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Preliminary Exploration of Music and Visual Video Integration: Taking Graduation Asterism·Echo as an Example

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Abstract: This paper introduces the creative process and technical implementation of the interactive multimedia work Asterism·Echo. Based on ancient Chinese observational data of Jupiter, the work generates line charts through celestial coordinate mapping and converts polyline trajectories into atonal musical motifs. Integrating human vocals, guqin, drums, strings, and synthesizers with multimodal mappings of Jupiter imagery, Dunhuang murals, and dance footage, the audio-visual content realizes interactive and immersive integration between music and vision. Adopting TouchDesigner and Logic Pro as core technical tools, the work maps sound frequencies and timbres to visual elements, thereby producing dynamic presentations including animations, particle flows, and light-shadow variations. During the creation, technical challenges such as data visualization, irregular rhythms, and fluid visual interaction were overcome. The work achieves in-depth integration of traditional Chinese cultural inheritance and technical implementation, demonstrating an innovative aesthetic path that bridges ancient natural science and contemporary artistic expression.

Keywords: Music visualization; Multimedia interaction; Sound-image relationship

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1. Introduction

With the rapid advancement of digital media and artificial intelligence technologies, the integrated creation of music and moving images has emerged as a vital genre of contemporary artistic practice. As early as the mid-20th century, diverse forms of audio-visual composite art sprouted overseas, including John Whitney's algorithmic animation experiments, Brian Eno's audio-visual installation works, and the cross-media and sonic explorations carried out by Japanese artist Seiichi Shingo. These artworks laid solid theoretical and technical foundations for subsequent interactive video and musical creation, particularly establishing systematic synchronization logic linking musical rhythm to visual motion.

In recent years, interactivity, real-time generation, and immersive experience have become the core

concepts of multimedia art. Foreign scholars have continuously probed the dynamic symbiotic relationship between music and images through procedural control and visual computation, advancing the in-depth development of interdisciplinary art. Although relevant domestic research started relatively late, interactive music videos have grown into a hot research topic among academia and creators since 2010, alongside the interdisciplinary convergence of multimedia art, digital imaging, and music engineering. Current research mainly focuses on rhythm matching, structural analysis, and technical implementation of music and visuals. Tools such as TouchDesigner, Ableton Live, and Max/MSP are widely adopted to realize audio-visual linkage. Meanwhile, some researchers integrate traditional cultural elements into digital art creation, exploring creative paths like "Intangible Cultural Heritage + Digital Art" and "Oriental Imagery + Contemporary Audio-Visual Works," which deliver unique cultural expressions for music visualization within the Chinese cultural context.

The author created the multimedia audio-visual work Asterism·Echo and explores the interconnections between music, visuals, and data through its complete creative workflow. Rooted in ancient Chinese observational archives of Jupiter, the work converts celestial coordinates into polyline visualization and maps celestial orbital trajectories into musical motifs and dynamic visual sequences. Rhythmic structure sits at the core of its musical composition; alternating and offset mixed time signatures construct a fluid, indeterminate temporal framework. Human vocals, guqin, percussion, strings, and synthesizers work in tandem to form a multi-layered soundscape that balances experimental qualities with oriental aesthetic imagery.

Visually, TouchDesigner is used to dynamically generate and reconstruct polyline tracks, particle systems, Dunhuang murals, and dance footage, translating abstract astronomical data into tangible, perceptible visual scenes. Technically, the piece adopts a one-way "music-driven visual" mapping mechanism. Audio rhythm, frequency, and timbre features control image movement and light-shadow transitions, ensuring that musical motifs and visual evolution unfold coherently along the same timeline.

2. Conception and construction of musical creation

2.1. Basic concepts and artistic expression of musical creation

Music is not merely a combination of harmony and melody, but a medium for conveying emotions and ideological thoughts. Historically, musical composition has evolved from rigid formal structures, harmonies, and tonal systems to atonal music and twelve-tone technique pioneered by Arnold Schoenberg in the early 20th century, gradually breaking the shackles of traditional frameworks. Following the rise of electronic and experimental music, composers have explored innovative expressive languages in terms of dynamics, duration, rhythm, timbre, and structural design to pursue free artistic expression [1].

Furthermore, distinct musical genres hold vastly different creative philosophies. Classical music lays emphasis on balanced harmony and melodic coherence, while pop music focuses more on emotional outpouring and resonance with the general public. Experimental music embodies creators' re-examination of sound, rhythm, and even the very definition of music, and often adopts unconventional means to convey intricate emotions and ideas. The evolution of these genres enables composers to establish profound emotional communication with audiences and articulate their personal thoughts and feelings through musical works.

Against this backdrop, musical creation is far more than a display of technical skill. Composers integrate personal experiences and worldviews into notes and rhythms to achieve unique, distinctive artistic self-expression.

