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Analyzing Innovative Pathways for Accessible Films in the Context of AIGC

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Abstract: Currently, AIGC technology is injecting new vitality into the film and television industry, playing a positive guiding role in the development of accessible film production. This paper examines the current status of AIGC technology in four areas of accessible film production: text generation, video editing, digital human applications, and audio applications. It explores the limitations and challenges that have emerged, and further investigates the potential development paths of AIGC empowering the field of accessible film production. The aim is to provide new insights for the subsequent creation of accessible films, and to further promote a new phase in the dissemination of accessible information in the digital and intelligent era in China.

Keywords: Accessible Films; AIGC; Path Innovation.

1. Introduction

Currently, according to data released by the National Bureau of Statistics, the disabled population in China exceeds 85 million, accounting for approximately 6.34% of the total population. Among this substantial disabled population, those with hearing and visual impairments constitute 38% of the total, representing a considerable number. Improving the social security system and service framework for individuals with disabilities is not only an essential aspect of societal development but also a demonstration of the progress of social civilization in China.

Artificial Intelligence Generated Content (AIGC) represents a technological capacity predicated on the learning and recognition of established data patterns, thereby enabling a degree of generalization to produce pertinent content. This technology facilitates the generation of diverse content formats, including text, images, audio, and video, while also enabling the conversion and integration of content across different modalities[1].AIGC's capacity to generate realistic dialogue, images, musical compositions, and automated code presents potential applications within the film industry, specifically in scriptwriting, sound design, and post-production, thereby offering valuable insights for the production of accessible films. Within the context of the AIGC era, technological advancements have not only transformed information access and dissemination but have also instigated profound societal shifts across various domains. The judicious application of AIGC technologies within the accessible filmmaking sector can contribute to the advancement of information accessibility, ensuring that individuals with auditory or visual impairments possess equal rights in accessing information and entertainment.

2. Accessible Cinema: Creative Genres and Technological Transformations

(1) Creation Type: The Evolution of "Audio Description" and the Refinement of "Sign Language Commentary"

Barrier-free movies are films that have been processed to be accessible for visually and hearing-impaired audiences to watch or listen to. It is a vivid and detailed process that involves re-editing or adding voice-over narration, subtitles, and sign language commentary to enable people with visual and hearing impairments to perceive the world of light and shadow without barriers [2]. In the 1970s, the concept of "describing movies for the blind" emerged in the West, which can be regarded as the origin of "accessible movies". In China, the development of accessible movies started relatively late. It was not until 2005 when Wang Weili founded the first "Mind's Eye Cinema" in Beijing, dedicated to screening movies for the blind, that the accessible movie industry in China began to take its first steps. The accessible movies created by "Mind's Eye Cinema" were exclusively for the blind. Volunteers regularly provided on-site narration to visually impaired people, which was an early practice of "audio description"[3]. In 2020, Guangming Cinema of Communication University of China, in collaboration with iQIYI, established an accessible theater. Subsequently, other streaming platforms such as Youku Video, Xigua Video, and Tencent Video also set up accessible theater sections, providing convenient viewing experiences for the visually and hearing impaired.

To be precise, today's accessible films cannot be compared with the previous concept. Their meaning is broader and specifically covers three types: The first type is accessible films that are made accessible for the visually impaired through post-production voiceover narration and re-editing. This is currently the most common form and is an evolution of the early "audio description". The second type is accessible films that are made accessible for the hearing impaired through the addition of subtitles or sign language interpretation. Although the hearing impaired can see the subtitles, they may not understand the emotional conveyance in the film's audio due to their limited ability to comprehend text. Therefore, sign language interpretation becomes a means to enhance emotions and compensate for the plot content. The third type is accessible films that combine the first two accessible film creation models, aiming to meet the personalized needs of both the visually and hearing impaired [4]. However, because the third type of barrier-free film creation requires a large amount of engineering and costs more money, so at present, the first two types are still used as the main body of barrier-free film creation.

