Woody International Publish Limited
An Multidisciplinary Academic Journal Publisher

Journal of Theory and Practice in Humanities and Social Sciences, Volume 2, Issue 1, 2025
https://www.woodyinternational.com/

Analysis of Barrier-Free Audio-Visual Communication: Characteristics, Elements, and Applications Across Media

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Abstract: ***This paper comprehensively analyzes the characteristics, elements, and types of barrier-free audio-visual communication in all media. The findings of this study show that the diversification of barrier-free audio-visual services provides people with disabilities a richer and more inclusive audio-visual experience. It identifies key elements such as audience, existing obstacles, and communication components while offering practical guidance for the production of accessible content tailored to individuals with hearing and visual impairments. Furthermore, the study demonstrates the broad applications and promising development prospects of barrier-free audio-visual communication across multiple fields, underscoring its importance in advancing inclusivity and safeguarding the basic cultural rights and interests of people with disabilities.***

Keywords: Barrier-Free Audio-Visual Communication; Characteristics; Elements, Applications; Accessibility innovations.

Cited as: Shuai, F., & Same'e, S. A. (2025). Analysis of Barrier-Free Audio-Visual Communication: Characteristics, Elements, and Applications Across Media. *Journal of Theory and Practice in Humanities and Social Sciences*, *2*(1), 25–34. Retrieved from https://woodyinternational.com/index.php/jtphss/article/view/151

1. Characteristics of Barrier-free Audio-visual Communication in All Media

1.1 Popularity: Laws and Regulations are Increasingly Improved, and Industrial Development is Becoming More Standardized

The country has introduced comprehensive laws and policy measures, which have become an important driving force for the provision of barrier-free content. In recent years, with the development of the economy and society and the advancement of science and technology, the supply of barrier-free audio-visual content in the field of public cultural services has attracted more and more attention from the public. In order to promote the supply of barrier-free audio-visual content and protect the basic cultural rights and interests of special groups such as people with hearing and visual impairments, China's relevant policies on barrier-free audio-visual communication are constantly improving. In September 2020, the Ministry of Industry and Information Technology and the China Disabled Persons' Federation jointly issued the "Guiding Opinions on Promoting Information Accessibility", which proposed: "Enrich the types and functions of mobile Internet applications (APPs) that meet the needs of key beneficiary groups, and promote barrier-free transformation of mobile Internet applications in the fields of news information, social communication, life shopping, etc." In October 2021, the State Administration of Radio, Film and Television pointed out in the "14th Five-Year Plan for the Development of Science and Technology of Radio, Television and Network Audiovisual" that it is necessary to promote the widespread use of virtual anchors and animated sign language in the production of news broadcasts, weather forecasts, variety shows, science and education, and other programs. With the release of a series of regulations and documents such as the "Opinions on Further Strengthening the Construction of Barrier-Free Environments", "Management Measures for the Construction of Barrier-Free Information", "Guiding Opinions of the State Administration of Radio and Television on Promoting Barrier-Free Television Services", "Implementation Plan for the Construction of Barrier-Free Environments in the 14th Five-Year Plan", "Law of the People's Republic of China on the Construction of Barrier-Free Environments", and "Regulations on the Construction of Barrier-Free Environments", and the formulation of

laws and regulations, a system of guiding opinions has been formed with industry specifications such as the "Barrier-Free Information Service Standards and Specifications" as the basis, the construction of barrier-free audio-visual environments as the focus, and the wide supply of barrier-free audio-visual content as the main goal. Barrier-free audio-visual is also moving from a new force to a main force, and from a new position to a main position.

