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2026 Volume 4, Issue 2
Educational Innovation Research
ISSN: 3029-1844(Print) ISSN: 3029-1852(Online)

Application of Audio-Visual Technology in Performance

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Abstract: With the rapid progress of the digitalization of the performing arts industry, audio-visual technology has become an important support for performance creation and display, which has a decisive effect on the artistic expression of performances and the audience experience. In this article, we will discuss how audio-visual technology is used on stage. Starting from the concept and type of audio-visual technology, it elaborates on the advantages of its application. Then, it puts forward some specific application and operation methods for sound optimization, visual effect creation, online and offline live broadcasts, rebroadcasts, and immersive scene construction, etc., in order to provide more practical references for the technological integration and development of the performing arts industry.

Keywords: audio-visual technology; performance art; immersive experience; visual effects; scene interaction

Online publication: February 26, 2026

1. Introduction

A dual boost in terms of upgradation for culture and fast progress of technology made the performance industry move away from the old single choice and bad experience to a diversified immersion one and digitalized one. The audience is getting higher requirements for seeing the show. The audio-visual technology becomes a bridge which connects art with tech, it brings about new ways of art expression, form innovation and communication for performance art. But at present, in terms of performance applications, there are still problems with disconnection from art creation, weak utilization of technology functions, and poor adaptation to the scene in performance applications, which can not give full play to its power. Therefore, we start from the artistic essence of performances and audiences' needs, to scientifically sort out and sum up the audio-visual technology, understand how audio-visual technology plays a role in every aspect of performances, and achieve the goal of integrating audio-visual technology with performance arts.

2. Core Concepts and Types of Audio-visual Technology

The audio-visual technology is an interdisciplinary technology that integrates many disciplines, including acoustics, optics, computer science, and artistic design. It mainly improves and creates audio-visual performance effects by collecting, processing, transmitting, and presenting sound and image signals. Thus, it basically provides technical support for the

artistic expression of performances. The technological system does not simply use one kind of tool. It is like several technical modules, each performing different tasks at various stages of the performance, working together to realize a certain artistic concept throughout all these performances.

In terms of application, it mainly involves two aspects: one is sound processing technology, and the other is visual display technology. Processing technologies such as microphone arrays, Digital Audio Mixing (DAM), Spatial Acoustic Simulation, Real-Time Sound Effect Processing, etc., can accurately reproduce the original performance sounds, generate personalized sounds in various styles, and change the sound field. This is an important technical method for creating digital stage art.

The visual presentation technology includes projection mapping, large LED screens, AR/VR visual synthesis, intelligent lighting control, etc. It can naturally combine virtual visuals with live-stage visuals and expand the range of visual display. The two technologies work together, forming the main body that supports the audiovisual aspects of performances and providing artists with numerous ways to create art through performance technology[1].

3. The Advantages of Audiovisual in the Performance

3.1. Performances: Improve the Immersion of Performances

The control over sounds and visuals has been meticulously managed through audio-visual techniques so that people are brought even nearer to the process taking place inside and they obtain a feeling of space immersively. Regarding sound, using spatial acoustic simulation and surround sound transmission technology, combined with the stage spatial structure and audience layout, it is possible to position sounds accurately and dynamically render them, so that people in various parts of the venue can feel like they are experiencing the sound effects at different locations within the narrative space of the performance. In terms of the vision, using AR/VR visual synthesis, it can achieve a seamless integration of the virtual stage environment and character picture with the real stage, break the constraints of vision in physical space, and make the audience's eyes exceed the limits of traditional stages. With audio-visual technology, it's possible to enable synchronous interactions between sounds and visions. The audio-visual content is shown in sync with the plot and the performance's mood swings, music effects, pictures, and lights all synchronize for a single perception.

