene experience, virtual star chase mode, but also the change of media usage habits and lifestyle. The influence brought by the development of digital technology is not only the updating and upgrading of virtual idols, but also the continuous reconstruction of social reality. Recently, the technical architecture, spatio-temporal logic, and ecological territory of the "metaverse" are just starting. Virtual idols will be more perfect when digital technology matures, their personalities will be more stereoscopic, and they will be more closely connected to their fans.

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