1.2 Originality: Attach Importance to the Layout of Original Content, and the Quantity is Stable and the Quality is Improved

In recent years, China has made great progress in achieving barrier-free audio-visual, allowing more people with hearing and visual impairments to enjoy high-quality content. On the one hand, the traditional media industry has made efforts to promote barrier-free audio-visual. For example, CCTV provides subtitles, sign language translation and other content in news programs such as "News Network" and "Common Concern", providing instant news information for people with hearing and visual impairments. On the eve of the Beijing Winter Olympics, CCTV News and Baidu Intelligent Yunxiling Digital Human Platform jointly launched a virtual sign language anchor to provide services for people with hearing and vision impairments in sports events and Winter Olympics news, with an accuracy rate of 98.5%. In addition to CCTV, local radio and television media centers are also actively carrying out barrier-free transformation of columns. For example, Ganzhou Radio and Television launched a special sign language program "Under the Same Blue Sky", which received a good response after its launch. On the other hand, many IPTV/DVB/OTT and video platforms in the field of smart audio-visual have actively explored the implementation of audio-visual accessibility. For example, Heilongjiang IPTV launched the "Watch China" section (sign language version), using AI sign language technology to serve the hearing-impaired; Youku's Reading Light Project, iQiyi's "Bright Cinema", Xigua Video's self-made accessible movie content, Bilibili's player improvements, Douyin and Kuaishou's accessible assistance modes, etc., cover news reporting, cultural entertainment and other fields. During the production process, the needs of people with hearing and visual impairments were taken into consideration, and auxiliary means such as subtitles, sound description, sign language translation, and sound enhancement were used to provide more accessible audio-visual options, so that people with hearing and visual impairments can better understand and accept the content.

1.3 Intelligence: Technology Promotes Audio-visual Accessibility, and Intelligent Technology Continues to Emerge

The development history of audio-visual barrier-free technology in China can be traced back to the late 1990s. As society pays more attention to the needs of people with hearing and visual impairments, related technologies began to sprout.

Initial stage (late 1990s-early 2000s): This stage mainly focuses on assistive technologies for the visually impaired, such as the visually impaired mainly using Braille technology for reading and writing. At the same time, some sound amplification devices and copying machines also began to appear.

Development stage (mid-2000s-early 2010s): With the rapid development of digital technology, China began to use electronic and information technology to develop audio-visual barrier-free technology, and gradually applied it in television, movies, websites, e-books, etc., and began to apply TV program subtitle translation systems. In 2008, the Beijing Paralympic Games implemented large-scale barrier-free media services for the visually and hearing impaired, which made these technologies begin to receive more attention and application.

Modernization stage (mid-2010s to present): At present, China's audio-visual barrier-free technology has entered the modernization stage, using technologies such as artificial intelligence, cloud computing and big data to achieve more intelligent and personalized services. In 2017, iFLYTEK first popularized speech-to-text technology to the public, providing "speech-to-text" and "text-to-speech" functions to people with hearing and visual impairments. In 2018, China began to promote the development of barrier-free movies, using technologies such as sound description and subtitle translation to provide a better viewing experience for visually impaired and hearing-impaired audiences. On this basis, Alibaba, DingTalk, Huawei, ByteDance, Xiaomi and other companies have successively launched a series of speech-to-text tools and products to help the hearing-impaired group. In 2020, the "Barrier-free version of the film" jointly launched by iQiyi and the "Guangming Cinema" project team of Communication University of China was broadcast online on iQiyi, making it easier for visually impaired people to watch the film. On June 21, 2021, Xigua Video launched barrier-free cinema channels on both PC and mobile terminals, providing more than 30 barrier-free movies including "A Good Show" and "Hidden Man" for the

visually impaired, and will maintain an update service of more than 10 exclusive films per month. In 2020, Chinese TV stations began to launch AI voice recognition subtitle services, realizing real-time voice-to-text conversion and presenting it on the screen. The development of the audio-visual barrier-free industry has formed a new audio-visual barrier-free pattern that integrates intelligent media services with new technologies such as "AI+5G+4K+VR".

1.4 Identification: Barrier-free Transformation is Highlighted, Highlighting the Humanistic Care of the Internet

In recent years, China's audio-visual barrier-free transformation has made significant progress, which has not only greatly improved the quality of life of people with hearing and visual impairments, but also demonstrated the results of China's online humanistic care.