2.2. Thematic sources and cultural imagery of creation

Based on the above creative concepts of music, the conception of artworks needs to be further implemented within specific cultural contexts and thematic selections. Creative themes usually stem from multi-faceted sources, including natural phenomena, social culture, historical traditions, scientific cognition, and personal experience. In artistic creation, natural phenomena such as celestial movement, climate change, and biological behaviors are often adopted as symbolic inspirations or structural frameworks, offering intuitive models of rhythm, order, and variation. Social culture and historical traditions transmit specific values, aesthetic standards, and philosophical reflections through symbols, images, and narratives, supplying cultural contexts and symbolic connotations for creation. Scientific knowledge and technological progress can also serve as thematic resources; particularly in multimedia and interactive art, data, physical laws, and mathematical models provide operable structural materials for artistic expression.

Cultural elements play an indispensable role in thematic construction. Every musical culture boasts unique origins and evolutionary trajectories [2]. By integrating cultural symbols with artistic forms, creation can deliver specific aesthetic values and reflect social, historical, and philosophical meanings through symbolic abstraction. For instance, traditional paintings, dance movements, architectural patterns, and musical styles can function as visual, auditory, or interactive vocabularies that correspond to creative themes. On the conceptual level, artists can abstract these cultural symbols and map creative ideas via transformations of form, rhythm, and color, triggering perceptual resonance between cultural imagery and artistic expression.

Therefore, creative themes and cultural imagery interact dynamically: themes set the creative orientation, while cultural elements endow works with depth and symbolism. This realizes the unity of form and content, and integrates culture and ideology within visual, auditory, or multi-modal expressions, providing conceptual guidance for specific artworks.

3. Musical creation philosophy and practice of Asterism·Echo

3.1. Background and theoretical basis of musical creation

As early as Ancient Greece, Pythagoras discovered the basic laws of physical acoustics: “A string length ratio of 2:1 is an octave, 3:2 is a perfect fifth, 4:3 is a perfect fourth, and 9:8 is a major second.” Thus, he found that the lengths of strings could produce different notes when plucked. The Pythagoreans believed that “all is number” and thus provided a strong theoretical basis for the mathematical nature of music. Plato was inspired by the ideas of the Pythagoreans and incorporated them into his Theory of Forms to create a system of thought based on mathematics. Geometric sequences were used to solve the problem of tuning for twelve-tone equal temperament, and then Fourier analysis-based equalizers were developed to give new life to audio processing and electronic music [3].

An article entitled *The Origin and Semantic Evolution of the Term “Physics“ in Ancient China* was published in the *Journal of the History of Natural Science*, and it has been verified that the Chinese term “wuli (physics)” first appeared in the Warring States Period. Pang Ziyun’s quotation in the Book of Han is recorded as follows: “I wish to understand the emotions of people and all the underlying physics.” At that time, “wuli” generally referred to universal principles, reasoning, and natural laws. Asterism·Echo1 is based on star chart relics found in Dunhuang, such as the Dunhuang Star Chart (Figure 1). This artifact shows constellations around the North Pole and the twelve divisions of the moon; it is an early Chinese conception of the universe and its motion. The application of Dunhuang mural elements in visual design is based on this star chart, and

thus astronomical images have been added to the work. The main source of inspiration for Asterism·Echo comes from this tradition: ancient Chinese scholars studied the laws of nature by observing changes in nature.

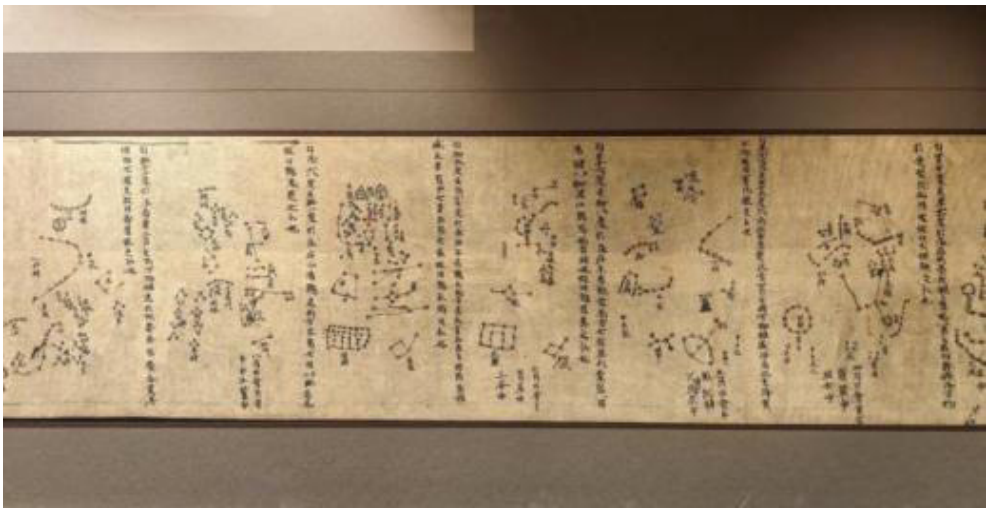

Figure 1. Dunhuang Star Chart

3.2. Creative theme and conception

The audio-visual content of this work is based on ancient Chinese observation records of Jupiter's positional variations. Physical mathematical models are adopted to convert and map such data into planar polyline structures, which are then used to generate musical motifs. To this end, the author systematically collected and sorted out records of Jupiter's orbital changes from historical documents predating 1911, laying a reliable data foundation for polyline graph generation and melodic motif design (Figure 2).

