

CONSTRUCTING A SOUNDSCAPE TO ENHANCE THE SPIRITUALITY OF PUJIU TEMPLE



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This thesis explores the integration of soundscape design and spirituality within the context of Buddhist temples, with a focus on Pujiu Temple in Shanxi Province, China. Wind chimes hold profound symbolic significance in Buddhist culture. Per Buddhist tradition, their sound is deemed a sacred summons capable of dispelling distractions and purifying the mind (Dalai Lama, 1992). As stated in the Bodhicaryavatara, the sound of wind chimes symbolizes the dissemination of the Dharma, guiding believers into meditation and self-reflection (Suzuki, 1964). Moreover, the sound of wind chimes resonates with the Buddhist concept of "dependent origination and emptiness", as it is produced by the interplay of wind, bells, and the environment, exemplifying the Buddhist doctrine of dependent origination (Berthier, 2000).

For instance, in Japanese Zen temples, wind chimes are often used in meditation practice, assisting practitioners in focusing and achieving deep meditation (Dalai Lama, 1992). Relevant studies have shown that the sound of wind chimes can significantly reduce stress levels and enhance inner calm (Suzuki, 1964). The study employs a multi-modal soundscape walk method to analyze the soundscape and visitor experiences across four key Locations: Pine Forest Path, Dream of the Western Chamber, Pagoda Courtyard Corridor, and Echoes in the Mountain Valley. Through a combination of sound pressure level measurements, questionnaires, and subjective evaluations, the research identifies the unique soundscape characteristics of each Location and their correlation with spiritual experiences.

The findings reveal that natural sounds, such as wind and bird calls, significantly enhance the tranquility and meditative atmosphere of the temple, while traditional Buddhist sounds, like chanting and bell ringing, deepen the sense of cultural and religious identity. The study proposes a phased soundscape design process, which includes initial, development, climax, and decline stages, to guide visitors through a journey of spiritual awakening and inner peace. The design incorporates elements such as wind chimes, guzheng music, and synthesized effects to create a harmonious and immersive soundscape.

The thesis contributes to the field by developing a theoretical framework for soundscape design in religious contexts and providing practical strategies for enhancing the spiritual experience of visitors. The results highlight the potential of soundscape design to foster deeper connections with Buddhist teachings and promote cultural heritage preservation. Future research directions include further optimization of soundscape elements, strengthening equipment maintenance, and expanding the scope of study to other cultural Locations.



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Chapter 1 Introduction

1.1 Research Background

Figure 1 shows, Historically, research on Buddhist temples has predominantly emphasized visual experiences, particularly material heritage elements like architecture, murals, and sculptures, while the auditory dimension has received relatively scant attention. However, the spiritual experience of a temple is not solely dependent on visual presentation. Sound, as an essential medium in Buddhist practice, plays a crucial role in shaping the religious atmosphere, guiding meditation, and enhancing the sense of ritual.



(Drawn by the author)

Existing research on temple soundscapes has largely remained at the level of physical acoustics, such as echoes, reverberation, and noise control, with limited exploration on how to optimize the soundscape to enhance the spiritual experience. The Surangama Sutra proposes the concept of "from hearing, thinking, and cultivation, to the supreme path," emphasizing that hearing is not only a way to perceive the environment but also an important path for spiritual practice. Thus, the value of a temple soundscape lies not only in the physical properties of the soundscape lies not only in the physical physica

themselves but in how these sounds shape the religious atmosphere and guide devotees into a deeper spiritual experience. Moreover, the soundscape of a temple is closely related to the spirit of the place. Traditional Chinese temples advocate the concept of "unity of heaven and man," where natural sounds (such as flowing water and pine waves) and religious sounds (such as bells, drums, and chanting) together create a unique auditory environment. However, urbanization and commercialization are weakening this characteristic. The intrusion of external noise, the overuse of amplification systems, and the generalization of background music have made the auditory atmosphere of temples increasingly similar to that of ordinary public spaces, diminishing the sense of religious immersion.

Against this backdrop, this study focuses on the role of the soundscape in enhancing the spiritual experience of temples and explores how to maintain the unique religious atmosphere of temples in the modern environment through scientific soundscape optimization strategies. This not only helps to deepen the study of Buddhist temple spaces but also provides new ideas for the adaptive development of contemporary temples.

1.2 Research Questions

1.2.1 The Impact of Soundscape on the Spiritual Experience of Visitors and Monks in Modern Temple Renovations

Contemporary religious architectural renewal often exhibits a pronounced "desoundscaping" trend, marked by an overemphasis on modern visual symbolism at the expense of the auditory dimension's crucial role in spiritual and cultural expression. This "visual-centric" (Ocularcentrism) approach to renovation essentially disrupts the "religious perception ternary structure" proposed by Campanella (2016) — the synergy between vision (icon), audition (echo), and somatosensation (soma), leading to the alienation of the spiritual experience (genius loci) of religious Locations. For example, in the renovation of some temples, there is an overemphasis on the updating of architectural appearance, interior decoration, and functional layout, while neglecting the impact of the soundscape, a key element, on the spiritual experience of visitors and monks. This neglect may weaken the spiritual atmosphere of the temple, making it difficult for visitors and monks to obtain a profound religious experience.

1.2.2 The Insufficiency of Research on the Spiritual Significance and Combination Methods of Traditional Soundscape Elements

Traditional soundscape elements, including bell sounds, chanting, and wind chimes, are frequently overlooked in terms of their spiritual significance. These traditional soundscape elements are important components of the spiritual experience of temples, but existing research on religious soundscapes lacks in-depth exploration of the specific spiritual meanings these elements represent, as well as methods for combining soundscape elements to enhance the spirituality of religious temples. This may lead to the marginalization or replacement of traditional soundscape elements, causing temples to lose their unique spiritual identity and cultural connotations.



