Explore the Impact of the Application of Artificial Intelligence Facial Image Processing and Synthesis Technology in Documentaries on Social Acceptance

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Abstract: In recent years, the widespread application of artificial intelligence technology in the field of face image processing and synthesis has attracted widespread attention, and it has provided new technical means and creative possibilities in the field of documentary production. However, due to the ethical risks of AI technology application and the lack of social popularity, its application in documentaries is still controversial. This paper analyzes the current status of the technical application of AI face image processing and synthesis technology in the field of documentaries, the main problems it faces, and its impact on social acceptance. This paper analyzes that although the application of AI face image processing and synthesis technology in the field of documentaries has absolute practicality, the contradiction between its technical essence and "authenticity", and the existing technical abuse problems existence will continue to affect its social acceptance in a short period of time. Based on this, this paper puts forward the following suggestions: strengthen the popularization and education of public AI knowledge, optimize the use of technology through government policies and industry norms, and promote the improvement of AI technology detection and supervision system. Based on the above solutions, the social acceptance of AI face image processing and synthesis technology and its application effect in the field of documentaries can be improved to a certain extent.

1 INTRODUCTION

With the rapid development and widespread application of artificial intelligence in various fields, "face-changing" technology has provided new thinking and aesthetic standards for the development of the film and television industry with its precise capture and realistic shaping, especially expanding new areas of creation and improvement for documentary media production. Artificial intelligence is no longer just a background element of documentaries. It is also closely related to the way documentary makers create and distribute films today. Artificial intelligence is quietly integrating into all stages of documentary production - from research and production to post-production and distribution (Anlen & Cizek, 2024). However, as Craig Hight pointed out, "documentary makers are considered important stakeholders in the truth and trust non-fictional forms of performance and participation." The nature of AI face image processing and synthesis technology obviously makes this technology contradict the important principles of documentary media. For many documentary creators, documentaries are rooted in an idealism that desires fragile responsibility, the truth of power, and the authenticity of historical narratives (Cole, 2024). Therefore, for some documentary producers and directors, using this technology also faces significant professional and social ethical issues. In response to the irreversible impact of AI tools, the "Best Practice Guidelines" of the Archives Producers Alliance specifically emphasize the importance of protecting primary sources and the need for transparency as AI-generated images flood the media landscape, in order to protect the integrity of archives, public records, and collective memory (Anlen & Cizek, 2024). However, the fact is that almost any documentary production process cannot avoid the use of AI technology or tools, because AI technology has been integrated into almost all kinds of daily electronic products that humans often come into contact with, including mobile phones and cameras. The fact that AI has become a common technology seems to be in serious

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conflict with the traditional concepts of the film and television industry. At the same time, taking Fang Li's film The Sinking of the Lisbon Maru (2024) as an example, the content of the film contains a large amount of research and production of historical archival images, which is an indispensable part of the production process for most documentaries, especially historical documentaries. Many films that refer to modern archives need to focus on the acceptance of AI facial image processing and synthesis technology by audience groups related to historical figures in the film. This shows that there is a certain degree of conflict between the practicality and ease of use of this technology in historical film and television works and the acceptance and ethical standards of the audience in real situations. As Floridi and Luciano mentioned, the ethical risks of AI face-changing technology, including privacy violations and moral disputes, may significantly reduce the audience's acceptance of it (Davis, 1989). In the face of different views and opinions put forward by creators and audiences, it is absolutely necessary to explore the relationship between the use of AI face image processing and synthesis technology and social acceptance. Therefore, based on the above-stated questions, this paper will analyze: Is AI face image processing and synthesis technology suitable for use in documentary production, what types of problems will AI face image processing and synthesis technology encounter during use, and what methods can solve the current problems of AI face image processing and synthesis technology?

Based on these three main research questions, this paper will analyze the characteristics and connotations of documentary production based on existing literature and film and television work cases, explore the significant and potential problems of AI face image processing and synthesis technology in the current documentary application process, and give corresponding solutions. At the same time, this paper mainly divides social acceptance into documentary creator acceptance and audience acceptance. By analyzing the two separately and answering the above research questions, it explores the impact of the application of this technology in documentary media on social acceptance.

2 CASE STUDY

After the introduction and improvement of artificial intelligence tools in recent years, the rapid development of AI has changed the relevant fields of Hollywood science fiction movies and all aspects of the video game industry, especially in the simulation of human 3D avatars. Today, the frequency of application of artificial intelligence in the field of documentaries is not reduced compared with science fiction films and games because of the pursuit of real records in documentaries. On the contrary, the usefulness and ease of use of AI face image processing and synthesis technology in the restoration of documentary archive images have made it very popular in the process of documentary production (Karras et al., 2019). So, in an era where AI technology has become a common technology, whether AI technology should be used and how to use it correctly are issues that documentary producers need to explore.

