

A study on the image construction of the virtual digital human in the promotion of sports events

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Abstract: *In the era of smart media, artificial intelligence technology is profoundly changing the sports media ecosystem with unprecedented power, promoting the industry from “media intelligence” to “smart media” transformation. This paper is based on the objective reality conditions of the generation and application of AI virtual digital humans in the publicity of sports events, using the literature method, theoretical analysis method, inductive summarization method, to conduct a comprehensive and in-depth analysis of the elements, types and characteristics of the construction of virtual digital human image, with the aim of exploring the current virtual digital human in the practice of sports event publicity, and put forward practical solution strategies to promote the virtual digital human in the field of sports event publicity. The aim is to discuss the problems existing in the current practice of virtual digital human in sports event promotion, put forward practical and feasible solution strategies, and promote the innovative development and standardized application of virtual digital human in the field of sports event promotion.*

Keywords: *Virtual digital human; Sports events; Technology; Users*

1. Introduction

With the iterative upgrading of Web 3.0 technology, intelligent communication technologies represented by big data, artificial intelligence and the Internet of Things are reshaping the underlying logic of the media industry, which is both an opportunity and a challenge for media practitioners. The 2024 Government Work Report proposes to “deepen the research and development applications of big data and artificial intelligence, carry out ‘artificial intelligence plus’ actions, and create an internationally competitive digital industry cluster.” This is also the first time that “Artificial Intelligence +” has been included in the work report, marking the entry of China's economic development into a key stage of artificial intelligence-driven development of new quality productivity forces. Currently, many media outlets have begun to use AI virtual digital humans in major sporting events to realize breakthroughs and innovations in the audiovisual communication paradigm. Therefore, correctly grasping the operation logic behind the image of AI virtual digital human and accurately playing the role of AI virtual digital human in the promotion of sports events have important theoretical value and practical significance for welcoming the arrival of the era of smart media and realizing “artificial intelligence +”.

2. The inevitability of the emergence of the virtual digital human

2.1. Technology enablement drives the emergence and growth of digital humans

Virtual digital human, refers to a digitized persona created using digital technology that is close to the human figure^[1]. From the perspective of the availability of new media technologies, the central underpinning is the continuous development of digital technologies. The prototype of the virtual digital man dates back to the 1980s, thanks to the development of computer graphics. In 1982, the Japanese anime Macross Quarter spawned the world's first virtual singer-songwriter, Lynn Minmay, whose record album successfully entered Japan's prestigious music charts, marking the initial rise of virtual idol culture. The first virtual digital presenter, Max Headroom, was introduced on the British program The Max Headroom Show in 1985, expanding the boundaries of media and audience perceptions of the use of virtual digital human characters. At the beginning of the 21st century, with the development and application of motion capture technology, 3D technology and CG technology, virtual digital humans entered the fields of film and television, games and advertising. Gollum in the 2001 movie “The Lord

of the Rings” was the first character in the history of cinema to perfectly combine motion capture technology and CG technology, realizing an accurate reproduction of expression texture and body movements. In 2007, the phenomenal virtual idol Hatsune Miku was launched, and its production process cleverly utilizes Vocaloid voice synthesis technology, which allows songs to be automatically generated by inputting lyrics and melodies. With the intensive use of a range of digital technologies such as AIGC, machine learning, and affective computing, virtual digital characters are entering the sports arena. Letty, the CUBAL League's first digital employee, made a stunning appearance in 2023, performing a dance routine with the cheerleaders for the warm-up segment. In order to achieve a better visual presentation, the technical team used high-precision modeling techniques to greatly improve the accuracy of Letty's dance moves. In addition, the Tokyo Olympics, the Paris Olympics and other major events also have the figure of virtual digital humans, the deep integration of sports and technology has become a new trend in the development of sports event promotion. The stages in the history of the virtual digital human are shown in Table 1.

Table 1: Table of stages in the history of the virtual digital man

Stage	Time frame	Core technology	Key feature	Representative case	Areas of application
Budding stage	1980s-1990s	Computer graphics, Hand-drawn animation, Special effects make-up	Rigid movements, Reliance on manual Production, Low level of realism	Lynn Minmay, Max Headroom	Music, Variety show
Exploration stage	2000s-2010s	Motion Capture, 3D Technology, CG Technology, Vocaloid Speech Synthesis	Dynamic simulation of expressions and movements, Low interactivity, Limited application areas	Gollum, Hatsune Miku, Luo Tianyi, Megurine Luka	Film, Games Advertising, Music
Development stage	2020s-Now	AIGC, VR, machine learning, Affective computing, Multimodal interaction, Real-time rendering	Intelligent, Personalized, Interactive, highly anthropomorphic	Xiao C, Meet Gu, Liu Yexi, Hua Zhibing, Letty, Xiaoyu, Xiaoyang	Sports, Education, News, Variety, Social platforms, Brand marketing