Figure 2 Research Questions

(Drawn by the author)

1.3 Research Objectives

Pujiu Temple, with its long history as a Buddhist sacred Location and its cultural symbolism due to the famous "Romance of the Western Chamber," possesses a unique soundscape that combines the Buddhist soundscape with traditional Chinese opera. This provides an important reference for soundscape research. This study takes Pujiu Temple in Shanxi Province as the object to explore the role of the soundscape in enhancing the spiritual experience of religious temples and proposes scientific soundscape optimization strategies and design plans. The core objectives of this study are as follows:

1.3.1 To Determine the Specific Spiritual Connotations of Soundscape Elements in Religion and Local Culture

This study aims to meticulously examine the spiritual connotations of soundscape elements within Buddhism and local culture, uncovering their underlying deeper meanings. By combined through religious scriptures, historical documents, and local folklore, combined with field investigations and interviews, the study explores the spiritual significance and values of various soundscape elements (such as temple bell sounds, chanting, and natural wind sounds) in Buddhist beliefs and local cultural traditions. Through the analysis of the associations between soundscape elements and religious rituals, as well as local folk activities, the study further explains how these elements play important roles in religious practice and the transmission of local culture, and their shaping and influence on the spiritual world of devotees and local residents. This provides a solid cultural and spiritual foundation for the subsequent soundscape optimization strategies.

1.3.2 To Analyze the Location Characteristics of Pujiu Temple from the Perspective of Buddhist Connotations and Determine Soundscape Optimization Strategies

Grounded in Buddhist connotations, this study undertakes a comprehensive analysis of Pujiu Temple's Location characteristics to formulate scientific and rational soundscape optimization strategies. First, an in-depth study of the architectural layout, spatial form, and relationship with the surrounding natural environment of Pujiu Temple is carried out to explore how these Location features reflect the doctrines, concepts, and aesthetic pursuits of Buddhism. Second, through on-Location measurements and assessments of the existing soundscape of Pujiu Temple, including sound source types, sound intensity, and propagation paths, combined with the special needs and preferences of Buddhism for sound, the existing problems and deficiencies in the current soundscape are identified. On this basis, in accordance with Buddhist connotations and soundscape design principles, targeted soundscape optimization strategies are proposed, such as reasonably adjusting the sound propagation paths, increasing the introduction of natural sound elements, optimizing the settings of artificial sound sources, and isolating noise. The goal is to enhance the Buddhist atmosphere and spiritual experience of Pujiu Temple through soundscape optimization, enabling it to better serve the functions of Buddhist practice and cultural dissemination.

1.3.3 To Design a Soundscape Optimization Plan to Enhance the Spiritual Experience of Pujiu Temple by Integrating Various Soundscape Elements

This study is dedicated to devising a scientifically robust soundscape optimization plan by integrating diverse soundscape elements to markedly enhance the spiritual experience of visitors and monks at Pujiu Temple. In the process of plan design, full consideration is given to the Buddhist cultural background of Pujiu Temple, its Location characteristics, and the different needs of visitors and monks. Natural sounds (such as wind, water, and bird chirping), religious sounds (such as bell sounds, Buddhist chanting, and chanting), and environmental sounds (such as footsteps and architectural echoes) are organically integrated and coordinated. By carefully selecting, laying out, and controlling the soundscape elements, a soundscape environment with a sense of hierarchy, rhythm, and artistic conception is created. This allows visitors to feel the profound cultural heritage and unique charm of Buddhism during their tour, thereby enhancing their sense of identity and belonging to Pujiu Temple. At the same time, a more peaceful, harmonious, and conducive acoustic space for practice is provided for monks, promoting their inner peace and concentration, and improving their practice effectiveness and religious experience.



1.4 Hypotheses

(1) There exists a significant correlation between the spiritual experience of Buddhist temples and the soundscape. The unique rhythm, rhythm, and volume characteristics of sound elements in temples, such as morning bells, evening drums, chanting, and Buddhist music, create a solemn and peaceful acoustic atmosphere. This acoustic atmosphere can directly affect the psychological state of believers and tourists, arouse their inner sense of awe, peace, and transcendence, and thus deepen their spiritual experience in the temple.

(2) Within the religious context, traditional soundscape elements possess distinct

spiritual connotations. By conducting questionnaires and consulting relevant literature to deeply analyze the regional cultural characteristics and Buddhist cultural connotations of Pujiu Temple, the specific spiritual meanings of various soundscape elements can be discovered and determined.

(3) Through careful selection, rational layout, and precise control of soundscape elements, their spiritual efficacy can be fully realized. The use of soundscape narrative and soundscape interaction design methods can effectively improve the current soundscape of Pujiu Temple, thereby enhancing the spiritual experience of stakeholders with the temple's soundscape.

1.5 Scope and Limitations of the Study

1.5.1 Scope of the Study

(1) This study focuses on elucidating the relationship between soundscape elements and spirituality, and how these elements influence visitors' inner spiritual experiences.

(2) This study centers on the soundscape of Pujiu Temple in Yongji City, Shanxi Province, China, and proposes targeted strategies to enhance its soundscape.



Figure 4 Location of Pujiu Temple in Yuncheng (Drawn by the author)

(3) The study aims to explore and establish a soundscape design paradigm to enhance the spirituality of Buddhist temples, offering theoretical and practical guidance for Buddhist temple soundscape design.

1.5.2 Limitations of the Study

(1) The study's sample may not fully represent all visitor groups, potentially limiting the results' wide applicability and representativeness.

(2) The soundscape design experiment, conducted in specific times and environments, may not fully simulate all possible weather, seasonal, and daily activity variations.

(3) The study's soundscape design plan necessitates the establishment of a long-term monitoring mechanism to assess its long-term impact on the temple's spirituality.

1.6 Research Methods

The research methods are divided into the following steps, implemented in this order:

(1) Literature Review: This study initially undertakes a systematic review and analysis of historical texts, soundscape studies, environmental psychology, and extensive Buddhist cultural research. In particular, it clarifies the definition and scope of spirituality in Buddhist culture, as well as how soundscape elements interact with the creation of religious connotations and atmosphere. This step aims to provide a solid theoretical basis for the subsequent empirical research and reveal the shortcomings of existing research.