Historical Records of Jupiter's Position and Related Astronomical Studies

Year	Historical Period	Primary Source	Jupiter's Position (Right Ascension)	Remarks
364 BCE	Warring States Period	Gan De, Tianwen Xingzhan (Astronomical Divination)	Approx. 16h 50m	Located in the constellation Scorpius, 44° N–90° S
104 BCE	Western Han Dynasty	Taichu Calendar	Approx. 22h 30m	Located in the constellation Pegasus, 90° N–53° S
4 BCE	Western Han Dynasty	Book of Han: Treatise on Astronomy	Approx. 8h 30m	Located in the constellation Cancer, 90° N–57° S
724 CE	Tang Dynasty	Yi Xing, Dayan Calendar	No specific coordinates provided	Records the orbital period of Jupiter
837 CE	Tang Dynasty	Dunhuang Star Chart	Approx. 7h 30m	Located in the region of Gemini, 90° N–55° S
1054 CE	Song Dynasty	History of the Song Dynasty: Treatise on Astronomy	Approx. 4h 30m	Located near Taurus, 90° N–30° S
1280 CE	Yuan Dynasty	Guo Shoujing, Shoushi Calendar	No specific coordinates provided	Calculated Jupiter's ecliptic longitude using the arc-sagitta method for circle division
1601 CE	Ming Dynasty	Xu Guangqi, Chongzhen Almanac	No specific coordinates provided	Introduced the Tychonic system and revised the model of Jupiter's orbit
1854 CE	Qing Dynasty	Archives of the Imperial Astronomical Bureau	12h 30m	Located near the celestial meridian, corresponding to a modern celestial coordinate of 0°

Figure 2. Records of ancient Chinese observations of Jupiter's position from before 1911 in astronomical texts [4]

The collected historical observational The collected historical observational data are uniformly converted to the celestial coordinate system (as shown in Figure 3) and visualized as a line plot. The specific procedure is as follows: within the circular modern celestial coordinate system, an equatorial longitude is selected as the central axis, with 0° set as the reference equatorial longitude; then, each coordinate point recorded in historical documents is located and connected sequentially to generate the line plot, thereby illustrating the time-series variation of Jupiter's position (as shown in Figure 4).

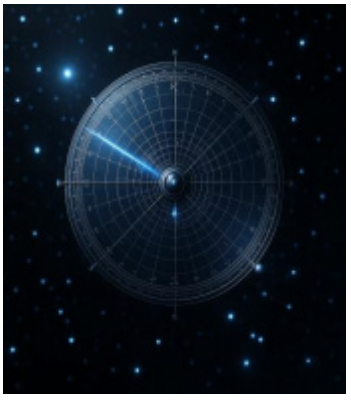

Figure 3. Celestial coordinate instrument

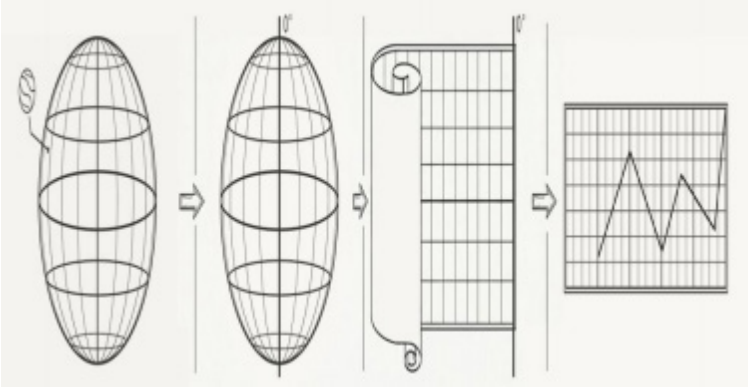

Figure 4. Data visualization workflow

In ancient documents, records of Jupiter observations denote right ascension in hours (h) and minutes (m). To apply such observational data for planar polyline visualization, hours and minutes must be uniformly converted into angular degrees for mapping within the modern celestial coordinate system. The conversion rules are defined as follows:

Conversion of hours to degrees: 1 hour of right ascension equals 15°, e.g., a right ascension of 16h → 16 × 15 = 240°.