3.2. Enhance the Quality of Performance Show

Audio visual technology gives full technical help to raise the show's performance degree, makes sound restoration qualitative betterment, image quality improvement, details display improvement, and all in one atmosphere creation improve. Use professional digital audio processing technology to do real-time noise cancellation, equalization, timbre enhancement to original sound like instrument performance, singer's songs in the show and so on, eliminate on-scene background noise, truly return to its true sound. At the same time, multi-track mixing is about coordinating all the different volumes and layers of sound. As far as its looks go: LED Screen display Technology, high precise Projection Mapping... can create Ultra HD picture effects; everything that appears on the stage can be seen very clearly, without blurs or colors mistakes; each small part will stand clearly. Intelligent light control is operating very exactly and changing the light according to how the plot goes, its style, the stage setting and where characters are moving, making the visuals of scenes much better.

3.3. Promotion of the Innovation of Performance Forms

Continuous update and function extension of audio-visual technology drives the creation of new performance forms, pushing performances from traditional stage plays to various different and personal. By means of technology, the scope of performance creation has been greatly enlarged. Can get rid of the shackles of physical space and traditional expression forms, bring in virtual scenes, add some interactivity, perform new kinds of dramas like immersion drama or interactive performance or holographic performance Use AR technology for the characters on stage will interact with virtual

characters in real time, use VR technology it can create a 360-degree effect on the audience, like they are right in the show, as if they are part of the performance. Audio-visual tech is very close to performers and audiences. Use sound recognition, motion capture and other ways to make the audience's actions change the course of the plot and the audio-visual form of the work, making people more involved in art. Besides, the audio-visual technology can achieve cross-border performances by incorporating different kinds of performance art forms with music, dance, drama, film & television, digital arts etc., which are combined through audio-visual means[2]. This will add more layers to performances' artistic expressions and presentation skills.

4. Use of Audio&Visual Technology in Production

4.1. The Use & Presentation of the Sounds Performance

In order to get a proper reproduction and art expression of performance sound, we need different audio-visual methods all along the way from sound collection, processing, transmitting, expressing to make sounds better. Firstly, microphone array and pick-up equipment needs reasonable setup based on the kind of performance and stage arrangement, different pick-up methods are required for different kinds of sound source. Multi-channel condenser microphones have been put on orchestral performance and directional microphones have also been set out for vocal singing so as to avoid disturbance of environmental noise. Meanwhile, laying out wireless pickup apparatus properly so as not to have a rough ride for sound actors.

For sounds, we are going to use some professional digital audio workstations and real-time sound effect processors to adjust every single one of our sound signals: in the processing stage. The technicians adjust their parameters like the EQ, compressors, and reverb according to the artistic and plot style of the performance, enhancing more natural reverbs for Classical Music performances to give an impression of a large room environment, whereas adding electronic sound effects in Pop Music performances to add more rhythm and layering of sounds. Also, a sound field simulation system has to be created so that we could adjust the sound field according to the acoustic conditions of the performance place and use smart reflectors and sound absorbers to adjust the paths of sound reflection and propagation within the venue, avoid too many sound dead spots or echo.

Regarding its sound, for transmitting and presenting it, we are using high-fidelity transmission methods here, together with surround-sound amplification units, in order to send out the clear processed sounds to the audience. For large-scale outdoor performances, we need big power amplifier equipment and distributed speakers set up according to the characteristics of outdoors; for small indoor performances, it is necessary to adopt immersive surround sound systems so that audiences are surrounded by sound sources. And also there should be a real-time monitor which can record sound parameters throughout the performance with acoustic monitors and adjust volume and sound effect parameters of amplification equipment based on the situation at the site to make sure that the sound is always stable and the effect is good during whole performance[3].

4.2. Application on the Creation and Presentation of Performance Visual Effects

Create and display performance visual effects according to the stage layout of the performance, its artistic conception, etc., comprehensively utilizing all kinds of audio-visual visual technology means to accurately implement visual effects on stage with art. Firstly, based on the plot situation and visual atmosphere of the performance, we should determine a visual effect design plan, clarify the presentation media and expression forms of effects. Myth theme performance uses projection mapping technique, will project the myth scene on stage set or architecture, creating a real and imaginary combined image. Modern dance performance uses dynamic large screen pictures of LED display and light change to improve dance movement feeling and place atmosphere.