(2) multi-modal soundscape Walk: Utilizing the multi-modal soundscape walk method, which includes on-Location sound pressure level measurement, soundscape recording, semi-structured interviews, and questionnaire surveys, a comprehensive assessment of Pujiu Temple's soundscape physical characteristics and subjective experiences is conducted. This method combines quantitative analysis (such as sound pressure level data) with qualitative feedback (such as visitor perception and emotions), and through soundscape design experiments and simulation verification, the effectiveness of the optimization plan is verified. It emphasizes the interactive relationship between the soundscape and human emotions, culture, and social activities, providing an interdisciplinary empirical framework for soundscape research.

(3) Soundscape Design: This study employs an on-Location soundscape design approach, using Pujiu Temple as the research object to explore soundscape-based optimization of the Location's spiritual experience. The study selects four representative Locations: Pine Forest Path, Dream Return to the West Chamber, Pagoda Courtyard Corridor, and Echoes in the Mountain Valley, and designs and implements a diverse soundscape plan in combination with their natural and cultural characteristics. The soundscape design process is divided into five stages: Location analysis, target setting, element selection, design implementation, and on-Location integration and noise control. The results of the study not only provide practical guidance for the soundscape optimization of Pujiu Temple but also provide theoretical basis and reference examples for the soundscape design of other Buddhist temples.

1.7 Keywords

Spirituality: The exploration and experience of values, meanings, and purposes beyond the material world, related to inner development, self-actualization, and connection to the divine.

Soundscape: The soundscape perceived by the human ear at a specific time and place, including natural, object, and man-made sounds, and their interactions with

human emotions, culture, and social activities.

multi-modal soundscape Walk: A research method combining questionnaire surveys, group interviews, and objective soundscape analysis to assess soundscape elements and characteristics.

Chinese Buddhism: The tradition of Buddhism developed and evolved in China, integrating Indian Buddhist doctrines with Chinese local culture, forming various schools and practices.

Zen Buddhism: An important branch of Buddhism emphasizing direct experience of Buddha-nature through meditation and contemplation for enlightenment, with a practice environment pursuing simplicity and tranquility.

Pure Land Buddhism: A school of Buddhism focusing on purifying the mind through chanting, reciting mantras, and practicing to aspire to be reborn in the Pure Land.

Pujiu Temple: A famous Buddhist temple in Yongji City, Shanxi Province, China, known for its long history and rich cultural heritage, used in this study to explore the impact of soundscape on Buddhist temple spirituality.

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Chapter 2 Literature Review and Related Theories

2.1 Soundscape in the Context of Chinese Temples

2.1.1 Definition and Meaning of Soundscape

The term "soundscape" is defined as "the soundscape as perceived, experienced, or interpreted by individuals, groups, or communities in a given context" (ISO 12913-1:2014). This definition highlights that soundscape research extends beyond the physical properties of sound to encompass non-physical dimensions such as humanities, psychology, and sociology (Kang & Schulte-Fortkamp, 2016). In the context of Buddhist temples, this understanding is particularly crucial, as it underscores the intricate relationship between sound and Buddhist spirituality.

As an interdisciplinary domain, soundscape research has evolved dynamically over time. The concept of soundscape was first introduced by Finnish geographer Granö (1929), who emphasized the role of auditory perception in spatial experience. However, it was Canadian composer R. Murray Schafer who, in the 1970s, systematically developed soundscape studies and introduced the field of soundscape ecology—an approach that examines soundscapes from aesthetic and cultural perspectives, particularly in natural and urban contexts (Schafer, 1977). Schafer's work also laid the foundation for soundscape education and conservation efforts.

Building upon Schafer's framework, Barry Truax's Handbook for Acoustic Ecology (1978) provided a theoretical basis for the practical application of soundscape studies, particularly in relation to sound communication and auditory perception. Since the early 21st century, contributions from scholars across diverse disciplines have expanded the scope of soundscape research significantly. Recent studies encompass a wide range of topics, including soundscapes of natural environments

(Jennings & Cain, 2013), psychoacoustic indicators of sound perception (Aletta, Kang, & Axelsson, 2016), soundscapes of heritage buildings (Pijanowski et al., 2011), and the psychological and physiological impacts of soundscapes (Kang et al., 2021). The field has also seen increasing attention on social sound surveys and the effects of global events such as the COVID-19 pandemic on urban and natural soundscapes (Aletta & Osborn, 2020).

A landmark contribution to the discipline is Soundscape and the Built Environment (2016), edited by Professor Jian Kang, chair of the European Soundscape Alliance. This volume systematically reviews soundscape research from ten distinct perspectives, offering the first comprehensive exploration of soundscapes within architectural and environmental contexts. It represents a pioneering theoretical advancement with significant implications for urban soundscape planning and environmental psychology.

In summary, soundscape research transcends the mere study of sound's physical characteristics, focusing instead on human perception and the interaction between sound and the environment. These research findings hold considerable significance for enhancing urban soundscapes and preserving the sound heritage of natural and cultural Locations.

2.1.2 The Relationship Between Sound, Scape and People

In 2014, the International Organization for Standardization (ISO) formally defined the concept of soundscape as "the soundscape as perceived or experienced and/or understood by a person or people, in context" (ISO, 2014). This definition elucidates the three fundamental components of soundscape: sound, people, and environment. Furthermore, it establishes a clear distinction between soundscape and the concept of isolated sound.

(1) The ISO (2014) definition underscores that a soundscape is not merely an

assemblage of sounds but a perceptual construct that arises from the interaction between auditory stimuli, human perception, and the surrounding environment. This tripartite structure forms the foundation for analyzing and designing soundscapes in various contexts.