According to the articles on AI face image processing and synthesis technology in the two searches of EURASIP Journal on Image and Video Processing and MDPI, the current research focuses on: face image restoration and completion, face replacement (deep fake technology), facial expression recognition and synthesis, deep fake detection and defense, multi-dimensional and multi-modal face synthesis, etc. Among them, the technologies widely used in documentary production include face repair and completion technology, face swapping technology, deep fake detection technology, and 3D face reconstruction technology. Most of the technologies mentioned above basically serve the restoration and enhancement of documentary archive images. Especially for documentaries on historical themes, the application of this technology has opened up a new creative field for them and greatly improved the creation ceiling of documentaries on this theme. They Shall Not Grow Old directed by Peter Jackson is a successful case of the use of AI face image repair and completion technology in documentaries. AI technology is used on a large scale to repair specific character images and reconstruct 3D faces for old and damaged historical archive images, which undoubtedly greatly improves the completion of the film and the audience's viewing experience. Other movies that use the same technology as this work include One Day When We Were Young (2021). In addition, the movie Here (2024) directed by Robert Zemeckis is a model of the use of face swapping technology. Metaphysical.ai specifically used this technology to age and de-age the real-time starring Tom Hanks in the movie. The StyleGAN architecture was first proposed by Timo Alia's research team in 2018 and presented in a paper in 2019 (Lees, 2023). This architecture is a combination of multimodal synthesis technology and 3D face construction technology. It

can generate realistic face images in documentaries, animations, and games, and can even construct completely virtual faces.

The above cases show that AI face image processing and synthesis technology has developed rapidly in recent years, and may bring more practical technical models and architectures to the documentary industry in the future. At the same time, these cases also once again confirm the importance of AI technology in the documentary production process. The current application of AI technology has provided documentary producers with more space for artistic creation. Andy Warhol Diaries (2022) narrates this four-hour series through the deep sound of Warhol "reading" his diary. Such a unique processing method reflects the artistic quality of the work pursued by some documentary producers. Compared with traditional documentary documentaries, some creators try to focus on showing the "specialness" of their works to the audience through more ingenious processing methods. This pursuit of artistry even includes the transition of different film styles or the interweaving of visual types. For example, in addition to interviews with people, historical impact broadcasts, and historical data displays, One Day When We Were Young also restores the state of mind of historical figures in disguised form through animation, giving the boring historical documentary a unique poetic feel while addressing real-life issues from a specific perspective, giving the work a stronger ideological depth, criticality, and educational inspiration. It can be seen that as an artistic collection of multiple characteristics and connotations, the production restrictions of documentaries continue to expand with the upgrading of AI technology. To a certain extent, AI technology can make it easier for documentaries to achieve qualified production goals in the minds of creators.

3 PROBLEM ANALYSIS

Based on the literature and case analysis presented above, it can be proved that AI face image processing and synthesis technology has a great promoting effect on documentary production. However, this technology still has some urgent problems to be solved in the current creative environment, especially the acceptance of this technology by different social roles. For some documentary producers who have achieved successful applications, AI face image processing and synthesis technology is a tool with significant practicality and ease of use, but for producers who hold the opposite opinion, the application of AI technology, especially the application of a large area, is not allowed. What's more, for some audience groups who have a shallow understanding of this technology and the documentary production process, they are prone to relatively serious psychological barriers to the use of some AI technologies. Therefore, analyzing the problems existing in the current application of AI face image processing and synthesis technology in documentaries and its social impact will help to change the society's acceptance of this technology in the future.

3.1 Social Morality and Professional Ethics in Documentary Film

As mentioned above, some documentary creators try to pursue the historical authenticity that documentaries originally have. The core reason why they oppose the use of artificial intelligence technology is that AI challenges the perception of reality, as well as the construction, narration and trust of truth (Anlen & Cizek, 2024). Although such incidents are not new problems for the film and television industry, as Yuval Noah Harari mentioned, the speed and scale of media output by artificial intelligence technology are exponential, and the lack of human supervision is unprecedented. Therefore, this group of creators believes that AI has caused a new information crisis, and the facial image processing and synthesis technology in AI technology has even more immeasurable destructive power, and the harm caused by this technology has caused obvious fluctuations in human society. The prevalence of deep fake technology is a concrete manifestation of the use of AI facial image processing and synthesis technology in opposition to the basic ethical and moral rules of human society. For documentary creators, being disapproved and condemned by the audience or even the public for using this technology in their works is not a consequence they want to face. The professional ethics of documentaries often attach great importance to the moral responsibility and honesty of the creators to the audience (Wang et al., 2024). In addition, as mentioned above, the current human society lacks absolute supervision over the development and use of AI technology. Behind all kinds of social harm caused by deep fakes is the neglect of personal privacy issues. All technologies related to human biometric recognition or construction, including AI face image processing and synthesis technology, always have issues involving personal privacy. For example, Anthony Bourdain was condemned for narrating

short texts in his private emails without revealing it through a deep fake voice generated by artificial intelligence in his film Roadrunner (2021). Therefore, some social groups will have a certain degree of resistance to the application of AI technology in documentaries.