Hardware Deployment: We have to fix up all the visual tools as accurately required by the effects designing such as Hd Led Screen, Laser Projecting Devices, Ar&Vr Visual Capturing Devices, Intelligent Lighting Control System. As

for LED screens, we need to choose proper resolution and splicing methods according to stage size and viewing distance so as to guarantee clear and intact images; as for projectors, accurate calibration and registration should make virtual pictures blend perfectly with reality and avoid any misalignment or deformation of images. The intelligent light controls should work in harmony with the stage sets as well as the actors' performance and increase the layers of visual effects by controlling the light color, brightness, and speed. Use laser beams and colored lights, these can give you a great impression when reaching the climax in your story.

The effect must be displayed in a Technology+art type Collaborative Management System based on Real-Time Collaboration Between Technical Person, Director, Stage Designer etc...with The Rhythm And Timing Of Performance And Actors' Performance As An Adjustment Parameter For Effects. Real-time visual effect monitor observe the output image, lighting operation to find out equipment problems, image problems at once. And also when we plan for any other occasions, like projection in bright outdoor situations or reduce the interference of equipment signals in doing indoor performances, there shall be a backup plan made. Full process in technology and art support, visual effects do not serve only for the performance works to express art works but create powerful view effects with delicate presentation and improve the performance work's artistic quality.

4.3. Application in Synchronous Live Broadcasting and Rebroadcasting of Online and Offline Performances

With the development of the performance industry's need to increase communication channels, as well as audience spread, audio-visual technology has become the main technical support for real-time live broadcast and re-broadcast of performances. There should be a comprehensive system from signal collecting, encod-transmitting, and ending presenting so as to guarantee the quality and feel of live streaming and replay. Collection of Signals: All kinds of audio and video collection equipment are placed around the performance site, in order to collect various stage performances, audiences watching and listening, backstage highlights, etc. To collect the sound signal, we use pickup tools and recording devices such as multi-track recorders to collect both the original sounds of the stage and different kinds of sound effects so that it is more real during the process of sound recreation. The collection of video signal: high definition camera, drone flying, fixed shooting with different angle cameras, and some sporting events are chased by a camera.

Encoding transmission phase: We need to choose the corresponding encoding technology and transmission protocol according to different live broadcasts or re-broadcasts. Online Live Broadcasting: uses advanced video compression technology to reduce bit rate but maintain picture quality and adapt to different network conditions and distribute live stream by CDN Content Delivery Network to various areas, for rebroadcast and display at offline venue, a high-speed wired system was established, lossless transmission of audio/video signal can be achieved, synchronization technology makes offline venue's big screen and online live images can be synchronized.

Lastly, at the terminal presentation stage, we could adjust audio and video parameter values based on the characteristics of different audience terminals for an adaptive presentation. For mobile phone users, it will compress the video quality and make the video resolution less than your device's screen and Internet speed. For PC and TV users, two picture quality options are available, along with surround sound to bring you the full audio/visual experience. At the same time, through audio-visual technology, to realize the live interactive function of requesting audience songs through sound recognition and real-time interaction with audience actors by means of video communication technology so that online audience can participate in performances, shorten the distance between watching online and going out to see it for yourself, enhance the performance's dissemination power and audience experience.

4.4. The Application in Scenics and Interaction of Immersive Performances

With the development trend of immersive performances in the performing arts industry, audio-visual technology is becoming increasingly important for scene creation and interaction. According to the space and audio/visual/interaction requirements, an experience immersion performance system needs to be set up. Immerse people in the performance scene.

Construct the scene with sound and visuals to create a 3D environment physically and virtually - (related to the themes/ story of the show). Concerning the physical space, acoustic design and spatial design break away from the confined stage. There are some open spaces in various regional performance spaces, such as performance areas, interactive areas, and immersive areas. Use sound - absorbing and insulating materials to separate different soundwave bands so that they do not cause any interference. In terms of the virtual space part, it will make use of VR/AR and holographic projection. I'm aiming for a total 360 - degree scene, bringing all kinds of virtual characters, props, environments, etc., to reality, allowing people to experience the blend of the real and fake worlds.