(2) Characteristics and Measurement of Sound: From an acoustical perspective, sound originates from the vibration of objects. When objects vibrate, they induce fluctuations in air pressure, generating sound waves that propagate through the medium and stimulate the human eardrum, ultimately leading to auditory perception (Rossing et al., 2002). The primary attributes of sound—pitch, loudness, and timbre—affect human auditory experiences (Howard & Angus, 2017).

Decibels (dB) serve as a fundamental unit of measurement in acoustics, quantifying sound intensity within a given environment. However, due to the variability of sound levels in different contexts, researchers often employ frequency-weighted networks to assess compoLocation sound fields more accurately. The A-weighted sound level (LAeq) is the predominant metric for environmental noise assessment, as endorsed by ISO standards and numerous national environmental monitoring agencies (ISO, 2017). This study employs LAeq as the primary metric for measuring sound intensity within the "Nanping Evening Bell" scenic area of Jingci Temple, providing an empirical basis for the acoustic assessment.

(3) Classification of Sound Sources and Composition of Soundscape: The realworld soundscape comprises a diverse array of sound sources, resulting in a compoLocation soundscape. To facilitate soundscape perception evaluation, it is essential to categorize these sound sources systematically. One classification approach is based on the origin of the sound, while another considers the nature of the sound-emitting entity (Kang & Schulte-Fortkamp, 2016).

Farina (2014) categorizes sound sources into three primary groups: geological natural

sounds, biological sounds, and anthropogenic sounds. Alternatively, Schafer (1977), from an ecological and cultural perspective, classifies sound elements into keynote sounds, signal sounds, and soundmarks. Keynote sounds constitute the background auditory environment, such as wind, flowing water, or cicada chirps. Signal sounds are prominent and easily distinguishable, including car horns and mobile phone ringtones. Soundmarks, on the other hand, possess distinct cultural significance, such as dialectal speech, traditional music, or temple bells imbued with historical context. This study integrates both classification frameworks to ensure a comprehensive analysis aligned with the research objectives.

(4) The Role and Influence of People. As both receivers and emitters of sound, humans play a pivotal role in shaping the soundscape. This influence can be understood in both broad and narrow senses. The broad sense encompasses historical and cultural dimensions, such as the renowned bell chime of Hanshan Temple, immortalized in the poetic imagery of "the bell sound reaches the guest boat at midnight" (Yu, 1981). It also includes the philosophical and emotional connotations embedded within sound-related traditions. In contrast, the narrow sense pertains to individual listeners and their subjective experiences (Kang, 2007).

Although demographic factors such as age, gender, and cultural background are immutable, researchers can nonetheless explore subjective auditory experiences. Natural sounds, including birdsong and flowing water, have been shown to evoke relaxation and positive emotions (Aletta et al., 2016). Since subjective sound perception remains relatively consistent across different sociological groups, it provides an avenue for obtaining objective and scientifically reliable soundscape evaluation data.

(5) The Role and Influence of the Environment: The environment serves as the foundation of the soundscape, encompassing both natural and cultural elements.

Natural environmental factors—such as spatial configuration, material properties, vegetation, and architectural features—affect sound propagation, reflection, and reverberation, thereby shaping auditory perception (Gage & Krause, 2019). Additionally, climatic variables, including humidity, temperature, wind speed, and lighting conditions, influence listener satisfaction with the soundscape. A visually comfortable environment can also mitigate the negative effects of noise, enhancing overall auditory experience (Watts et al., 2009).

The cultural environment, shaped by religious traditions, historical narratives, social customs, and collective memory, further enriches the soundscape. Distinct cultural contexts influence how soundscapes are perceived and valued, leading to the emergence of unique regional acoustic identities (Blesser & Salter, 2007).

(6) The Interrelationship of the Three Elements: The interdependent relationship among sound, environment, and people forms the core of soundscape research. The interactions among these three elements necessitate a multidisciplinary approach to analysis. Psychoacoustics explores the relationship between sound and human perception, while environmental and architectural acoustics examine the interplay between sound and physical surroundings. Additionally, environmental psychology and sociology investigate the human-environment dynamic (Kang & Schulte-Fortkamp, 2016).

People-Environment Relationship: Traditional landscape studies primarily emphasize visual perception of the environment. Soundscape research extends this paradigm by integrating auditory elements into spatial analyses, providing a holistic perspective on environmental experience (Pijanowski et al., 2011).

People-Sound Relationship: Conventional psychoacoustic studies focus on the auditory perception of sound in isolation, neglecting contextual factors such as visual stimuli and cultural background. Soundscape research, in contrast, emphasizes the interplay between sound perception and environmental context, considering the influence of place-specific factors on auditory experience (Aletta et al., 2016).

Environment-Sound Relationship: Architectural and environmental acoustics traditionally prioritize the physical properties of materials and spatial configurations in sound transmission. Soundscape research expands upon this by examining the historical and cultural significance of sound in specific environments, advocating for the preservation of culturally significant acoustic elements (Gage & Krause, 2019).



Figure 5 The relationship between sound, scape, and people, with spirituality at the core.

(Drawn by the author)

Through this integrative approach, soundscape research not only enhances the understanding of soundscapes but also informs the design of spaces that foster meaningful and spiritually enriching auditory experiences.

2.2 Religious Spirituality and Soundscape in Religion

2.2.1 Definition and Connotation of Religious Spirituality

In the field of religious studies, the concept of "spirituality" is multilayered and complex, encompassing the relationship between individuals and transcendent entities, as well as the pursuit of ultimate meaning or purpose. The following is a refined exposition of the definition and understanding of "spirituality" in religion, based on academic research and scholarly sources:

Religious spirituality is commonly understood as the connection between individuals and transcendent entities. This connection surpasses the limitations of the material world and points to a deeper level of existence and meaning. According to Koenig et al. (2012), religion and spirituality are closely related to individual mental health, with spirituality being regarded as an intrinsic force that influences psychological wellbeing and happiness. Additionally, William James (1902) explored the diversity of religious experiences in his seminal work The Varieties of Religious Experience, emphasizing the significance of spiritual experiences in shaping individual lives.