First, major media organizations, information websites, film and television production companies and Internet platforms have begun to pay attention to the transformation and improvement of barrier-free audio-visual content. They realize that providing barrier-free content for people with visual or hearing impairments is both a social responsibility and a market demand. Therefore, they began to invest more resources in producing barrier-free audio-visual content, including through the transformation and optimization of websites, setting up obvious "barrier-free" entrances on the homepage, optimizing the interface design and information transmission methods of network platforms such as online audio-visual APPs, adding subtitles, audio descriptions and sign language translation, etc., so that people with hearing and visual impairments can also enjoy the same entertainment and information. At the same time, China also promotes the implementation of barrier-free services in the fields of video and live broadcast, including diversified processing of video content such as subtitles, narration, and sign language translation, so that people with hearing and visual impairments can better access and enjoy cultural and social entertainment, creating a fairer network environment for them.

Secondly, the increase in social attention and awareness has also promoted audio-visual barrier-free transformation. With the progress of society and people's recognition of inclusive and equal values, attention and support for people with hearing and visual impairments are also increasing. The government, media, enterprises and the public have increased their demand and promotion of audio-visual barrier-free content, which has also prompted relevant institutions and individuals to invest more resources and energy in producing and improving the quality of barrier-free audio-visual content. Many government departments, enterprise and institution websites and social platforms have launched barrier-free versions, providing functions such as text magnification, voice broadcast and screen reading. The addition of this auxiliary information not only facilitates people with disabilities to understand the content, but also improves the understanding and tolerance of ordinary people for them, making it easier for people with hearing and visual impairments to obtain information and participate in social activities, showing a strong humanistic care in China's online audio-visual field.

1.5 Artistry: Diverse Aesthetics Stand Firm, and Audio-visual Language Accelerates Innovation

In the past few years, China's audio-visual barrier-free industry has made great progress. Not only have many excellent barrier-free films, TV series and program works emerged, but also actively explored and promoted various barrier-free audio-visual services, so that more people with disabilities can enjoy a diverse audio-visual experience.

First, the diversified development of Chinese society has provided a broad demand space for audiovisual barrier-free content. With social progress and economic development, the field of audiovisual barrier-free has also shown diversified characteristics, covering TV programs, movies, online videos, music, educational materials, live streaming and other fields, with rich audiovisual effects, diverse themes, and respect for the aesthetic preferences of different groups of people. This not only allows the visually impaired to enjoy more film and television works through hearing, but also provides more viewing options for the hearing-impaired, allowing them to experience the charm of audiovisual art with others through barrier-free means. And audiovisual barrier-free services are no longer limited to traditional subtitles and sign language translation methods, but also include technological elements such as artificial intelligence and virtual reality. In this way, the audience with hearing and visual impairments can better understand and appreciate their favorite audiovisual works, better participate in social life, and obtain information and cultural products equally.

Secondly, the promotion and application of audiovisual barrier-free technology has promoted the accelerated

innovation and improvement of audiovisual language. For example, through text recognition and speech synthesis technology, the text on the screen is converted into speech in real time, providing more ways for the hearing-impaired to obtain information. At the same time, through image recognition and speech recognition technology, the images and sounds in videos and TV programs are intelligently analyzed, and text descriptions or subtitles are automatically generated to provide a better visual experience for the visually impaired. Providing more efficient and accurate audio-visual language services for people with hearing and visual impairments not only improves the quality of audio-visual language, but also shortens the time for people with hearing and visual impairments to obtain information. China has gradually formed a set of audio-visual barrier-free languages suitable for special groups, including sound descriptions for the visually impaired, oral images, picture enhancement for the hearing impaired, and sign language translation. These audio-visual languages can not only help people with hearing and visual impairments understand and participate in audio-visual media, but also provide information in different ways, so that they can better feel the connotation and emotion of the works.

In addition, the development of audio-visual barrier-free has also prompted more attention to the needs of people with hearing and visual impairments. More and more people realize that people with hearing and visual impairments are also part of society and should be given equal rights and respect. In this context, the reform of audio-visual language has also received more policy support and social recognition. This attention and support has further promoted the development and innovation of audio-visual language.