Conversion of minutes to degrees: 1 minute of right ascension corresponds to 15 arcminutes (0.25°).

For example, a right ascension of 50m is converted to 50 * 0. 25 = 12.5°.

The total angular-degree value is the sum of the converted hour and minute values. For instance, 16h50m converts to 240 + 12. 5 = 252.5°.

Thus, all the observation points have been given specific angles that can be displayed on the unfolded

plane of the celestial grid (Figure 5).

Diagram: Each data point shows the location of Jupiter in the old Chinese records of observation. Points are numbered in chronological order, and they are connected sequentially from left to right to form a polyline graph. To map the motion of celestial bodies onto sound, declination values are uniformly distributed. The difference in declination between Point ① and Point ② on the polyline is taken as the reference for one perfect octave. Based on the above calculations of interval relationships among all data points, the note sequence A-A-C-D-A-C has been generated and serves as the main audio-visual theme of the work.

This way can build an all-encompassing logical chain: celestial position → declination mapping → interval calculation → musical motif generation. Provide a scientific basis for the conceptual origin and simultaneous display of visual and auditory materials.

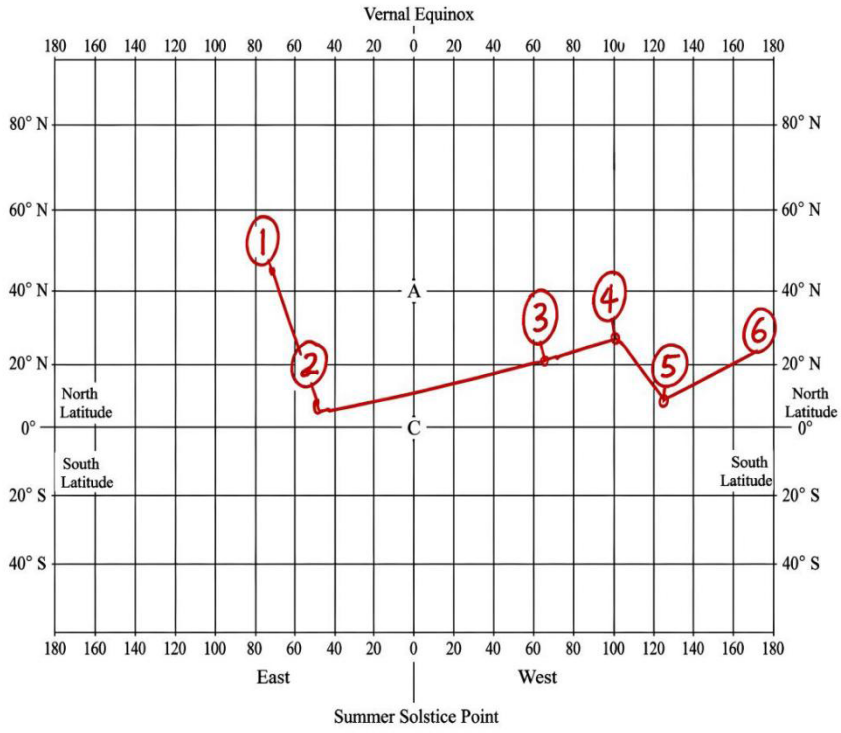

Figure 5. Data visualization line chart

4. Core musical elements and artistic expression

At the bottom of this work is atonality; thus, it does not use the traditional system of modes and offers greater expressiveness to polylines and visual maps. The layers of sound in this work include vocals, guqin, percussion, strings, and synthesizers. All of them have different purposes, but together they create a single work of art. Vocals provide the main driving force for changes in the melody line, register shift, and space division of musical motifs. Percussion provides the basic rhythm for the development of melodies and textures, adds various levels to the structure and rhythm of the work, and can be closely coordinated with visual maps.

4.1. Vocal design

Vocals are divided into high, medium, and low registers, and both men's and women's voices are used. They provide a tune and a continuous supporting part. Vocal processing can add various colors to the sound world, expand the sense of space and movement, and thus present the structure and coordination of multiple vocal parts simultaneously. The particular processing methods are as follows:

Continuous Voices and Fragment Slicing: Divide the vocal line into several small sections and extend them melodically to create many layers of sound.

Timbre and Pitch Modification: Shift the pitch of vocal samples to create new melodies and timbres. Processed whisper textures add a sense of mystery to the music and can also serve as both a melody and a texture for vocals.

Spatial Processing: Reverb, delay, and automatic panning are used to place sound sources at different virtual distances and orientations in space, creating an immersive sense of depth and a feeling of movement for the listener.

4.2. Guqin design

As a representative work of traditional Chinese culture, the sound and history of the guqin are well-suited to the theme of this work. Processing Strategies: Combine live performance and sampling; recorded guqin performances can be used to learn all kinds of playing techniques, such as open strings, harmonics, tremolo plucking, upward plucks, and downward plucks. Other Sound Modifications Include Reversal and Equalization Adjustment.