In academic discourse, spirituality is also defined as an individual's connection with the transcendent in everyday life, encompassing the cultivation of awe, gratitude, kindness, a sense of connection with the divine, and compassionate love. These experiences constitute the core of an individual's spiritual life, influencing their psychological state and behavioral patterns. For instance, Yaden and Newberg (2017) provide a comprehensive examination of spiritual experiences in the contemporary world in their book The Varieties of Spiritual Experience: 21st Century Research and Perspectives, highlighting the diversity and significance of spirituality in modern society.

In summary, the definition of spirituality in religion extends beyond the pursuit of the transcendent to include an individual's inner sacred experiences and practices. These

experiences are often subjective and are frequently interpreted within organized religious traditions. Moreover, they are closely linked to psychological well-being and overall life satisfaction. Academic research continues to explore the profound relationship between spirituality and human experience through interdisciplinary approaches, incorporating insights from psychology, neuroscience, and sociology.

Soundscape in the Context of Chinese Temples

Religious Spirituality and Soundscape in Religion

Spirituality in Buddhism

(Emptiness and Existence)

Identification of Pujiu Temple's Soundscape

Analyze

Figure 6 Focus process diagram of literature review (Drawn by the author)

2.2.2 Application of Soundscape



Figure 7 The distribution of various religious sound scenes in the selected papers Source

https://www.vosviewer.com/

Christianity, Islam, and Buddhism are the three major religions in the world, with a vast number of believers. Therefore, research on the soundscape of historical buildings associated with these three religions is the most extensive. Figure 7 shows the distribution of various religious soundscapes in selected papers according to cluster analysis. The largest proportion of soundscape research is on Christian churches (73%), followed by Islamic mosques (12.2%) and Buddhist temples (10.8%). Research on the soundscape of other religious buildings accounts for about 4%.

(1) Soundscape of Christian Churches

Christianity is one of the most influential religions in the world, and scholars worldwide have given significant attention to the study of church soundscapes. Most related research focuses on the sound or sound field of traditional churches, and some focus on the perception of the architectural soundscape. The history of bell development in the Roman Empire can be traced back to the late seventeenth century (Blesser & Salter, 2007). Additionally, experimental and numerical methods combining material science and music acoustics have been used to restore the bell sound of St. Peter's Church (Álvarez-Morales et al., 2016). From the perspective of hearing health, church bells do not cause occupational hearing loss to bell ringers (Kryter, 2014). Some studies found that the most suitable sound source position for music in churches is aligned with the organ, which plays a crucial role in Baroque polyphonic composition (Braasch, 2013). Research also shows that vegetation in the surrounding environment of a church can reduce noise pollution (Margaritis & Kang, 2016). Different architectural styles, such as Romanesque domed churches, Gothic cathedrals, and Baroque domed churches, exhibit suitable acoustic characteristics conducive to gathering and preaching, with lower acoustic absorption properties (Álvarez-Morales et al., 2017).

(2) Soundscape of Islamic Mosques

Over the past decade, the study of the soundscape of traditional Islamic architecture has received considerable attention from scholars in Central and West Asia. The mosque is the core of Muslim society, with primary activities including prayer and listening to sermons, making speech intelligibility particularly important (Karabiber, 2010). In terms of acoustic parameter research, scholars have determined suitable acoustic design types for mosques through sound field measurements and simulations (Hammad & Pitt, 2020). This is beneficial for saving materials, energy, and time in future acoustic renovations or architectural replacements and plays a crucial role in the development of archaeological acoustics (Abdou, 2003). By measuring the acoustics of existing mosques and reconstructing different spatial configurations throughout history, researchers have successfully restored the soundscape of past mosques (Hoşkara et al., 2009). Additionally, comparative studies on mosque acoustics and speech intelligibility have led to the formulation of general acoustic
guidelines for mosque design, considering factors such as size, volume, and occupancy rate in the main prayer hall (Nosrati et al., 2019). Other studies analyze room acoustics in mosques, evaluating speech intelligibility and exploring the sense of sacredness produced by sound within these sacred structures (Hammad & Pitt, 2020). Further research suggests a correlation between the acoustic design of mosques and the comfort level of worshippers, with some findings indicating that the main hall of a mosque may not be entirely suitable for worship activities due to acoustic comfort considerations (Nosrati et al., 2019). These studies provide a valuable scientific foundation for understanding and improving the soundscape of mosques.

(3) Soundscape in Buddhist Temples

Over the past decade, scholars in East Asia, including those from China, Japan, and South Korea, have conducted in-depth research on the soundscape of historical Buddhist temples. These studies show that the historical atmosphere created by bell sounds has a positive impact on people's subjective sound evaluation, and like natural sounds, the temple soundscape should be coordinated with the local natural environment, history, and cultural background (Kang & Zhang, 2010). By recording and analyzing the acoustic parameters of sounds in Han Chinese Buddhist temples, researchers found that the physical and psychoacoustic characteristics of these sounds match their functional roles within temples (Zhang et al., 2016).

Comparative research on the sounds of Buddhist temples and Catholic churches has shown that cathedral spaces are more closely associated with visual components in terms of social function, whereas temple spaces emphasize religious activities related to sound elements (Jeon et al., 2010). Regarding the sound field of Buddhist temples, scholars have explored acoustic characteristics related to the sound source position and direction in Japanese Buddhist temples. By combining sound field measurement and acoustic simulation, they analyzed the influence of spatial elements and sound sources in the main halls of Buddhist temples, revealing that fabric sound absorption materials and the position of Buddha statues significantly affect the sound field, while the scale and layout of temple courtyards also influence the overall temple acoustics (Ando et al., 2001).