2. Elements of Barrier-free Audio-visual Communication in All Media

2.1 Audience Analysis

According to the Main Data Bulletin of the Second National Sample Survey on Disability, "there are 27.8 million people with hearing and speech impairments in China, accounting for one-third of the total number of people with disabilities and ranking first among the five major disabled groups including visual impairment, physical disability, intellectual disability, and others. This constitutes 1.67% of China's total population (*CDPF, 2023*)." According to joint survey data released by the former National Health and Family Planning Commission and the China Disabled Persons' Federation in 2016, "the number of people with hearing impairments in China is 206 million, accounting for 15.84% of the total population. Among them, 67.2 million have moderate or more severe hearing impairments, and 113 million are elderly individuals aged 60 and above with hearing impairments (*Tai, 2023*)." In the current rapid development of online audio-visual content, individuals with hearing impairments have not had the opportunity to hear sounds transmitted through media platforms. They have not experienced the excitement of watching large-scale live broadcast galas or the thrill of live sports events. Compared to those with normal hearing, even engaging in seemingly ordinary media activities such as watching online movies, variety shows, and web dramas requires them to struggle to understand the content through subtitles. This silent "visual world" exists in a state of tranquility and coldness. According to statistical data from the World Health Organization in 2020, there are 8.3 million blind people in China, with more than 400,000 new cases each year, making China's population of visually impaired individuals the highest in the world. As of 2019, the number of visually impaired people in China has rapidly increased to nearly 17 million, which means that approximately one out of every 80 people is blind. Focusing on the prevalence and causes of visual impairment and blindness among the Chinese population over the past 30 years, survey data shows that in 2019, the overall prevalence rates of moderate, severe visual impairment, and blindness in China were 3.23%, 0.33%, and 0.61%, respectively, equivalent to approximately 45.92 million, 4.67 million, and 8.69 million patients (*Xu et al., 2020*). Unlike individuals with hearing impairments, people with visual impairments are able to hear sounds transmitted from media devices. However, there are still numerous technical compatibility issues with media applications that can truly cater to the "listening" needs of those with hearing impairments. They are unable to hear the information contained in images when tapped on their mobile phones, unable to hear scene descriptions and character actions in online audio-visual programs, and even less able to perceive the emotions of the characters in the drama, as well as the rhythm of the story. This type of auditory "message" results in a rigid perception.

2.2 Existing Obstacles

At the visual level, the hearing-impaired can pay attention to the visual elements in the picture by looking, just like the hearing people. That is to say, in general, there is no significant difference between the hearing people and the hearing-impaired in the content information conveyed by the visual of the picture. The reason why the hearing-impaired cannot get the same viewing experience as the hearing-impaired is because of their own hearing impairments. The information conveyed by the program at the auditory level, that is, the human voice, music, and

sound, cannot have an emotional impact on the hearing-impaired.

At the auditory level, the visually impaired can perceive the auditory elements in the program by listening, just like the hearing people. That is to say, in general, there is no significant difference between the hearing people and the visually impaired in the information conveyed at the sound level in the image. The reason why the visually impaired cannot get the same audio-visual experience as the hearing people is because of their own visual impairments. The information conveyed by the image at the visual level, that is, the characters, scenes, actions, psychology, and montage narratives, cannot have an emotional impact on the visually impaired.

2.3 Communication Elements

Based on the previous discussion on the provision of accessible audio-visual content, the means that can effectively assist individuals with audio-visual impairments to understand program information can be categorized into three types: subtitle display, sign language interpretation, and audio description. Article 30 of Chapter III on Accessible Information Communication in the Law of the People's Republic of China on the Construction of an Accessible Environment, adopted at the Third Session of the Fourteenth National People's Congress Standing Committee on June 28, 2023, stipulates: "Television stations established with financial funds shall provide synchronous subtitles when broadcasting television programs. If conditions permit, they shall broadcast news programs with sign language interpretation at least once a day and gradually expand the scope of programs with sign language interpretation. The state encourages the addition of subtitles, sign language, or audio description tracks to publicly published and distributed film and television video products and online video programs (*China's NPC website, 2023*)." It can be seen that subtitles, sign language interpretation, and audio description are the ways of providing accessible audio-visual content that have been explicitly stipulated at the national level for the first time in legal form.

