

The Impact of Auditory Effects on the Expressive Power of Sound Art in Film and Television

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Abstract: Since the advent of sound films, audio has emerged as an indispensable component of cinematic art. The "auditory effect" experienced by the human ear is a natural response that influences both physiological and psychological processes. This phenomenon of "auditory effects" is omnipresent in our daily lives and is equally significant in the realms of film viewing and creation. This paper examines the impact of auditory effects on the expressive capacity of audio in film, grounded in the principles of psychoacoustics. It explores effective ways to leverage "auditory effects" to enhance the artistic expressiveness of audiovisual works, offering theoretical guidance and creative inspiration for sound creators in their artistic endeavors. By carefully considering auditory effects in sound creation, one can optimize the physiological and psychological impacts of sound elements, thereby augmenting the overall expressiveness and artistic quality of the work.

1. Introduction

Since the birth of the first sound film, "The Jazz Singer", many experts and scholars have embarked on a long journey in the pursuit of sound art. Today, sound has become an indispensable element of cinematic art. Film and television are audiovisual arts, and the artistic expression of sound plays a crucial role, influenced and controlled by audiovisual psychology. Professor Li Feixue states in "An Introduction to Sound Art in Film and Television", "Sound is delivered to hearing; sound art is an auditory art that reaches the human ear through sound wave transmission, impacting the brain and producing a synesthetic effect similar to vision. Sound affects people's psychology and ultimately influences their emotions" [1]. This indicates that sound has artistic qualities and can impact emotions, as different sound effects can evoke different emotional states, allowing films to express various emotions. The acoustic expression of emotional states is closely related to the auditory experience in film sound, which can significantly enhance the artistic expressiveness of auditory effects in films [2]. The art of sound in movies has rich expressive power, and researching film sound art is currently a hot topic. Moreover, how the expressiveness of auditory effects in sound is manifested in film works has also become a focal point of this study.

2. Auditory Effect

The theoretical foundation of auditory effects stems from psychoacoustics. Auditory effects constitute a primary component of psychoacoustics, which is the study of the psychological responses elicited by sound perception [3]. Subjective factors play a significant role for listeners when assessing whether a sound disrupts their experience. To objectify these subjective elements, experts have developed fundamental concepts and measurement parameters through extensive theoretical and practical research in psychoacoustics. This field primarily investigates the relationship between sound and the auditory experiences it evokes, aiming to understand the functions of the auditory system and the mechanisms behind them. Key auditory effects perceived by the human ear include the masking effect, Haas effect, bone conduction effect, binaural effect, cocktail party effect, Doppler effect, and shadowing effect. This paper focuses on the influences of the binaural effect, masking effect, and Doppler effect on the artistic expressiveness of sound in film and television [4, 5]. It thoroughly explores how these auditory effects naturally manifest or are intentionally utilized during viewing and creative processes to enhance the artistic portrayal in cinematic works.

3. The impact of the binaural effect on cinematic sound art expression

3.1 Concept of the binaural effect

The phenomenon of binaural hearing involves perceiving sound from a single source through both ears. Due to differing auditory angles, sound waves arrive at each ear with a distance disparity. This disparity results in variations in time, phase, and sound level, leading to distinct auditory experiences in each ear, commonly referred to as the binaural effect. This effect enhances auditory perception, enabling the localization of sound direction, distance, and spatial context. In film and media, it not only advances the narrative but also enhances the authenticity of the storyline, thereby enriching the artistic expression of sound in audiovisual works.

3.2 The rational application of the binaural effect in film and television

The binaural effect has been widely used in film and television creation, not only enhancing the artistic depth of the works but also improving the audience's understanding of the film's content, thus enriching their sense of reality and immersion.

3.2.1 Driving the Narrative

The fundamental task of film and television works is to present the story content in its entirety. The use of sound in film can propel the development of the plot, highlight the film's themes, construct historical contexts, and enrich the visual experience. These functions underscore the necessity of sound in storytelling. The binaural effect in films is both abstract and three-dimensional. For instance, in the Indian film “Madaari”, the blind voice actor Rohan meets a similarly independent and confident blind girl, Supriya. However, a disaster shatters their confidence and dignity, leading Rohan to embark on a revenge plan. In the film, the male and female protagonists primarily rely on their binaural hearing to navigate their surroundings and perceive events. They sense the rapid approach of danger through the sound of footsteps and feel the imminent threat from the sound of a gun being cocked, prompting them to dodge quickly. They also use the sounds of footsteps and objects colliding to pinpoint the enemy's exact location, delivering a heavy blow. The application of the binaural effect not only drives the plot but also emphasizes the spatial environment created by sound.