In terms of soundscape evaluation, studies found a significant correlation between the soundscape evaluation of temples and measured sound levels (Zhang et al., 2016). In Han Chinese Buddhist temples, clarity among physical and psychoacoustic sound parameters is closely related to sound preference (Kang & Zhang, 2010). Researchers have also examined the relationship between Buddhist temple soundscape evaluation and mental health, identifying the extent to which religious belief-related factors serve as mediating variables (Jeon et al., 2010). However, research on the soundscape of historical Buddhist temples remains relatively limited, particularly for traditional Tibetan and Theravāda Buddhist temples, indicating substantial potential for future research in this field.

The above analysis reveals significant differences in soundscape research across different religious traditions. In the field of natural sciences, research on Christian soundscapes is the most in-depth. In the field of social sciences, Islamic soundscapes receive relatively more attention. However, research on Buddhist soundscapes remains relatively scarce.

2.2.3 The Role of Sound in Expressing Religious Spirituality

In the process of shaping spiritual tourism experiences, sound plays a crucial role. Alegre and Garau (2010) pointed out that the perceived noise level directly affects the satisfaction of tourists because interfering sounds may destroy the quiet environment required for spiritual experiences. Similarly, Li et al. (2023) emphasized that environmental elements have a significant impact on the overall sensory experience of a destination, with sound playing a key role in creating a suitable atmosphere.

At the same time, research has highlighted the importance of "silence" and "quietness" in enhancing spiritual tourism experiences. Wang et al. (2023) found that most participants in spiritual tourism prefer quiet and secluded environments for reflection, often choosing to travel alone to minimize interference from other tourists. Research by Chen and Koenig (2021) also supports this idea, suggesting that auditory stimuli, including natural and religious sounds, influence the depth of spiritual engagement. Furthermore, Kang and Zhang (2010) found that well-designed soundscapes in religious Locations enhance visitors' sense of tranquility and facilitate introspective experiences.

However, there is currently limited research on the role of soundscapes in spiritual tourism, particularly regarding how soundscape design can enhance tourists' spiritual experiences. More empirical research and theoretical discussions are needed to bridge this gap.

2.3 Spirituality in Chinese Buddhism

2.3.1 The Origin and Development of Chinese Buddhism

Buddhism originated in ancient India between the 6th and 5th centuries BCE, founded by Siddhartha Gautama (Harvey, 2013). While there is no consensus in academia about the exact time Buddhism was introduced to China, it is generally believed that it arrived via the Silk Road before the Common Era (Lai, 2020). During the Northern and Southern Dynasties, Buddhism developed rapidly in China and integrated with local culture, forming a unique Chinese Buddhist tradition (Chen, 2002).

The development of Chinese Buddhism has gone through several important stages.

The early period was characterized by the "Geyi" Buddhism of the Wei, Jin, and Northern and Southern Dynasties (220–589 CE), where Buddhist concepts were interpreted through Daoist terminology (Tsukamoto, 1985). This was followed by the "Jiaomen" Buddhism of the Sui and Tang Dynasties (late 6th to late 9th century), which saw the establishment of formal Buddhist schools. The emergence of Zen (Chan) Buddhism in the late Tang Dynasty (early 10th century) marked the beginning of the "Zongmen" era, during which Chinese Buddhist sects flourished (McRae, 2003).



Figure 8 The Origin and Development of Chinese Buddhism (Drawn by the author)

The main sects of Chinese Buddhism include Han Chinese Buddhism, Tibetan Buddhism, and Therav $\mathbf{\bar{a}}$ da Buddhism. Han Chinese Buddhism had a profound influence during the Sui and Tang Dynasties, leading to the formation of distinct sects such as Tiantai, Huayan, and Chan Buddhism (Faure, 1993). Han Chinese Buddhism predominantly follows the Mah $\mathbf{\bar{a}}$ y $\mathbf{\bar{a}}$ na tradition, where "Yana" is a metaphor for the different paths practitioners take toward enlightenment. "Mah $\mathbf{\bar{a}}$ y $\mathbf{\bar{a}}$ na," meaning "great vehicle," emphasizes universal salvation and the bodhisattva ideal, in contrast to "Therav $\mathbf{\bar{a}}$ da," which Mah $\mathbf{\bar{a}}$ y $\mathbf{\bar{a}}$ na Buddhists often describe as focusing on individual liberation (Williams, 2009).

2.3.2 The Contradiction Between the "Emptiness" of Zen and the "Existence" of Pure Land in Chinese Mahayana Buddhism

Chinese Buddhism has developed a unique Mah $\mathbf{\bar{a}}$ y $\mathbf{\bar{a}}$ na Buddhist concept of "universal salvation," influenced by the Confucian ideal of "great harmony under heaven" and the Daoist principle of "unity of heaven and man" (Lai, 2003). This integration process is not only a mutual reference of religious beliefs but also a deep exchange at multiple levels, including philosophical thought, ethics, and social practice (Ziporyn, 2016).

On the one hand, Chinese Mah $\mathbf{\tilde{a}y}\mathbf{\tilde{a}}$ na Buddhism embraces the theory of emptiness ($\mathbf{\hat{su}}$ nyat $\mathbf{\tilde{a}}$), represented by the Madhyamaka school and Zen, which emphasizes that "all is emptiness" and considers all worldly phenomena to be illusory (Garfield, 1995). N $\mathbf{\tilde{a}}$ g $\mathbf{\tilde{a}}$ rjuna, the foundational thinker of the Madhyamaka school, articulated this concept in his M $\mathbf{\tilde{u}}$ lamadhyamakak $\mathbf{\tilde{a}}$ rik $\mathbf{\tilde{a}}$, arguing that all things arise due to dependent origination (prat $\mathbf{\tilde{l}}$ tyasamutp $\mathbf{\tilde{a}}$ da) and thus lack intrinsic existence (Siderits & Katsura, 2013). This doctrine teaches that all phenomena are in a constant state of change, without a fixed and unchanging essence, thereby helping practitioners transcend attachment and achieve mental liberation (Suzuki, 1968).