The guqin in this work has various cultural connotations and can also be combined with other instruments to create rich and moving music that is deeply rooted in Chinese culture and art.

4.3. Percussion design

At the center of the percussion section are Chinese drums, and other daily sounds such as heel tapping on the floor, turning pages, light table-tapping, and glass-bottle-clinking are added. Recorded raw materials are cut up, rearranged, and looped, then combined with drum cycles to form composite percussive timbres. Add synthesizer loops to increase the density of rhythm, raise dynamic tension, and expand space. Therefore, the percussion can be used to add color and express emotion to the whole work, rather than just providing a beat.

Artistically, this approach can also be applied to create music from daily life sounds. Add various rhythms and enhance the sense of place and culture; thus, it will be more appealing to the audience.

4.4. String design

Col legno battuto is used in the string part as a special technique. The Polyline-derived musical motif A-A-C-D-A-C appears repeatedly in the texture (Figure 6). To add some rhythm to the motif, move the beginning of the sound away from the downbeat and create new rhythms and texture variations. In addition, the reversed motif audio can be added to the arrangement to create a unique "backward suction" effect that enhances auditory tension and rhythmic momentum. String timbres also have an ascending swell effect, and they are used together.

Crescendo and spatial processing can be used to guide the emotional changes in a piece of music and add dynamism and harmony to the entire work.

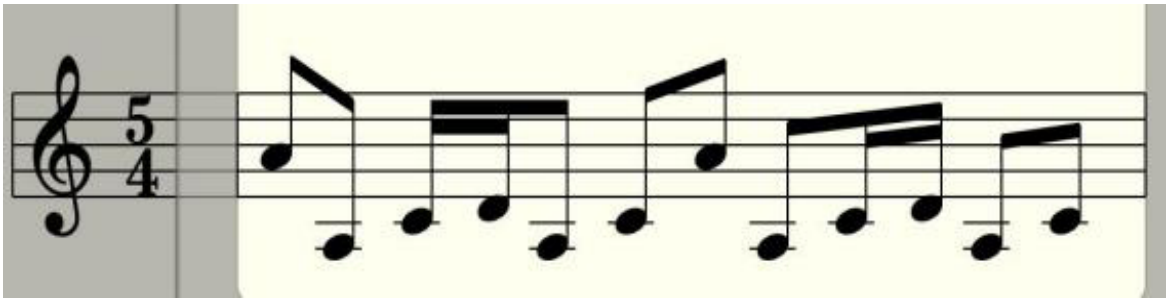

Figure 6. Musical motif

4.5. Correlation with overall artistic expression

Based on the above core dimensions and audio-processing technology, this work can achieve various forms of art, such as rhythm, melody, color (timbre), space, and culture. Vocalizations, Guqin, Percussion, and Strings all have their own layers of sound and are combined to create a rich tapestry of Chinese culture and modernism. Electronic sound processing can enhance the sense of space and spectral tension in music; thus, it can serve as both a driving force for visual mapping and a carrier of cultural and scientific ideas.

In short, the above compositional features together create a three-way connection among music, art, and culture, and thus provide strong support for multimedia interaction and visual display of the entire work.

5. Video production and visualization design of Asterism·Echo

5.1. Basic theories and artistic expression of video creation

In video creation and visualization design, visual language acts as the core carrier of artistic expression, which covers elements such as frame composition, color application, dynamic transformation, and shot switching. These elements directly guide the audience's attention and emotional perception, while conveying information and reinforcing the core theme. As mentioned above, sound has an intimate connection with physical principles, and the same holds true for moving images. Based on physical, photochemical, and electronic recording mechanisms, images form an integrated audio-video recording mode. Although sound and footage can be separated in post-production, their ontological foundations stem from the reproduction of the same objective physical space-time, thus possessing an inherent causal relationship [5].

As an audio-visual work, the symbols of visual language and sound create a meaning-producing system according to certain rules. Footage, still pictures, markers, costumes, and body language can all serve as ideographic "vocabularies," but these vocabularies have different shapes and expression methods [6]. Rhythm and Time Management Are Required. Adjust the speed of animation and shot transitions according to the music's tempo. Abstract Data Visualization and Dynamic Moving Pictures can help people better understand the themes of works through multiple senses. Color, Light, Shadow and Motion Trajectories can all add beauty to a picture and help us feel the movement of stars and planets more vividly. Thus, there will be a deep connection among vision, science, and art, and an interdisciplinary system of "Science + Art" will be formed.