(2) Technological change: the foresight of various platforms and the future orientation driven by technology

At present, AIGC technology is driving changes in the accessible film production industry, and various platforms are also taking advantage of the trend to enter the accessible film production process using AIGC technology, bringing more convenience to the visually impaired and hearing-impaired groups. In early 2024, Guangming Cinema at Communication University of China established an AI model, attempting to apply AIGC technology to accessible film production, improving production efficiency while further bridging the digital divide. At the end of 2024, Tencent Video Accessible Theater released its inventory report for 2024. It is reported that in order to improve production efficiency and keep up with the times, Tencent Video developed its own AI model, which increased production efficiency by one-third. A total of 193 works were launched in 2024, with a cumulative total of over one million views. Data shows that the visually impaired population has a strong demand for watching movies, and the average daily app access time for visually impaired users is twice that of visually impaired users.At present, the work has received a good response, providing a new paradigm for AIGC to empower the development of accessible film industry.

From this, it can be seen that the development of accessible films in the future relies on technological innovation, which not only significantly improves efficiency, but also focuses on the user's viewing experience. For example, Tencent Video conducted a one-on-one investigation and learned that the visually impaired have a high demand for the "double speed playback" function. Therefore, the app was optimized to emphasize the position of the "double speed playback" function on the page [5]. However, based on the current development status of accessible films, the path of AIGC empowering accessible film creation is just beginning and still in an immature stage of development. Therefore, this article attempts to explore the current development status of AIGC empowering the barrier free film industry, sort out various application directions, and explore the many possibilities it brings to the path innovation of barrier free films in the future. It also brings new thinking to the creation of barrier free films and further promotes the new situation of barrier free information dissemination in China in the era of digital intelligence.

3. The application direction of AIGC technology in the accessible film industry

(1) Text generation: automatically written in conjunction with the plot, with detailed content

The entry of AIGC technology into the accessible film production industry first brings about a transformation in the way text content is produced. Traditional accessible film production is mainly divided into two methods: on-site commentary and editing and synthesis. The latter produces works with longer polishing time and higher quality, suitable for online platform playback, public media dissemination, or large-scale movie watching activities. Therefore, post production editing and synthesis are still the main production form.

AIGC technology can automatically generate text information closely related to movie content through advanced natural language processing techniques (NLP models). This text information can not only help visually impaired viewers better understand the dialogue and plot in the movie through subsequent dubbing and commentary, but also serve as a textual basis for sign language commentary, providing more detailed scene descriptions and character relationship analysis for hearing-impaired viewers. In foreign countries, Netflix's AI tool automatically generates scripts in "Stranger Things", reducing manual correction time by 70%. Tencent Video's "Barrier Free Theater" in China understands the entire video content (what scenes and actions are in the picture) based on Tencent's independently developed hybrid big model in the first batch of 190 accessible version movies that have been launched, Finally, volunteers conducted polishing to compress the entire production cycle to one-third, greatly improving production efficiency. But currently, there is still a lot of room for improvement in the accuracy and naturalness of text generated by AIGC technology, as well as the synchronization between text and movie content.

(2) Video editing: automatic recognition of edited clips, precise fitting

AIGC technology is gradually demonstrating its enormous potential in the field of video editing for accessible film production. The traditional editing method relies on the manual operation of the editor, which is time-consuming and laborious. The use of AIGC technology can change the traditional editing method during the production of accessible films and improve efficiency. Video editing, as a crucial part of the accessible film production process, mainly involves accurately matching the voiceover audio tracks (for visually impaired individuals) or sign language commentary videos (for hearing-impaired individuals) with the required commentary content of the original film. AIGC technology can automatically recognize important segments in videos that require commentary, such as character action scenes, empty mirror paragraphs, etc., through machine learning algorithm training, and generate complete video content based on preset styles and editing strategies, effectively shortening the production cycle. For example, with the assistance of Tencent AI technology, Tencent Video's accessible film editing and production cycle has been shortened to about 10 days, and production personnel only need to watch the film about 5 times throughout the entire process, in general, at least 15 screenings are required, greatly increasing the production of accessible films. Although AIGC technology has made some progress in the field of video editing in accessible film production, it still needs to be continuously explored and improved.