Then, a realistic problem facing the barrier-free audio-visual content supply level is how to accurately use the three barrier-free audio-visual content supply means of subtitle display, sign language translation and oral image to effectively make up for the hearing-impaired people's hearing barriers in voice, music, sound and other auditory barriers, as well as the visual barriers of visually impaired people in character conversion, scene conversion, specific actions, character psychology, character action purpose and other visual barriers. This requires that on the basis of returning to the image audio-visual language ontology, combined with the barrier-free audio-visual content supply means, the basic elements of barrier-free audio-visual communication should be determined.

2.3.1 Barrier-free elements of image auditory language for hearing-impaired people

The image auditory language for hearing-impaired people mainly includes three main auditory languages: human voice, music and sound. The human voice in the image auditory language refers to the language uttered by people in the image, which has distinct expression characteristics such as pauses, tone, stress and rhythm. According to the specific function, it can be divided into dialogue, monologue and narration. Dialogue, also known as verbal dialogue and communication between characters, mainly plays three roles: explaining the plot, shaping the character's personality and conveying the subtext connotation. Monologue, also known as inner speech expression, plays the role of portraying the inner world of characters and showing the complex image of characters in the form of "voice-over". Narration, also known as the objective statement of an outsider, stands in the position of an outsider in the form of "voice-over" and promotes the development of the plot through objective narration.

Music in the visual auditory language refers to the music that appears in segments in film and television works, which rises in time with the arrangement of narrative rhythm, plays the role of rendering the emotions of characters, setting off the atmosphere of the scene, and expressing the theme.

Sound in the visual auditory language refers to the general term for all sounds in the natural environment and social environment that appear in the time and space relationship of film and television, except for human voice and music. The main function is to create a realistic auditory space, participate in the narrative of the story to imply the occurrence of events, and set off the emotional effect and tone of a certain scene.

To explore the supply of visual auditory language elements from the perspective of barrier-free audio-visual content supply, it is necessary to discuss subtitle display and sign language translation item by item.

2.3.1.1 Accessible subtitle display elements

In terms of subtitle display, the various elements of subtitle display mainly serve people with hearing impairments and belong to visual communication.

Accessible subtitle display for "dialogue" mainly includes 4 elements: "marking the name of the speaker of the dialogue", "briefly describing the pauses, tone, stress, and rhythm of the speaker of the dialogue", "subtitle color (white)", and "displaying the dialogue content in the center of the bottom of the screen".

The barrier-free subtitle display for "monologue" mainly includes "marking the name of the monologue speaker", "briefly describing the pauses, tone, stress, and rhythm of the monologue speaker", "subtitle color (other non-repeating colors)", "marking the word "monologue" separately", and "displaying the monologue content in other obvious positions other than dialogue and narration".

The barrier-free subtitle display for "narration" mainly includes "marking the word "narration" separately", "subtitle color (other non-repeating colors)", "displaying the narration content in other obvious positions other than dialogue and monologue", and "briefly describing the pauses, tone, stress, and rhythm of the narration speaker".

The barrier-free subtitle display for "soundtrack" mainly includes "displaying the start and end of the soundtrack", "briefly describing the rhythm, melody, strength, and speed of the soundtrack", "briefly describing the purpose and function of the soundtrack", "marking the word "soundtrack" separately", and "subtitles Color (other non-repeating colors)", "other non-repeating obvious directional display", a total of 6 elements.