3.2 Audience Acceptance

Based on the technology acceptance model, perceived usefulness and perceived ease of use are the two main determinants of the technology acceptance model, and these determinants are positively correlated with the user's acceptance attitude towards a certain technology (Venkatesh & Davis, 2000). Perceived usefulness refers to the extent to which users believe that using a certain technology or system can improve their work performance or life efficiency, while perceived ease of use refers to how little effort users believe is required to learn and use a certain technology or system. However, since most documentary viewers have little understanding of the core of AI face image processing and synthesis technology and the documentary production process, the perceived usefulness and perceived ease of use of AI technology cannot be intuitively experienced by the audience. In addition to perceived usefulness and perceived ease of use, user usage attitudes may be affected by external factors, including ethical considerations and risk perception, which in turn affect adoption decisions (Dinev & Hart, 2006). Therefore, when they cannot intuitively feel the advantages of AI technology in documentaries, most viewers will focus more on referring to their own ethical risk perceptions. The Perceived Ethical Risk and Perceived Privacy Concern scales proposed by Dinev & Hart roughly subdivide ethical risk perceptions (Floridi & Taddeo, 2016). Its content includes but is not limited to the following dimensions: unknown risks, moral risks, privacy risks, authenticity risks, social impact risks, etc. In addition to the audience's concerns about their own privacy and the audience's pursuit of the authenticity of the film mentioned above, the audience's acceptance is directly affected by the audience's limited understanding of the technology, which will lead to active avoidance or only follow the self-ethical risk cognition standards. Therefore, for documentary audiences, the real viewing experience of the film is proportional to the audience's acceptance of AI face image processing and synthesis technology, and the audience's acceptance of AI face image processing and synthesis technology is proportional to their understanding and recognition of the technology.

3.3 Technical Limitations

Taking the face-changing technology in AI facial image processing and synthesis technology as an example, the technology first appeared in 2014, and the corresponding software appeared in 2018 and was officially put on the market. With the appearance of OpenAI in the past two years and its extensive use, AI biometric technology has gradually entered the public eye. In 2023, the application of AI facial image processing and synthesis technology ushered in a staged climax. Although the development speed of artificial intelligence has a steady upward trend in recent years, and the upper limit of the research and development of this technology is immeasurable. However, with only 6 years of research and development history, the technical maturity of AI biometric technology is still questionable. At the same time, the complexity of the use of AI facial image processing and synthesis technology has a very differentiated upper and lower limits. For users who have not learned professional knowledge, they do not have the ability to fully master it. Therefore, the current ease of use of this technology has not reached the expected level.

4 SUGGESTION

The problems faced by AI face image processing and synthesis technology in the current documentary creation environment mainly stem from the fact that humans have a relatively shallow overall understanding and control of AI technology. As a product of the new media era, the characteristics and development trends of artificial intelligence are an impact on traditional media. The short time of research and development and contact has directly affected some of the technologies and concepts of traditional media and failed to match AI technology, which has indirectly led to the low tolerance of human society for this technology. Although the acceptance of new technologies by the times and society will increase year by year with the advancement of time, and new technologies and old media will gradually merge, the promotion of more technical knowledge and the limitation of the scope of technology use to avoid more "abuse of deep fake technology" are indispensable actions in the process of forming this result. In the process of solving the problem of imperfect understanding of AI technology in human

society, popularizing basic knowledge and improving people's AI literacy are considered the primary method (Scantamburlo et al., 2024).

At the same time, several ethical issues embodied by AI technology in the current social environment will gradually be solved with the development and improvement of technology. AI facial image processing and synthesis technology is currently developing exponentially, and many existing technical and ethical issues are being constantly resolved and replaced. The implementation of AI deep fake detection technology has to some extent made up for the technical defects and loopholes of AI face-changing technology in the early stage. In documentary production, it can realize multi-program detection and repair, thereby basically ensuring the stiffness and distortion of face-changing technology in documentary applications. The two films Welcome to Chechnya (2023) and Another Body (2023) use artificial intelligence technology to protect the identities of vulnerable subjects by changing (rather than blurring) their faces and voices. For the audience, this makes the subject humane, protects their well-being, and fully interprets the two-sided nature of deep fake technology. Therefore, when facing the social and ethical issues of AI technology, using AI deep fake detection technology to control the use of AI technology and controlling the use of AI facial image processing and synthesis technology through systematic management and control within the basic ethical and moral scope of human society is a way to solve this problem (Seth, 2024).

5 CONCLUSION

In the analysis of this study, it can be concluded that the impact of the application of artificial intelligence face image processing and synthesis technology in documentaries on social acceptance is objectively changing with the maturity of technology, social opinion and time. A large number of successful cases have proved that the application of AI face image processing and synthesis technology in documentary production is absolutely practical, and it is very suitable for the production of documentaries and other types of film and television works without touching the bottom line of ethics. The application of AI face image processing and synthesis technology in documentaries starts with a small and specific focus, and indirectly presents the overall acceptance and focus of artificial intelligence technology in human society. With the iteration and update of technology, the AI deep fake technology that has deeply disturbed human society may only become a symbol of an era or a reference case for future technological development in the future.

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