(3) Digital human application: intelligent translation of sign language content, diligent and efficient

Digital humans are the trend in the field of film and television media, and they have also demonstrated their unique advantages and broad application prospects in accessible film production, especially in the field of sign language interpretation for hearing-impaired groups. Sign language is a symbol system that uses the shape, movement, position, and palm orientation of both hands, combined with facial expressions, body posture, and necessary mouth movements, to express specific meanings according to certain grammar rules[6].In the traditional accessible film production process, sign language workers are usually required to record sign language translation videos through text content to facilitate the viewing of film and television works by hearing-impaired people, which is time-consuming and labor-intensive. The sign language digital characters generated by AIGC technology can intelligently convert text content into sign language symbols based on instructions. The rich

expressions and actions of digital characters can also serve as effective means of conveying information and emotions, helping hearing-impaired audiences better understand the content information in movies. Tencent Video, based on iFlytek's speech recognition and Tencent 3D virtual human technology, generates an AI sign language anchor called "Lingyu" and creates a sign language commentary version of "Wandering Earth 2" for the hearing-impaired to enjoy. Despite being criticized by the audience for the stiff and unnatural "listening" movements of AI sign language anchors, which lack aesthetic appeal, one can still see the unlimited potential brought by AI sign language anchors entering the field of accessible film production.

(4) Sound application: Remove noise, capture key points, and improve the experience

From early basic text to speech to speech synthesis (TTS) technology, and now to highly anthropomorphic speech generation, AIGC technology has made rapid progress in mimicking the naturalness, emotional richness, and ability to adapt to different contexts of human speech expression[7].The production of accessible films also draws on the changes brought by AIGC technology in the field of sound applications, providing visually impaired and hearing-impaired audiences with a richer viewing experience.

The entry of AIGC technology into the accessible film production industry has brought personalized sound effects generation experience, while also having a positive impact on sound enhancement and noise reduction. In May 2024, Youku platform launched the AI Hu Ge voice package in its accessible theater, becoming the first domestic audiovisual platform to use AI technology to synthesize the voices of celebrity artists for accessible content production, bringing personalized viewing experiences to the visually impaired. It is reported that the first batch of movies to join the Hu Ge AI voice package includes more than ten films such as "The Disappearance of He", "Eliminating the Three Pests of Zhou Chu", and "The Invisible Peak", providing a wide range of choices for visually impaired groups. In addition, AIGC technology can analyze the sound components in movies through intelligent algorithms, effectively remove background noise, enhance the clarity of character dialogue and key sound effects. This is particularly important for visually impaired viewers, enabling them to more accurately capture the sound information in movies and better understand the plot.

4. AIGC technology empowers the innovative path of accessible film industry

(1) Accurate user profiling, precise grasp of the needs of disabled groups

At present, AIGC technology is still at the initial stage of exploration in the field of barrier free film production. It often uses a "one size fits all" single mode to bring a "one-way" viewing experience to visually impaired audiences with different needs. Although there are some service functions available for viewers to choose their preferred voice package and adjust the dubbing speed, it is still difficult to meet the diverse viewing and perception needs of visually impaired and hearing-impaired groups. Therefore, in the future production process of AIGC empowering accessible films, it is necessary to accurately depict user profiles and provide personalized services to visually impaired and hearing-impaired users.

The user portrait theory holds that a user portrait is a labeled portrait abstracted based on demographic information, social relationships, preference habits, and consumption behavior, including user basic attributes, purchasing power, behavioral characteristics, interests and hobbies, psychological features, social networks, and other information[8].In order to more accurately depict the user profile information of visually impaired viewers, online platforms can try to capture the behavioral characteristics of visually impaired users, such as the playback frequency or dwell time of movie viewers when "enjoying" complex fight scenes. For the hearing-impaired population, AI technology can provide personalized viewing settings based on the audience's viewing habits and needs, such as subtitle size, color, background, etc. In addition, at the cultural data level, efforts are being made to collect information on the cultural awareness of movie watching users, such as the acceptance of Tang poetry imagery in "Chang'an 30000 Li" and the aesthetic preferences of hearing-impaired groups towards sign language interpretation digital characters, in order to enhance the refinement of user portraits.

In addition, in the accessible theater section, various platforms can provide personalized movie recommendations based on the viewing history, preferences, and ratings of visually impaired and hearing-impaired audiences, helping them enjoy the personalized services provided by non-accessible video platforms. This enables users to quickly find movies of interest, enhance their viewing experience, and subtly increase their loyalty to the platform.