3.2.2 Shaping the Sense of Space in Sound

The binaural effect is a perceptual activity that spans both physiological and psychological realms. Due to the distance and angle between the ears, as well as factors affecting the outer ear canal, sound reaching the two ears creates detectable time differences, level differences, phase differences, and timbre differences. This allows the human ear to perceive the direction, movement, proximity, and spatial environment of sound sources in film sound. Without the binaural effect, neither sound creators nor film viewers can engage in spatial perception of sound. In sound creation and playback, it is precisely because of the binaural effect that film sound possesses a three-dimensional spatial quality. The sense of space in sound is generally reflected in three aspects: environmental sense, perspective sense, and directional sense. The environmental sense refers to how sound in a film conveys the creator's intended spatial environment to the audience, giving them a realistic feeling. For example, when singing in a large, empty auditorium, the sound appears particularly rich and resonant, with a longer reverberation time. The perspective sense primarily showcases the distance between the sound source and the characters based on the physical properties of sound. In the American film "World War Z," the protagonist assesses the presence of zombies in the environment by interpreting the sounds they make while searching for a cure for the virus, thus illustrating the spatial and perspective sense of the environment. The directional sense relies on the binaural effect to identify the direction and specific location of sound sources, further engaging the audience in the plot. The binaural effect has a typical spatial artistic expressiveness, allowing individuals to discern changes in sound and feel alterations in their surroundings. When used appropriately and reasonably in films, this effect enhances viewers' sense of immersion, intensifying their feeling of presence and reality, making them experience the authenticity of the spatial environment and the story's content during viewing.

3.3. Techniques to enhance artistic expression through binaural effects

3.3.1 Expanding the Space Beyond the Frame

The use of the binaural effect in film and television can effectively showcase genuine artistic expression and spatial artistry. The enhancement of spatial expression largely lies in the expansion of the cinematic space beyond the frame. This can be seen in two ways: first, the expansion of physical space, and second, the expansion of psychological space. The binaural effect primarily enhances physical space through the use of active sounds in film. In practice, utilizing the binaural effect to determine the position of sound sources allows them to be placed anywhere within the sound field, whether inside or outside the frame. If the sound source is outside the frame, it directly expands the space beyond the frame; conversely, if the sound source is inside the frame, its reflective qualities can be captured by the binaural effect to achieve the same goal. Additionally, multiple sound sources can be placed in different positions within the sound field, whether they are related or unrelated, and can consist of active sound groups both inside and outside the frame that are perceived by the audience's ears. Through the binaural effect, viewers gain a sense of the sound source's location and environment, thereby expanding the space beyond the frame.

The binaural effect can also expand the viewer's psychological space through passive sounds in film. A direct example of this is the use of film music. In typical multichannel film production, music is often placed in the front, left, or right channels, excluding the center channel. The audience's ears perceive changes in the melody, rhythm, instrumentation, and other sound elements, which helps expand their psychological space. Moreover, creators often use techniques to blend sound and music seamlessly, allowing for a natural transition between active and passive sounds, further expanding psychological space. Since the binaural effect can create both physiological

effects between the ears and psychological effects within the mind, creators can achieve a natural transition between physical and psychological spaces to expand the space beyond the frame, ultimately enhancing the artistic expression of film and television works.

3.3.2 Optimizing the Temporality and Spatiality of Sound

Film and television art possesses both spatial and temporal qualities, making it a temporal-spatial art form. Therefore, film sound exists in time and space, flowing through time and propagating through space. In the creative process of film and television, sound is often used to showcase the temporal and spatial aspects of the work, using special audio effects to illustrate unique time and space. For instance, certain typical sounds can be associated with morning, noon, or evening. Regarding the temporal characteristics of sound, filmmakers may use local dialects as the language style of the film based on where the story takes place, allowing the audience to discern the time and location of the story through sound—like the street vendors of old Beijing or the folk tunes of northern Shaanxi, which evoke the era in which the story unfolds. Through the spatial characteristics of sound propagation illustrated by the binaural effect, the artistic effect of the sound environment can be achieved by manipulating the position and changes of sound sources in space. Whether reinforcing or diminishing the binaural effect can enhance the environmental spatial expression and authenticity, allowing the audience to achieve both physiological and psychological perceptions during the viewing experience. In the creative process, how to effectively utilize the binaural effect requires creators to seize the right moments and techniques to enhance the spatial and authentic expression of film works, thereby elevating their artistic depth and value.