5.2. Visual design in Asterism·Echo

The main components of the visual system in this project are multi-level dynamic moving pictures. The

purpose of this work is to present the observation logic of ancient physics and astronomy and incorporate elements of traditional Chinese culture. The video shows the movement path of Jupiter (Figure 7) and also includes abstract shapes such as dynamic dance moves, water ripples, and geometric lines to show the rhythm and order of the universe. The addition of Dunhuang mural elements (Figure 8) can be combined with astronomical symbols to create a new work. Audiences will be drawn to the visual changes and, at the same time, feel the sense of exploration by ancient Chinese scholars in their pursuit of nature's laws and Oriental aesthetics.

The two main paths of visual narration are as follows. First, there was no knowledge of nature, and then people began to explore it. The second one has cultural and historical imagery and shows a wish for the future. These visual elements are in line with the traditional art of the universe and celestial phenomena, and they also represent the ancient people's yearning for nature.

The whole Design integrates video creation, scientific data, and art to enhance the sense of place for the theme. It creates an interactive platform for artists and presents all kinds of visual languages through digital technology to achieve the harmony of technology and art [7].

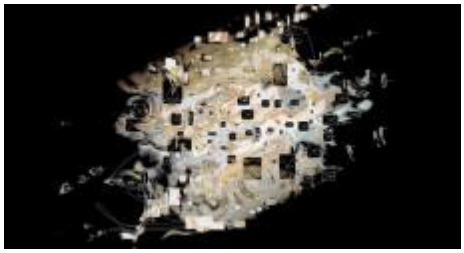

Figure 7. Excerpt from the Jupiter trajectory engineering analysis

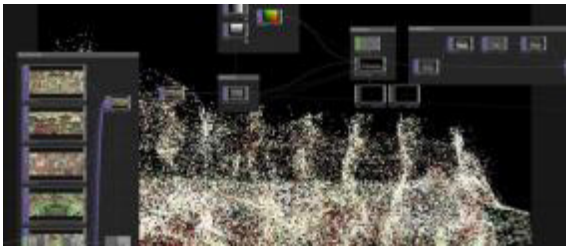

Figure 8. Excerpt from the Dunhuang Grottoes Painting Project

6. Integrated creation of music and video

6.1. Theoretical framework for the integration of audio and video creation

Gilles Deleuze put forward the idea of a "pure audio-visual image" and separated the connection between sound and picture from the cause-and-effect logic of storytelling to show how time and thought are connected. Later, Michel Chion also proposed the idea of an "audio-visual contract" and believed that sound and pictures work together to create a certain way of perceiving moving pictures. This theory breaks down visual centrism and redefines the harmony of sound and picture [5].

Multimedia electronic music is a type of electroacoustic music that also uses visual materials, such as videos, animations, moving pictures, and data visualization. It can break away from the limitations of sound alone in traditional music and add expressiveness and immersion by combining hearing with sight. Zhang

Xiaofu's Norlang is an example; it combines percussion and electronic music with video to show how audio-visual cooperation can be done. TouchDesigner and Max/MSP are software platforms for creativity at this time. Rhythm, Melody, and Timbre are employed to guide the movement of visuals and color changes, create multiple layers and spaces of integrated audio-visual works, and thus display the creative power of multi-media integration.

6.2. Interactive design of audio and video in Asterism·Echo

The audio-visual interactive Design of this work takes the form of segments (Figure 9). As time goes by in each period, musical ideas will be used to create and develop pictures. Linear Graphics and Abstract Textures gradually transform into Jupiter's Orbit, Dunhuang Mural Imagery, and Dance Movements. Polylines, Particle Flows, and Light-Shadows can all be used to present the music visually. Changes in the pictures are coordinated with changes in the music to enhance the sense of movement.

The general structure of the work shows a gradual progression from "initial perception" to "exploration of natural laws" and finally to "meaning construction," which aligns with the cognitive logic of ancient Chinese astronomical observation. Each stage has a different rhythm and color in terms of sound and image; at the same time, new visual components will also be added or altered dynamically according to changes in sound. Through this segmented audio-visual mapping device, the work can achieve structural unity under the guidance of music and enhance the sense of motion and immersion.