(2) Optimize the review mechanism to avoid the negative impact of ambiguous symbols

As is well known, movies are the art of symbols. In the academic perspective of semiotics, movies are only phenomena, and symbols are the essence [9]. Analyzing the key symbols in a film is of great significance for understanding its meaning. When AI technology enters the accessible film industry, its accuracy in describing movie symbols affects the audience's understanding of the movie. For example, in the cultural map of China, "red" represents auspiciousness and "dragon" represents auspiciousness, but in the Western context, "red" represents danger and "dragon" symbolizes evil. The understanding of the same symbol between the East and the West is vastly different, and AI may cause misunderstandings. Therefore, practitioners should build symbol databases to correctly guide AI to generate precise descriptions that fit the context, providing users with a better viewing experience.

In addition to understanding film symbols, attention should also be paid to handling discriminatory semantics during the review stage of accessible film production to avoid negative impacts. Because the training data of AI models may carry implicit social biases, such as strongly associating visually impaired groups with labels such as "vulnerable" and "in need of help", it may bring psychological burden to visually impaired and hearing-impaired groups watching movies. In the future accessible film production process, AI's "Fairness aware AI" can be used to actively detect and correct discriminatory language. At the same time, actively establishing a data annotation mechanism for special viewing groups to participate, ensuring the diversity coverage of the dataset, and practicing the resolution of "discriminatory" discourse from their perspective, thus presenting true "fairness". Under the ethical framework of technology for

good, AIGC empowering personalized services for accessible movies is actively reconstructing and enhancing users' viewing experience.

Of course, as a unique expression of film art, dialects also need to consider the adaptation of dialects and sign language in the process of accessible film production, which requires AI to automatically recognize dialects as Mandarin for the accuracy of subsequent sign language generation. Although many voice assistants such as Xiao Ai and Xiao Du now support dialect speech recognition, due to factors such as a lack of corpus, they are still not perfect and cannot provide barrier free production for dialect movies. Therefore, in the future, larger training dialect models can be trained to cover a variety of dialect movies and bring diverse films and experiences to moviegoers.

(3) Innovative movie viewing experience, utilizing sign language to resonate with digital emotions

The metaverse is a virtualized multidimensional network world that utilizes technologies such as VR (virtual reality), AR (augmented reality), MR (mixed reality), XR (augmented reality) to replicate and reconstruct the real world[10].In the era of new media, the metaverse integrates various technologies to provide users with an immersive interactive experience. For the screening of accessible movies, in the future, various technologies can also be used to expand users' viewing space and bring innovative viewing experiences to them.

Currently, AI sign language digital humans have been launched for hearing-impaired users, but due to the immaturity of the technology, they still face an awkward situation where they exhibit unnatural behavior. In the future, with the advancement of technology and algorithms, more realistic sign language digital characters can be generated, which not only look no different from real people in appearance, but also capture natural movements and expressions through intelligent algorithms, providing hearing-impaired users with a better viewing experience and connecting users' emotional resonance. In addition, in the future, for offline screening cinemas of accessible movies, hearing-impaired users can wear AR glasses to watch the projected virtual anchor image, thereby achieving "floating commentary" and avoiding the phenomenon of sign language images blocking the screen in traditional accessible movie production, ensuring the integrity of the movie screen.

At the same time, interaction with users can also be achieved through online streaming platforms. For example, while enjoying videos, it is possible to support hearing-impaired users to ask barrage questions, and AI can filter them and have virtual hosts answer them in sign language, allowing hearing-impaired viewers to understand the plot and character relationships of the movie more thoroughly and in real time. In addition, AIGC technology should also strive to provide visually impaired audiences with virtual commentators with voice description capabilities, helping them better understand the scenes and details in movies. These digital human characters not only have high intelligence and interactivity, but can also be adjusted and optimized in real time based on audience feedback and needs. During the 2024 Paris Olympics, many cinemas opened live streaming rooms to watch the events in real-time. In the future, it may even push digital people into the field of real-time broadcasting, allowing visually impaired and hearing-impaired groups to participate in sports events in real time, enriching their spiritual and cultural life, and enhancing their sense of social integration.

5. Conclusion

Overall, AIGC technology has entered the field of accessible film production, showing both potential and challenges in areas such as text generation, video editing, digital humans, and sound applications. However, how to enhance the authenticity and naturalness of sign language digital human characters, how to face the complexity of intelligent algorithms, and how to solve the consumption of computing resources have not been well addressed. But the author believes that in the future, research on AIGC empowering accessible films will continue to explore new algorithms and break through new technologies to improve the production efficiency of accessible films, optimize the quality of works, and bring more innovation and breakthroughs to accessible film production.

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