2.2. Upgraded user experience forces digital humans to advance

In the era of all-media, information dissemination is no longer a one-way output, but a two-way interaction, and the identity of consumers has changed from “audience” to “user”, and the awareness of the main body has gradually increased. When watching sports events and activities, users are demanding more personalization, stability, and interactivity from the anchors. For example, when watching sports events, users are inclined to listen to a certain commentator, but the real commentator can not do at any time to explain the user wants to listen to any of the event, and the virtual commentator can be 24 hours a day online, targeted to solve this pain point problem.

At the 2024 Paris Olympic Games, the digital humans Zhang Yufei and Zou Jingyuan appeared at the “China House” in Paris, France. With the help of intelligent voice and big model technology, they are able to communicate with athletes and spectators of different cultural backgrounds in multilingual dialogues, promoting Chinese sportsmanship, spreading Chinese excellent traditional culture and showing China's scientific and technological power to the world.

The enhancement of user experience also promotes the development of data background analysis and user behavior analysis, enabling the organizers of tournament activities and the media to more accurately understand user habits, grasp user psychology, realize accurate push, and improve the finesse of tournament activity promotion. In the process of continuously meeting the personalized and diversified needs of users, the virtual digital human will also develop in a more intelligent direction.

2.3. Expanding demand for tournament publicity urgently needs the use of digital humans

As people's consumer demand for sports continues to climb, the scale of the event continues to

expand, and the comprehensive pressure to promote the event increases and the complexity of the event rises dramatically. In a sports program, a real-life anchor needs to spend a lot of time on rehearsal and recording, and the labor cost of the anchor takes up a significant portion of the overall expenses of the program, thus increasing the time and money costs of traditional sports program production. The virtual anchor is able to use pre-set programs and algorithms to directly generate natural and coherent hosting, greatly reducing production costs. In addition to program hosting, the virtual digital man can also rely on data collection, data cleaning and data analysis steps to complete the sports news writing and reporting, reducing the time to write news to a few seconds. For example, in the 2016 Rio Olympics coverage, xiaomingbot, a news robot from today's headlines, made its debut and wrote 457 newsletters and event reports on badminton, table tennis, and tennis in the 13 days after the opening, writing more than 30 articles per day^[2]. The application of news robots avoids human error and improves the authenticity and objectivity of reporting. As the news robot is on call 24 hours a day, it can perform instantaneous analysis and generate news reports at the first time when faced with breaking news, fully meeting the timeliness requirements of the news. The value of automated production of virtual digital humans lies not only in the form of innovation, but also in the reconfiguration of the logic of content production, which has become a key engine to enhance the effectiveness of event promotion.

3. Elements, types and characteristics of the virtual digital human images

3.1. Elements: perceptual cornerstones of digital technology construction

The visual image is a fusion of technology and art. On the technical level, the construction of the visual image of the virtual digital human uses technologies such as motion capture and real-time rendering. The real human-driven digital human acts as a 'Holster.' Through the interpretation of a real actor, referred to as the 'Role player,' it generates the same movements and expressions. As a result, the digital human's display becomes more natural and lifelike. On the artistic level, the visual style of the sports virtual digital human highlights the athletic qualities. During the 100-day countdown to the Beijing Winter Olympics, China Mobile Migu launched Meet Gu, a 5G ice and snow digital intelligence expert modeled after Ailing Gu. Dressed in a red-and-white ski suit and combing his head with a high ponytail, Meet Gu perfectly presents the upright temperament of an athlete, which has become a major highlight of the Winter Olympics.

Auditory images are intangible but highly contagious. The auditory image of the virtual digital human in the promotion of sports events not only covers the basic elements such as timbre, pitch and speed of speech, but also incorporates rich linguistic variations. For example, increase the speed and volume of your voice when an athlete achieves a good result, and switch to a subdued tone to calm the audience when they lose. At the same time, the virtual digital man switches multiple languages in real time with the help of its rich voice library, which not only promotes international cultural exchange and dissemination, but also improves the visibility of sports events in the international arena.