On the other hand, Mah $\bar{a}y\bar{a}$ na Buddhism also contains the spirit of existence, primarily represented by the Consciousness-Only (Yog $\bar{a}c\bar{a}ra$) school and the Pure Land sect. Yog $\bar{a}c\bar{a}ra$ holds that all phenomena arise from consciousness (vijñaptim \bar{a} tra), asserting that reality is a projection of the "storehouse consciousness" ($\bar{a}layavijn\bar{a}na$) (Lusthaus, 2002). This view suggests that everything exists within the realm of mind and that transformation from defilement to purity is possible through specific spiritual practices (Schmithausen, 2005). In contrast to the Madhyamaka school, Yog $\bar{a}c\bar{a}ra$ posits that consciousness is the fundamental basis of reality, encapsulated in the teachings that "the three realms are only the mind" and "all

dharmas are only consciousness"(Buescher, 2008).

The debate between emptiness and existence has been a central issue throughout the development of Chinese Buddhist thought. The Madhyamaka perspective interprets the Buddha's enlightenment under the Bodhi tree as the realization of emptiness—that is, the recognition of the lack of inherent self-nature in all things (Williams, 2009). Conversely, the Yog $\bar{a}c\bar{a}$ ra tradition interprets enlightenment as an understanding of the transformative power of the mind (Alayavijñ \bar{a} na), suggesting that external reality is a reflection of the mind itself (Kalupahana, 1992).

This tension is reconciled in Zen Buddhism, particularly in the teachings of Huineng (638–713 CE), the Sixth Patriarch of Chinese Chan. His Platform Sutra, the only Chinese text considered equivalent to a Buddhist scripture, integrates the concept of "no-nature" with the inherent purity of the mind (Yampolsky, 1967). Huineng's teachings synthesize "prajñã emptiness" with "Buddha-nature existence," thereby illustrating a non-dualistic approach to the emptiness-existence debate (McRae, 2003). This synthesis not only expanded the traditional Buddhist doctrine of dependent origination but also allowed Chinese Buddhism to harmonize with Confucian and Daoist philosophies, ultimately shaping the core of Chinese intellectual and religious thought for over a millennium (Faure, 1993).



Figure 9 The "emptiness" of Zen Buddhism and the "existence" of Pure Land Buddhism in China (Drawn by the author)

2.3.3 Comparison of Sound in Zen and Pure Land

(1) The Silence of Zen

Zen Buddhism tends toward the spirit of emptiness (\hat{Su} nyat \hat{a}), emphasizing direct experience over textual teachings. Practitioners cultivate inner stillness through meditation (zazen), fostering spiritual concentration and wisdom growth (Suzuki, 1964). In contrast, Pure Land Buddhism embodies the spirit of existence, as practitioners continuously recite the Buddha's name (Nianfo), such as "Namo Amitabha," to purify the mind and seek rebirth in the Pure Land (Inagaki, 2003).

The origins of Zen trace back to Mah $\bar{a}k\bar{a}\dot{s}yapa$, an early disciple of the Buddha. During the Vulture Peak Assembly, the Buddha silently held up a golden lotus flower before his disciples. While most remained puzzled, Mah $\bar{a}k\bar{a}\dot{s}yapa$ smiled in recognition. Seeing this, the Buddha declared that he was entrusting to Mah $\bar{a}k\bar{a}\dot{s}yapa$ the "mind-to-mind transmission beyond words" (Dumoulin, 1988). This event symbolizes Zen's unique emphasis on direct transmission of wisdom beyond scripture.

Chinese Zen (Chan) originated with the Indian monk Bodhidharma, revered as its first patriarch. Around 520 AD, Bodhidharma arrived in China and, according to legend, meditated for nine years in a cave behind Shaolin Temple. He remained silent and motionless, to the extent that birds nested on his shoulders (McRae, 2003). This legendary episode epitomizes Zen's approach: "directly pointing to the mind, seeing one's nature, and attaining Buddhahood"—a path of enlightenment through direct experience rather than reliance on scripture (Faure, 1991).

Zen's Influence on Japanese Aesthetics

Zen's influence on Japanese culture, art, and aesthetics is profound. One of its most striking manifestations is in Japanese dry landscape gardens (karesansui), which are closely associated with Zen meditation (Kuck, 1968). Dry landscape gardens feature carefully arranged stones, gravel, and minimal vegetation, cultivating an atmosphere of quietude and contemplation (Keane, 2016). The natural sounds surrounding these gardens—wind rustling through leaves, distant bird calls, or flowing water—reinforce the silence and introspective quality of Zen spaces (Berthier, 2000).

A notable example is the soundscape design of Zen gardens by contemporary landscape master Shunmy $\overline{\mathbf{0}}$ Masuno. His gardens are not only visual but also auditory and sensory, integrating elements such as the subtle trickling of water or the rustling of trees to enhance meditative tranquility (Masuno, 2012). Zen gardens are often placed in natural environments away from urban noise, or their structures are designed to buffer external disturbances, ensuring that visitors can focus on the internal harmony of natural sounds (Walker, 2013). This approach reflects Zen's pursuit of simplicity, harmony with nature, and inner peace, demonstrating the depth and subtlety of Japanese garden art (Nitschke, 1993).



Figure 10 Zen Buddhism: Japanese rock garden Source https://www.sohu.com/a/72160180_373212

(2) The Buddha-Recitation of Pure Land

Pure Land originated in China and can be traced back to the Master Huiyuan of the Eastern Jin Dynasty in China. Pure Land is one of the eight major sects of traditional Chinese Buddhism. Unlike Zen, which emphasizes inner enlightenment, the practice of Pure Land emphasizes "rebirth through other-power," mainly through reciting the Buddha's name, especially reciting the name of "Namo Amitabha," relying on the external power of Amitabha Buddha to reach the Buddha-land. Pure Land believes that before Amitabha Buddha became a Buddha, he made 48 great vows, the most important of which is that any sentient being who wholeheartedly recites the Buddha's name can be guided by Amitabha Buddha. The practice method is simple and easy to implement, and is more easily accepted by the general public, so the influence of Pure Land is widespread.