For the accessible subtitle display of "theme song/interlude", it mainly includes "display the beginning and end of the theme song/interlude", "display the lyrics of the theme song/interlude", "singer's name and gender", "briefly describe the rhythm, melody, strength, speed, harmony, and timbre of the theme song/interlude", "separately mark the words 'theme song/interlude'", "subtitle color (other non-repeating colors)", "other non-repeating obvious directional display", a total of 7 elements.

For the accessible subtitle display of "sound", it mainly includes "describe the sound source and sound content of the sound", "describe the source direction of the sound", "display the beginning and end of the sound", "briefly describe the purpose and function of the sound", "separately mark the words 'sound'", "subtitle color (other non-repeating colors)", "other non-repeating obvious directional display", a total of 7 elements.

2.3.1.2 Sign language interpretation elements

In terms of sign language interpretation, the various elements of sign language interpretation mainly serve people with hearing impairments and belong to visual communication.

For "dialogue", barrier-free sign language interpretation mainly includes "the name of the speaker of the dialogue and the content of the dialogue", "the speed, pauses, strength, amplitude, and rhythm of the speaker of the dialogue are presented through the facial expressions and sign language rhythm of the sign language interpreter", "the color of the sign language interpreter's clothing (pure dark colors are preferred)", and "fixed screen position of the sign language interpreter".

For "monologue", barrier-free sign language interpretation mainly includes "the name of the speaker of the monologue and the content of the monologue", "the speed, pauses, strength, amplitude, and rhythm of the monologue speaker are presented through the facial expressions and sign language rhythm of the sign language interpreter", "the use of sign language to emphasize that it is a 'monologue' moment", "the color of the sign language interpreter's clothing remains unchanged", and "the screen position of the sign language interpreter remains unchanged".

The barrier-free sign language translation for "narration" mainly includes "the name and content of the narrator's name and narration content through sign language translation", "the speed, pause, strength, amplitude and rhythm of the narrator's speech are presented through the facial expressions and sign language rhythm of the sign language interpreter", "the sign language emphasizes the moment of 'narration'", "the color of the sign language interpreter's clothing remains unchanged", and "the screen position of the sign language interpreter remains unchanged".

The barrier-free sign language translation for "soundtrack" mainly includes "the appearance and end of 'soundtrack' are emphasized through sign language", "the rhythm, melody, strength and speed of the soundtrack are described through the facial expressions and sign language rhythm of the sign language interpreter", "the purpose and function of the soundtrack at this moment are explained through sign language", "the color of the sign language interpreter's clothing remains unchanged", and "the screen position of the sign language interpreter remains unchanged".

The barrier-free sign language translation for "theme song/interlude" mainly includes "emphasizing the appearance and end of the 'theme song/interlude' through sign language", "interpreting the lyrics of the theme song/interlude through sign language", "describing the rhythm, melody, strength, speed, harmony, and timbre of the theme song/interlude through the facial expressions and sign language rhythm of the sign language interpreter", "briefly describing the rhythm, melody, strength, speed, harmony, and timbre of the theme song/interlude", "explaining the purpose and function of the theme song/interlude at this moment through sign language", "the color of the sign language interpreter's clothing remains unchanged", and "the screen position of the sign language interpreter remains unchanged".

The barrier-free sign language translation for "sound" mainly includes "describing the sound source and sound content of the sound through sign language", "describing the source direction of the sound through sign language", "displaying the beginning and end of the sound through sign language", "describing the purpose and function of the sound through sign language", "the color of the sign language interpreter's clothing remains unchanged", and "the screen position of the sign language interpreter remains unchanged". There are 6 elements in total.

2.3.2 Accessible elements of visual language for visually impaired people

To explore the supply of visual language elements from the perspective of accessible audio-visual content supply, it is necessary to split the oral images into elements and discuss them one by one.

The visual language for visually impaired people is different from the conventional visual language. Its main purpose is to allow visually impaired people to receive sound information through their auditory senses, thereby making up for the absence of visual images. It mainly includes four main aspects: introduction to the story background, introduction to the character situation, introduction to the picture content, and introduction to the narrative rhythm.