Phase	Time Range	Music Cue	Visual Content	Description
Phase 1	Beginning – 1'24"	Opening: ambient introduction, mysterious atmosphere, expressing the flow of current	Use line drawings as main elements, with supporting elements and extract patterns	Ancient people observed nature directly, experienced the mysterious and awe-inspiring aspects of the natural world, and began the pursuit of understanding the universe.
Phase 2	1'24" – 2'19"	Rhythmic percussion instruments are added, with moderate tempo changes	Add more elements, combine the stillness of the universe with dynamic motion lines and particle effects	In ancient China, people began to discover the movement of celestial bodies and gradually explored the mysterious processes behind it.
Phase 3	2'19" – 3'08"	If a clear rhythm emerges, 4/4, 4/5, 4/7 time signatures can be used	Use dance movements as the core, dancers ' actions and weights move in synchronization; simultaneously coordinate with the movement of celestial bodies and layers of feelings	In ancient China, the movement of celestial bodies was observed with great accuracy, establishing the correspondence between life and the universe.
Phase 4	3'08" – 4'10"	More percussion instruments with richer rhythms; continuously change the tempo, and the rhythm integrates music theory elements such as AACDA	Particles and light & shadow changes appear, while celestial bodies move rapidly; consistently focus on the movement of celestial bodies in the dome projection	Further explore the laws of celestial body motion, and continuously accumulate physical knowledge.
Phase 5	4'10" – 5'40"	Use the first section's rhythm and the third section's percussion instruments as a foundation, and add new elements	Combine elements of celestial bodies and folding line drawings; introduce several elements that appeared in the previous sections	On the trajectory of observing celestial bodies—one path of folding and unfolding—further explore the application of celestial bodies to accumulate experience, and reflect the integration of technology and knowledge.
Phase 6	5'40" – End	Ending response	The universe, celestial space, celestial bodies and the sun move together, with light gathering	Celestial bodies symbolize humanity's exploration and pursuit of the universe and future hopes for light; at the same time, space and time intersect, reflecting the inheritance of humanity's scientific spirit and the expression of hope for the future.

Figure 9. Work introduction

7. Creation process and technical implementation

7.1. Technical implementation of music and visual integration

The interactive design of imagery and music follows rigorous audio-visual mapping principles. This method can flexibly convert ancient astronomical observation data into fluid percussion beats, vocal lines, string phrases, and synthesizer motifs. For visual presentation, these polyline points generate particle-augmented

animated trajectories dynamically within TouchDesigner, overlaid with halation effects and animated dance visuals to deliver intuitive perceptibility to audiences.

Musical rhythm, melody, and timbre are transmitted to TouchDesigner via MIDI and OSC signals, driving polyline animation, particle flow, light and shadow transformation, as well as dynamic transitions of Dunhuang mural footage. In this project, the dynamics of visual elements are primarily regulated according to high, mid, and low frequency bands: intensified high frequencies bring more vigorous particle flickering (Figure 10); variations in mid frequencies govern the movement range of polyline trajectories; low frequencies correspond to overall visual undulation or the emergence of new elements. Meanwhile, different instrumental timbres trigger flowing or rotating visuals, so visual expressions shift alongside timbral changes. For example, accented strikes of Chinese drums or stressed male vocal notes spawn extra particles with synchronized brightness amplification, achieving instantaneous correspondence between visuals and music.

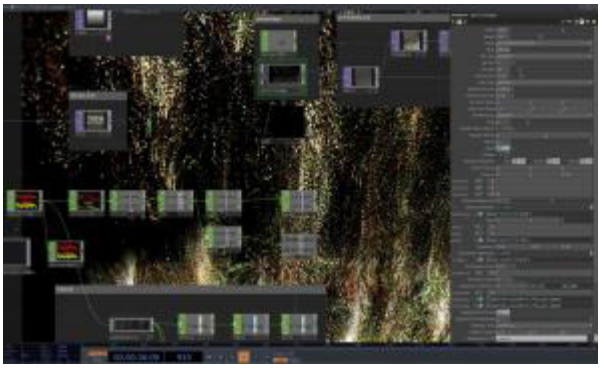

Figure 10. High-frequency flow control

7.2. Visualization design and effect generation

For the Design and Effect Generation of Visualization, an audio-feature-driven visual compositing strategy is used to convert acoustic information from various voice parts into parameter control signals for visuals. Strums and harmonics of the Guqin have distinct transient characteristics and subtle high-frequency fluctuations. Therefore, transient detection and spectral analysis of audio signals (envelope extraction and high-frequency energy distribution analysis) are carried out, and the analyzed data are mapped to the transparency, blending mode, and detailed texture variation of visual compositing layers (Figure 11). When guqin strums occur, peaks of transient energy trigger an intensified overlay of texture and particle layers to create a visual “ripple diffusion” effect that enhances the sense of space and fluidity associated with this oriental timbre.

Rhythm refers to how many times and how loudly a beat is struck in a particular area of motion. Low-frequency and beat-point detection map the rhythmic information of drum hits to the movement range and speed of dance footage, and adjust the emission rate and feedback strength of the particle system (Figure 12). As the rhythm increases in speed, so does the kinetic energy of the dance visuals; thus, there will be larger movement amplitudes, faster motion trajectories, and enhanced feedback overlays, resulting in noticeable trail afterimages and spatial superpositions. In areas with sparse rhythms, reduce the feedback strength and gradually decrease the visual elements to create a relatively slow and gentle visual rhythm that alternates between tension and relaxation.