4. Analysis of the impact of the masking effect on the expressiveness of film sound art

4.1 Concept of the masking effect

The phenomenon analyzed through the auditory characteristics of the human ear, where the presence of one sound diminishes the sensitivity to other sounds, is termed the auditory “masking effect”. This means that the existence of a particular sound reduces the perception of another sound. This phenomenon correlates not only with volume but also with frequency, hence it is also referred to as “frequency masking”.

4.2 Appropriate application of the masking effect in film

The masking effect is a complex physiological and psychological phenomenon. In films and TV shows, the effective use of the masking effect can create crises, contribute to the narrative, and drive the plot forward, thereby enhancing the artistic quality of the work.

4.2.1 Contributing to the narrative and pushing the story forward

The masking effect has been widely applied in the creation of films and shows, effectively hiding certain sound elements. It not only contributes to the narrative to further develop the plot but also enhances the artistic charm of the film, showcasing the impact of narrative expressiveness. For instance, in Giuseppe Tornatore's movie “The Legend of 1900”, the male lead, 1900, wants to give a record to a girl as she disembarks, but he doesn't know how to say it. When he finally tries to speak, surrounding noises drown him out. Here, the masking effect is used to ensure the girl doesn't hear his voice, creating a sense of regret for the audience and setting the stage for the protagonist to abandon his intentions later on.

4.2.2 Enhancing the story's realism

In films, the masking effect can also serve to enhance the story's realism, affecting both the physiological and psychological responses of the audience as they enjoy the movie. This impact is evident in many war films. On the battlefield, the sounds of relentless gunfire and explosions are overwhelming. When a barrage hits, a voice nearby shouts for everyone to get down, but the surrounding noise drowns out the command, making it so that only those right next to the speaker can hear it. This is because of the masking effect, where crucial sounds are obscured by the chaotic background noise, adding to the film's authenticity and sense of crisis, thereby enhancing its artistic effect.

4.3 Techniques to enhance artistic expression through the masking effect

4.3.1 Enhancing the Artistic Expression of Timbre

The masking effect is a typical representation of timbre's artistic expression. By increasing the presence of one sound source to diminish the perception of another, clarity of the film's main content is ensured, interference is reduced, and the relative frequency of the masked sound source is adjusted to change its psychological impact on the listener, enhancing the artistic expression of sound in film. When creators use this effect in their works, they can employ technical means to enhance the pitch and volume of other sound sources to weaken the sound of the key source, allowing the audience to quickly grasp the creator's intended message and thereby enhance the timbre's artistic expression in the film. In the movie "Aftershock," during the rescue operation, the addition of sounds like adult shouts, children's cries, rain, and thunder made it difficult to hear the voices of trapped civilians, creating significant challenges for the rescue efforts, resulting in many people losing their lives due to prolonged rescue times. In this process, the diversity of sounds, when mixed in the listener's auditory perception, leads them to mistakenly believe that the timbre has changed, making it hard to locate the desired target. This is the artistic expression of the masking effect, highlighting the severity of the disaster and adding a more realistic environmental portrayal to the film.

4.3.2 The Authentic Artistic Expression of Sound Design in Film

Sound design is crucial in the process of creating sound for films. Without careful prior planning and design, the audience's auditory and visual effects and experiences can be directly impacted. Consequently, filmmakers often combine principles from psychoacoustics with visual and auditory thinking to design and conceptualize sound in their works. This process includes capturing synchronous sound, recording post-synchronized voiceovers, creating sound effects, and mixing, all of which enhance the authenticity of the film. Currently, the masking effect has been greatly recognized in the creation of film works, particularly in terms of timbre expression, authenticity, and spatial expression, allowing the audience to gain more audiovisual experiences and perceptions while enjoying the film. The application of the masking effect should also be designed according to the director's vision and the film's thematic content, rather than being used blindly, as this could have negative effects. For example, in many monster movies featuring battles between monsters, background music, sound effects, and dialogue occur simultaneously, with their physical parameters being quite similar. The three sound elements emphasize the severity of the situation at the same time. However, the sounds of monster collisions, tearing, and the impact of their movements lack distinct prominence, resulting in a lack of authenticity and somewhat diminishing the artistic expression and emotional impact of the sound. This is due to the improper application of the primary and secondary relationships among the three sound elements, which can inadvertently

weaken the sense of realism and shock experienced by the audience.

5. Analysis of the Impact of the Doppler Effect on the Expressiveness of Film Sound Art

5.1 Concept of the Doppler effect

The Doppler Effect is a phenomenon of sound propagation discovered by Doppler in 1843. It describes the change in pitch that occurs when the position of the sound source or the listener changes. This auditory experience primarily manifests when the distance between the ear and the sound source alters, leading to changes in sound frequency. For example, while riding on a train, as another train approaches from the opposite direction, the listener will perceive the sound of the train's horn shifting from low to high frequency, and then back from high to low as the trains pass.