The introduction to the story background mainly refers to the basic description of the historical background, natural environment, and social environment that play a role in the appearance of the characters, the development of events, and the direction of the ending. Considering the overall perception of visually impaired people on the narrative of the image, it is necessary to give an overview of the main story before the main film is shown.

The introduction to the character situation mainly refers to the language description of the appearance of the main characters in the play, the transformation of the relationship between the characters, the transformation of the characters in different scenes, the actions of the characters in different events and the purpose of the actions, as well as the psychology of different characters, so as to increase the complete understanding of the characters in the play for visually impaired people. For the main characters, they should be introduced when they first appear, and their main basic characteristics such as name, gender, occupation, identity, clothing, appearance, temperament, etc. should be introduced; for the relationship between characters, they should be introduced when the relationship between characters develops, and the relationship types should be introduced according to the situation: social relationship, blood relationship, subordinate relationship, emotional relationship, situational relationship, etc.; for the role conversion of characters in the play, it is necessary to introduce the complex characteristics of the characters in different scenes, as well as special explanations for situations such as the sudden appearance of a certain person; for the actions and purposes of the characters, it is necessary to describe the main behaviors of the characters, and combine the cause-effect logic to supplement the results of the actions; for the psychology of the characters, it is necessary to explain and explain the expressions of the characters when necessary.

The introduction of the content of the picture mainly refers to the description of the "signifier" of the image picture. From the perspective of an independent lens, the "signifier" mainly includes the objective spatial field directly presented by the composition, scene, angle, light, color, etc. under a single lens. At the same time, it is necessary to describe the "signified" of the image picture, and explain the meaning reflected by the "signifier" based on the

image effect produced by the "signifier".

The introduction of narrative rhythm mainly refers to the image rhythm produced by the advancement of the plot, the changes in the characters' emotions, and the editing of the shots. This requires an explanation of the narrative montage and the expressive montage of the image from the perspective of time and space, so that people with visual impairments can fully understand the changes in narrative rhythm. For narrative montage, it is necessary to combine the film situation to express the use and effects of continuous montage, parallel montage, cross montage, and inverted montage in popular language, and describe the sound and picture relationship effects produced by montage when necessary; for expressive montage, it is necessary to combine the film situation to express the use and effects of cumulative montage, contrast montage, metaphorical montage, psychological montage, and repetitive montage in popular language, and describe the sound and picture relationship effects produced by montage when necessary.

In addition to the above elements, it is also necessary to pay attention to the voice actor's sense of narration, and the voice of the voice actor should be able to give the audience a desire to listen. The voice actor's tone and intonation should be consistent with the emotional tone of the paragraph scene, pay attention to the dubbing tone and emotional color, and ensure that the voice actor's emotions are always active.

Normally, the spoken audio is inserted into the gaps in the film where there is no "dialogue, monologue, or narration" to ensure that the narrative is consistent with the next shot, without changing the original length of the film. At the same time, the dubbing script of the dubbing artist should transform the "non-linear" visual language into linear spoken language, without the need for long descriptions, and should be brief and clear.

3. Types of Barrier-free Audio-visual Communication in All Media

3.1 Barrier-free Online Movies

Barrier-free online movies refer to movies played on Internet platforms that comply with relevant national copyright policies and regulations, and are presented by professional teams with barrier-free technology, and are released online on Internet platforms. The length is equivalent to that of regular movies, and they have a barrier-free audio-visual format with the volume of complete movies. For people with visual impairments, voiceovers are inserted at appropriate positions in the movie to supplement the information of the screen content in the movie. For people with hearing impairments, sign language descriptions and subtitles are provided at appropriate positions in the movie to make up for the missing information at the sound level of the movie.

3.2 Barrier-free News Reports

Barrier-free news reports refer to the use of sign language interpreters to translate the content of news anchors' reports in sign language, or the use of sign language hosts as news anchors, and the use of sign language interpreters and full subtitles to help people with hearing impairments accurately understand news information. It can also refer to the barrier-free transformation of various news programs of mainstream media through barrier-free audio-visual technology, and the barrier-free news after the transformation can meet the needs of people with hearing impairments.