Based on the above parametric control scheme, which is based on audio transient frequency response and rhythmic features, precise modulation of visual compositing, motion patterns, and feedback structures driven by guqin timbres and percussion rhythms can be achieved in this work. Thus, a unified dynamic logic for micro-texture variation and macro-motion tendency in visuals has been created to enhance synchronization and immersion of sound and image.

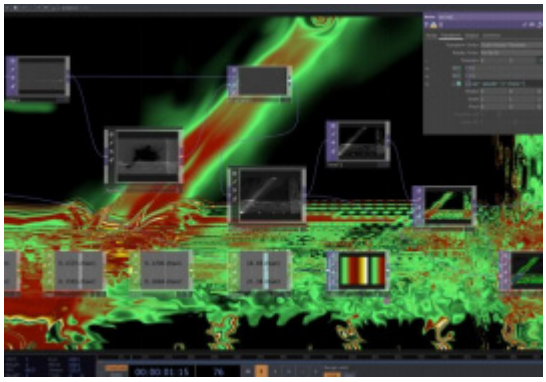

Figure 11. Excerpt from the Guqin Driver Interface Engineering Project

Figure 12. Excerpt from the dance feedback engineering drawing

7.3. Technical challenges encountered during creation

The main carriers of this work are vocals, guqin, percussion, strings, and synthesizers. Vocals have both short, separated sections and long, continuous ones, creating many layers of sound. As one of the instruments that best expresses the aesthetic ideals of ancient China, the guqin can be played with open strings and harmonics to create beautiful melodies in harmony with other instruments, such as percussion. The Design of the drum rhythm is relatively simple; therefore, frequent changes in time signatures, such as 4/4, 4/5, 4/4, 4/7, 4/4, and 4/3, are used to add a sense of rhythm and indeterminacy. It is generally atonal, but there are modal fragments, and strings play the melodic motif A-A-C-D-A-C in a textural way. Continuous audio offsetting and off-beat displacement create new musical textures continuously. Synthesizers add space and color to the sound world, and thus combine the charm of old times with the spirit of modernity, integrating sound and image to create a meditative mood for the audience.

A large number of videos showing the Dunhuang murals and dances have been collected at this time. TouchDesigner was used to perform layering, edge detection, texture reconstruction, and dynamic

fractal algorithms on high-resolution images during the creation stage. Mural patterns were converted into parametric geometric shapes and particle matrices. Motion curves extracted by the algorithm from dance footage are mapped to spectral data of musical voices, creating a multimodal coupling of music, dance, and visuals. A Music Interaction System has been created in TouchDesigner for audio-visual synchronization and cross-domain mapping. For example, the low-frequency spectral band drives the expansion and contraction of the mural pattern; mid- and high-frequency components regulate particle energy flow and spatial displacement of light phenomena. Energy vector fields derived from dance movements are overlaid on musical beats to create multi-modal interactions.

Music, Dance, and Visuals. The Design aims to achieve audio-visual integration and dynamic immersion. Many technical problems occurred in the creation process. First, there was a problem with the physical basis

8. Conclusion

Asterism·Echo has created many works that integrate music and pictures in various ways. Based on the old Chinese observations of Jupiter, this work creates interactive audio-visual experiences by designing musical themes, guqin, percussion, strings, synthesizers, and multimodal mappings that link Jupiter's path with Dunhuang mural art. Many problems occurred during the creation process, such as conceptual ideas and themes, Guqin learning and recording, counterpoint between irregular rhythms and visual movements, and technical optimization of the interactive system. Audio data reconstruction and fractal noise control have been used to achieve both artistic expression and technical innovation in this work. Artistically, the work reflects the ancient aspiration for knowledge about the universe and, through collaboration among artists, presents a multi-temporal space for people from different times. TouchDesigner and Logic Pro can be used together to create all sorts of experiments in audio-visual interaction.

This exploration will present a new form for the inheritance of traditional culture and provide a reference case for cross-disciplinary creation and digital art. In practice, this creative system can be applied to digital art exhibitions and immersive space displays. For example, in art galleries or digital exhibition spaces, multiple screens can be used for projection or surround sound to present astronomical data and audio-visual interactions in a three-dimensional way and help people better understand abstract scientific knowledge through both sight and sound. Many foreign digital art projects have employed similar techniques, such as teamLab. Such projects create immersive artistic spaces by generating visual images in real time and involving the audience; thus, they have explored how audio-visual combinations can tell stories in space. The technical workflow of this work can also be applied to real-time audio-visual performances in the field of stage arts and live performance. Music-driven

Visual Systems can be used to present different stages of visual works and live sound simultaneously for better expression and audience experience. Ryoji Ikeda's audio-visual works are also very precise in their combination of sound and image. Visual Systems can be used to present different stages of visual works and live sound simultaneously for better expression and audience experience. Ryoji Ikeda's audio-visual works are also very precise in their combination of sound and image.

Disclosure statement

The authors declare no conflict of interest.

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