5.2 Appropriate application of the Doppler effect in film

The Doppler effect has a huge impact on film and video creation. It not only gives a powerful sense of spatial sound but also makes the audio more vivid, dynamic, and lively, which in turn affects the audience's physiological and psychological perception.

5.2.1 The Realism of Pitch Variations

The Doppler effect originates from reality, making the sounds in films feel more authentic and enhancing the artistic quality of the work. When utilized fully in films, the Doppler effect can make the audio-visual experience more three-dimensional, realistic, and impactful. For example, in the movie "Eagle", the opening features a fast-moving motorcycle. As it zooms by, the sound of the bike changes from high to low pitch, showcasing the use of the Doppler effect and greatly enhancing the film's realism. Similarly, in "Chinese Zodiac", when the main character JC escapes the base, the sound of various bullets and missiles rushing towards him reflects this sense of reality.

5.2.2 The Design of Sound Techniques in Film

In cinematic works, the design and application of sound techniques can provide smoothness to the visual experience, leading audiences into a more immersive film environment. This has led to various combinations of sound and image, such as sound sync, sound foreshadowing, sound continuity, and sound transitions. These methods work hand in hand to effectively express the themes and content of the film, thereby increasing its artistic value. For instance, if the sound of the motorcycle kicks in early and its pitch increases, the motorcycle appears on screen when the sound reaches its peak, providing a particularly realistic sensation both emotionally and audibly.

5.2.3 Continuity of Sound

In films, when depicting a spatial scene or an event, creators often choose different camera angles to tell the story. However, if there's no transition between shots, it can create a "visual illusion" for the audience. To resolve this issue, utilizing the Doppler effect in sound is one of the most effective methods to enhance continuity. For instance, in "Run Lola Run", the integration of sound and image is done effectively, creating an immersive experience, where sound effects intensify the atmosphere, maintaining a strong grasp of the film's tone.

5.3 Techniques to enhance artistic expression through the Doppler effect

5.3.1 The Spatial Artistic Expression of Pitch Variation

The application of the Doppler effect in film and television works injects fresh vitality, enhancing the spatial sense of sound and expanding the four-dimensional expressiveness of movies. This leads to a psychological connection with the audience, thereby increasing the sense of realism in the film. The Doppler effect also enhances the layers of sound in motion within the film; as characters move, the sound design changes accordingly, creating a complete unity with the visuals. It's precisely the use of the Doppler effect that transforms the audience's experience from passive reception to an active psychological engagement, allowing films to deliver a holistic audio-visual experience. This fusion of auditory and visual arts creates perfect cinematic art, significantly showcasing its artistic expressiveness.

5.3.2 Artistic Expression in Terms of Speed and Intensity

The artistic expression concerning speed and intensity primarily embodies a sense of speed, power, and rhythm through the high-speed movement of objects, aligning with the film's theme and style. In "The Hobbit: The Battle of the Five Armies," for instance, the powerful longbow shooting down the dragon illustrates this concept. The varying distances of the iron arrow to the dragon, along with differing frequencies, lead to changes in pitch, enhancing both intensity and speed, thereby creating a realistic spatial environment. This illustrates the Doppler effect's speed-related artistic expression. The creators utilize technical methods, allowing the frequency to rise and the pitch to grow as the sound source gets closer to the listener, imparting a sense of urgency. The shortening of the sound wavelength also evokes an anxious feeling in the audience, fostering a subjective experience similar to that of the protagonist.

In summary, in film creation, it is crucial to fully utilize the theoretical foundation of psychoacoustics, which aids in better understanding the audience's psychological changes, thus playing a constructive role. The impact of auditory effects on the artistic expressiveness of film sound demonstrates the importance of sound language in cinematic expression. For creators, sound elements should also be prioritized in the creation process, serving as a bridge for communication between the audience and the creators.

6. Conclusion

Auditory effects, as a component of psychoacoustics, should be effectively leveraged during the creation of audiovisual works to enhance their narrative and artistic qualities. This article focuses on the artistic expression of sound through its three core elements. Various dimensions like the narrative function, spatial-temporal aspects, realism, character development, visual structure, dynamics, and suggestiveness of film sound all influence its artistic impact. By examining the binaural effect, masking effect, and Doppler effect within auditory phenomena, this study explores their inherent characteristics and applications in film production, thereby identifying techniques to elevate the artistic representation of sound. This exploration offers a robust theoretical foundation and practical guidance for future design and utilization of sound in audiovisual projects.

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