Social image is often used to characterize the image that an individual presents in social situations or in the public sphere. The social image of virtual digital humans in the promotion of sports events can be dissected in two dimensions: micro and macro. At the micro level, it is the attentive companion of the user. While providing tournament services online 24 hours a day, Virtual Digital also focuses on interaction with users, building two-way running emotional links with them by opening social media accounts, responding to pop-ups during live broadcasts, and organizing offline meet-and-greets. At the macro level, virtual digital humans are purveyors of values. The virtual digital human conveys the values of fairness above all, openness and inclusiveness, and a human-centered approach through social interaction.

3.2. Genres: multiple identities adapted to the context of the event

First, the virtual digital human is the sportscaster who is the "face" of the program. In traditional program hosting, the host can only be confined to the studio, while the meta-universe can break the limitation of space and time, allowing the host to appear in different scenes. CGTN's "Global Sports" featured real-life anchor Mike and virtual host Ainia immersively introducing the opening ceremony of the Paris Olympics and experiencing the various competition events, allowing viewers to "be there" in Paris, France, without having to leave their homes.

Secondly, virtual digital humans are sports commentators that connect events and audiences. Goffman's Dramaturgy explains people's daily lives by comparing society to a stage and its members to

actors. The virtual event commentator relies on powerful artificial intelligence and emotional computing technology. The real commentator also plays an important role. Together, they perform different roles on the 'big stage' of sports events. Their collaboration creates a 'visual feast' for the audience. During the 2016 Olympic Games in Rio de Janeiro, commentator Yang Yi partnered with Baidu's robot 'Duer.' They collaborated to comment on the men's basketball quarter-final match between Australia and Lithuania. The objective and calm scene description and data analysis of Duer and Yang Yi's emotional stimulation complement each other, enriching the content and level of the narration and maximizing the dual value of scientific and technological advancement and humanistic emotionality.

Finally, the virtual digital human is the sports reporter who conducts the event coverage. The virtual digital human reporter supported by big model and big data can achieve accurate presentation of sports event news, real-time tracking of event hotspots, and all-round, full-time reporting. However, at present, virtual sports journalists are still unable to conduct natural and smooth interactions like real journalists, lack of real feelings, and find it difficult to gain the trust of interviewees during interviews. As a result, virtual digital humans are relatively few in number in the professional field of sports journalism and still face many challenges in future applications.

3.3. Characteristics: breakthrough innovation in a new paradigm

Generation Z, as a generation that grows and develops together with the Internet, has a higher degree of acceptance and frequency of exposure to AI, and is the main force of digital consumption. Therefore, in the promotion of the tournament, virtual anchors become the link between it and Gen Z. The virtual digital human provides personalized and distinctive information push for Gen Z users by constructing user profiles. For example, the Hangzhou Asian Games Digital Personality, Xiaozhu, is unique in its image design, which satisfies Gen Z's visual pursuit of "high value" and Gen Z's love of traditional culture in the trend of national style. According to the "China Virtual Digital Human Influence Index Report" published by Communication University of China in 2024, one of the four major trends in the digital human industry under the Sora model is "the trend of IP-based digital human is becoming more and more obvious, and the space for content production and operation has been further expanded". How to stand out from the many sporting events and impress the audience is the key to IP-enabling digital humans. First of all, digital humans should be deeply integrated with the event, become an integral part of the event content, win the recognition and trust of users, and make the audience's memory of the sports event more distinct and lasting. The second is to realize the commercial extension of the IP of the digital human, and increase the economic income through the derivation of peripheral products, co-branding, meta-universe experience and other ways of high-frequency exposure to the virtual digital human.

4. The optimization path of constructing the image of virtual digital human in Sports

4.1. Be wary of the technological hegemony behind the lack of humanity

At present, virtual digital humans are facing an identity crisis in the world of anthropomorphism due to the serious homogenization of their image presentation: standard smile arcs, uniform conversational tones, and identical dressing styles..... Under the fast-food commercial development of sports events, the image design of virtual digital humans has become a simple arrangement and combination. The deeper crisis lies in the fact that users are subconsciously domesticated by industrialized production, and their perception and understanding of the real world is gradually blurred. In addition, with the emergence of the virtual digital human, the cost of producing in-depth fake or false news has been dramatically reduced, so the information gatekeeping work of "fact-checking" by the news media is still needed^[4]. In the era of smart media, in the "parameter supremacy", "only technology theory" and other cognitive traps in the torrent of hostage, we should be more vigilant about the hegemony of technology, to avoid the lack of humanities in the event publicity.