3.3 Accessible Live Broadcast of Sports Events

Accessible live broadcast of sports events refers to the appearance of sign language interpreters in a separate frame space on the screen while the sports events are being broadcast. Through sign language, the language information of the sports event commentator is translated to help people with hearing impairments obtain content information other than the sports event broadcast screen and feel the passion and vitality of the sports events. In general, it is necessary to achieve synchronous sign language translation with the commentator, and at the same time, highlight the expression of the emotions and appeal conveyed by the event, throughout the entire process of various types of sports events.

3.4 Accessible Live Broadcast with Goods

Accessible live broadcast with goods refers to the sign language interpreter acting as the sign language interpreter of the live broadcast anchor, being in a subordinate position of the live broadcast screen, and cooperating with the

live broadcast anchor to provide real-time barrier-free hand flip services. It can also refer to the sign language interpreter acting directly as the sign language live broadcast anchor, being in the live broadcast screen anchor position, and live broadcasting goods through sign language. However, this type requires an assistant beside the sign language anchor who can not only understand the anchor's sign language content, but also translate the sign language information into voice and synchronize it to the netizens watching the live broadcast.

3.5 Accessible E-sports Live Broadcast

Accessible e-sports live broadcast refers to opening an "accessible viewing" link channel while broadcasting online e-sports live. In this channel, the e-sports commentator's voice is translated in real-time in the form of subtitles throughout the whole process, and the information other than the e-sports broadcast screen content is expressed in sign language in the form of sign language translation, helping the hearing-impaired to feel the charm of e-sports live broadcast. Because a large number of game professional terms are involved in sign language, it is necessary to specially invite hearing-impaired people who are familiar with a certain type of competitive game as sign language interpreters.

3.6 Accessible Short Video

At present, accessible short videos are mainly based on the barrier-free assistive technology of various short video APPs and the screen reading function of the user's mobile phone. Before entering the short video APP, the visually impaired need to open the third-party screen reading software on the mobile phone to realize the synchronous reading of the content of the area selected by the user's touch on the screen. The visually impaired can obtain information about their current operating area based on the read content, thereby improving the use and interactive experience of the visually impaired. In addition, with the further acceleration of barrier-free transformation of China's online video APPs, barrier-free auxiliary technologies for various short video APPs have also begun to emerge, mainly by optimizing the color perception of the picture, adapting the narration reading function, and AI intelligent subtitle real-time translation to help the hearing-impaired group. Short video types with sign language as the main language are only scattered at the level of individual user content release, and a trend of barrier-free short video audio-visual with sign language has not yet been formed.

3.7 Barrier-free Online Variety Shows

Barrier-free online variety shows refer to variety shows that comply with relevant national copyright policies and regulations, and are presented by professional teams with barrier-free technology on the Internet platform, and are released online on the Internet platform. Without changing the original length of the variety show, barrier-free information is supplemented for the audio-visual content of the online variety show. For people with visual impairments, voice-overs are inserted at appropriate locations in the online variety show to supplement the information on the picture content in the online variety show. For people with hearing impairments, sign language descriptions and subtitles are provided at appropriate locations in the online variety show to make up for the missing information at the sound level of the online variety show.

3.8 Accessible Online Dramas

Accessible online dramas refer to online series specially produced and broadcast for people with hearing and visual impairments. They can be divided into accessible series, accessible unit dramas, and accessible single-episode dramas. The plot setting can be a restoration of the original work or a change to the original work, and it can be broadcast online and on TV simultaneously or online first and then on TV. In terms of accessible production, on the basis of not changing the length of the original drama, three types of accessible content supply, namely subtitles, oral description, and sign language translation, are added. In terms of accessible communication, it is consistent with the current interactive mode of online dramas, retaining functions such as forwarding, commenting, barrage, collection, and likes, and visually impaired people can use screen reading software to achieve online interaction.

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