We will have to dive into the sound & vision cooperation of ours: Sound, spatial audio technology is needed to change the location and volume of sounds based on where your audience is located and how they're moving, making it feel like the sound is coming from different parts of a scene. For instance, in a forest scene, spatial audio makes it feel like the natural sound effects from nature are being sent out to everyone all around you, like bird calls and breeze. And for audio-visual coordination, it should be adjusted by the development of the plot. At the time of the turning point on the plot, we will adjust the audio and visual lighting together to help the audience resonate with the development of the plot.

Interactive audio-visual tech, it's being used in different interactive ways to make the audience part of the performer. With the help of motion capture tech, sound recognition tech, tactile feedback tech, and so forth, to realize real-time interaction between audience and performance scenes, characters. For example, virtual characters are responding accordingly as people make certain actions, percations and variations on the performance scenes based on where we find plot progression. Through immersive interaction terminals like VR interactive devices and smart bracelets, people will get scene information and make some decisions during the performance, so that people will have more engagement and immersion when they are there.

5. Use Audio-visualization Tech, Make Sure it's Safe and We're Running the Performance

Audio-visual technology can give power to artistic expression and spread performance as well as it has an important guarantee function in the safety prevention of performances and daily operation and maintenance. It builds a strong technical defense line for the smooth running of performances. In speaking for the sake of safety, it's possible to create whole with sounds & pictures for safety. Audio listener is recorded at every time and if there is equipment crash or too much noise, I'll try to reduce it for you. When the visual monitoring device connects to lightning and sounds etc., we will conduct immediate inspections of the stage area as well as the auditorium at any time, discovering that some people do strange things, there are dangers associated with equipment. And link to the emergency broadcast system with some announcements, reminders so I can keep people around here and everybody else orderly. Also, we can achieve the real-time state of equipment through audio-visual technology warning. There's an observation by sensors on audio-visual machines if any events take place, like equipment being overloaded, circuit faults, etc. It would warn anytime and shift over to other devices so performance wouldn't be cut down due to such events.

Equipment performance improvement for equipment operation and maintenance to provide continuous assistance: The digital operation and maintenance system integrates the operation data of all types of audio-visual equipment to accurately calculate the number of equipment usages and losses, and develop reasonable maintenance strategies to reduce the probability of equipment malfunctions. Using remote control technology, technical staff can set up audio-visual device parameters and fix minor problems without being on-site, thus saving work time and money.

Additionally, through the use of audio-visual technology, all performance materials can be digitized, protected, and backed up by recording sound and video. This facilitates later review, improvement, secondary creation, etc. It also prevents material loss, providing technological support for the sustainable development of shows.

6. Conclusion

In a nutshell, audio-visual technology is an important form of medium that combines performance art with modern technology. In performances, it has evolved from being merely supportive to becoming an important part of making performances more immersive and expressive. It offers a new way of creating performances and facilitating communication. To maximize the use of audio-visual technology, we can improve sound, create visual effects, conduct online/offline live broadcasts/rebroadcasts, or construct and interact with immersive scenes, so that performances can be presented and communicated in different ways. Looking forward, the performing arts industry must further integrate audio-visual technology with performance art, constantly refine and enhance the application details and flexibility of technical means, and promote the sustained and healthy development of the entire industry.

Disclosure statement

The author declares no conflict of interest.

References

[1] Zhang T, Yi J, Yu Y, et al., 2026, A Review of Audio-Visual Fusion Technology: Development, Applications, and Challenges. Neurocomputing, 671: 132575.

[2] Zhang Y, 2025, An IoT-Enhanced Automatic Music Composition System Integrating Audio-Visual Learning with Transformer and SketchVAE. Alexandria Engineering Journal, 113: 378-390.

[3] Li T, 2024, A Brief Analysis of the Integration of Modern Digital Technology and Traditional Audio-Visual Art. Probe - Media and Communication Studies, 6(2): 3-19.