Water Lippmann's theory of Pseudo-environment suggests that the information environment formed by mass communication activities is the one that is provided to people by the mass media after it has been restructured through the selection, processing and reporting of news and information. In promoting sports events, the virtual digital human serves as a medium to create a 'mimic image.' It should accurately capture the unique characteristics of the sports event. It should also reflect the humanistic values behind the event. Humanistic elements should be incorporated into the design of the

virtual digital human. This allows the audience to connect with the event through the 'mimic image'. The humanistic elements should be integrated into the design of the virtual digital human, so that the audience can feel the humanistic charm of the sports event through the "mimetic image". Through the excavation of humanistic heritage in sports events and the presentation of technological empowerment, the harmonious symbiosis between technology and humanity is realized, and the sustainable development of the anthropomorphic environment is promoted.

4.2. Promoting the transformation of digital humans from "digital media image officers" to "digital assistants"

Today's virtual digital humans have made certain breakthroughs and achievements in interactivity, which is not only an advancement on the technical level, but also an enhancement of the user viewing experience. However, there are still a number of pressing issues that need to be resolved in order to truly achieve the all-round integration of digital humans into daily life and the provision of deeply personalized services. For example, the virtual digital human has limited comprehension ability when communicating with the user, the performance is hard, and the language reply is patterned and mechanized, which greatly restricts the further enhancement of the user experience. At the same time, the current popular "virtual idol", "virtual anchor", often only as a "netizen" flash in the pan and more focused on a single entertainment function. Therefore, in order to let the virtual digital human play a greater role, we should change its function of "digital media image officer", which emphasizes IP dissemination and is light on practical application, and promote its transformation into a companion-type digital assistant.

In terms of technology, the input and research and development of natural language processing and emotional computing of virtual digital man should be increased, so that virtual digital man can truly understand the emotional expression and internal logic behind the user's language, and non-language such as facial expressions and body movements can be accurately recognized and judged, and ultimately express the relevant contents in the field of sports through the way of the user's preference, and truly become the user's soulmate. In terms of function, the virtual digital human can expand its range of identities in sports. It should focus on practicality and applicability in daily life. For example, it can serve as a fitness private tutor, health consultant, or sports partner. This allows the digital assistant to become a close companion, supporting people's growth and development. Through the double upgrade of technology and function, the virtual digital man will be deeply and comprehensively integrated into people's daily life, and become the right hand of people's sports.

4.3. Defusing the ethical concerns of digital human immortality

The Technical Requirements for Digital Avatars issued by National Radio and Television Administration in 2024 stipulates the technical requirements for digital avatars in the broadcasting, television and online audiovisual industries, and sets forth normative requirements for the categorization, application scenarios, and images of digital avatars. Through this policy document, the personal information of the role player is protected, the user experience is upgraded, the industrial chain is more perfect, and the industry has a positive impact on the development of the industry in the direction of standardization. It is worth noting that, with the in-depth implementation of the "Digital Virtual Human Technical Requirements" and other documents, the service life of the digital human has been greatly extended, and even reached a state of near "immortality". Digital humans can transcend the limitations of time and space to continuously accompany users and become an important emotional support for them. Although this compensates for the user's mind vacancy to a certain extent, excessive virtual interaction will aggravate the user's dependence on virtual emotions, leading to his or her deep immersion and inability to extricate themselves, and even the loss of the ability to interact emotionally in real life [5].

In order to resolve this ethical concern, on the one hand, the creators should take the responsibility of guiding the virtual to the real, such as in the event publicity more through the virtual digital human to tell the real sports stories, promote the spirit of sports, weaken the digital human carrier itself, and at the same time set up the interactive time and frequency reminder function, to prevent the user from being immersed in the virtual world for a long period of time; On the other hand, users need to enhance their cognitive and disciplinary abilities, so that they can devote more time to real life by participating in fan gatherings, mass fitness activities, etc., and participate in the world of sports with a more rational and healthy attitude.

5. Conclusion

Under the wave of digital intelligence, AI virtual digital humans are reshaping the ecological pattern of sports event promotion in a revolutionary manner. The application of virtual digital humans in the field of sports breaks through the limitations of the traditional means of publicity of sports events, and by virtue of its audio-visual image and social image to adapt to the needs of various types of scenarios, and become a typical model of the emotional link between the event and the user, cross-border integration. Of course, as the brand image of the tournament, the virtual digital man still has technical and ethical problems, which has become a common challenge for the academia and industry in the field of AI. In the future, only by adhering to the concept of people-oriented, coordinated development of technology and humanities, the construction of the image of digital humans can be continuously optimized, and sports events can constantly release new vitality, and truly realize the beautiful blueprint of symbiosis between reality and reality, and synergy between people and machines.

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