Reciting the name of the Buddha is the most advocated and common practice method in Pure Land, that is, through continuous verbal recitation of "Namo Amitabha" to concentrate the mind, enhance the faith and wish, and achieve the purpose of purifying the mind. Reciting the name of the Buddha is divided into loud recitation and soft recitation. Loud recitation requires the Buddha's name to be recited loudly, with clear pronunciation and no distractions in the mind. Soft recitation is so soft that others cannot hear it clearly, only the person themselves can hear it, focusing only on their own soft voice, avoiding interference from external sounds.

Unlike Zen, which relies on personal inner wisdom, Pure Land relies more on external "rebirth through other-power." It is said that the Pure Land is a place full of music. The "Infinite Life Sutra" and other classics mention that the seven-treasure trees in the Pure Land can emit five sounds when moved by the breeze, and these sounds are naturally harmonious and pleasant to the ear. Therefore, the ritual music of Pure Land is considered an important part of Buddhist ceremonies. For example, "Thousand Buddha Sounds" is a typical Pure Land Buddhist song, and its melody can create a solemn scene of monks in deep mountain temples reciting scriptures continuously and the distant and lingering Buddha's voice.



Chanting

Figure 11 Pure land Buddhism: chanting Buddha

Source http://www.360doc.com/content/20/1013/10/6657566 940204873.shtml

The music and soundscape of Pure Land not only play an important role in religious ceremonies but also occupy a place in social culture. For example, the Jodo-in in Kyoto, Japan, as the head temple of Pure Land, will have a team of monks ring the big bell on the eve of the new year every year. The bell sound is deep and far-reaching, echoing through the night sky of Kyoto, becoming an indispensable program on New Year's Eve. Through these sounds, Pure Land not only shapes a sacred sense of space visually but also provides a spiritual purification and comfort for believers audibly.

In general, the soundscape of Zen is more reflected in quietness and introspection, while the soundscape of Pure Land is reflected in the repetition and continuity of reciting the Buddha's name. The silence of Zen helps practitioners achieve inner peace and self-enlightenment, while the sound of reciting the Buddha's name in Pure Land is a call and reliance on external Buddha's power. Both of these soundscapes help enhance the spirituality experience of believers, but the methods and focuses are different.

2.3.4 Current Status and Examples of Buddhist Temple Soundscape Research in China

(1) Current Status of Buddhist Temple Soundscape Research in China

Chinese scholars have conducted extensive research on architectural soundscapes, yet studies specifically on Buddhist temple soundscapes began relatively late. Zhang Dongxu (2018) conducted a sound parameter survey and subjective questionnaire study at Han Chinese Buddhist temples such as Pujiu Temple, Fayu Temple, and Yueling An on Mount Putuo. His research examined the impact of traditional temple space elements on courtyard and Buddha hall sound fields, offering both subjective and objective perspectives (Zhang, 2018).

Subsequent studies have focused on soundscape comfort, addressing historical

sounds, temple gardens, and architectural acoustics. Yu Rui (2020) investigated the Daci Temple block, compiling historical records of sound alongside instrumentmeasured data and questionnaire surveys to reconstruct its historical soundscape, which can serve as a reference for modern temple soundscape design (Yu, 2020).

Li Yanling (2019) examined traditional temple and Taoist garden soundscapes, conducting questionnaire surveys at four traditional temple and Taoist gardens on Mount Emei. Through quantification and evaluation of individual and compoLocation soundscape elements, Li identified the optimal elements and sound levels for enhancing the soundscape environment. The study concluded that people prefer low sound pressure levels in Buddhist characteristic sounds and suggested integrating modern acoustic technologies in both classical and contemporary religious garden soundscapes (Li, 2019).

Wang Fang et al. (2021) conducted on-Location sound level tests and analyses at Kaiyuan Temple in Quanzhou, using questionnaire surveys to evaluate visitor perceptions of individual sound elements, primary sound nodes, and overall soundscapes. Through principal component analysis, three primary factors influencing soundscape perception—relaxation, imagery, and tranquility—were identified, leading to optimization strategies for temple garden soundscapes (Wang et al., 2021).

Other studies have explored temple soundscape comfort levels through soundscape analysis. Liu Jing and Yan Zengfeng (2020) assessed the soundscape comfort of Qingcheng Mountain, while Li Shengnan et al. (2022) conducted subjective-objective correlation analyses on soundscape preferences and sound levels at Hanshan Temple, revealing key perceptual characteristics (Liu & Yan, 2020; Li et al., 2022).

(2) Examples of Buddhist Temple Soundscapes in China

Throughout history, Chinese Buddhist temples have developed rich and revered

soundscapes.



Figure 12 Development and Summary of Soundscape of Buddhist Temples in China (Drawn by the author)

One of the most well-known examples is the soundscape of Guanyin Bodhisattva of the South Sea on Mount Putuo, Zhoushan, Zhejiang Province. This soundscape is a harmonious blend of natural and cultural sounds, embodying both ecological and spiritual significance (Chen, 2017).



Figure 13 Zhoushan Putuo Mountain, Zhejiang Province https://www.163.com/dy/article/FRKIH1CT0518W2M8.html

(1) Putuo Mountain Soundscape

From a natural soundscape perspective, Putuo Mountain is surrounded by the sea, and the sound of waves is one of its most distinctive natural sound elements. The waves crashing against the rocks and beaches produce "swish" and "rumbling" sounds, which vary with the tides and wind conditions, forming a dynamic and rhythmic natural symphony (Li & Zhang, 2019). These marine sounds not only establish a majestic maritime ambiance but are also closely linked to the local marine ecosystem, playing a crucial role in habitat and migration patterns of marine life (Chen, 2018).

Additionally, Putuo Mountain has a high forest coverage rate, creating an ideal habitat for birds. At dawn and dusk, birds sing melodiously, producing clear, vibrant calls that add natural vitality to the landscape. These varied bird songs highlight the biodiversity of Putuo Mountain, providing valuable ecological data for studying local bird species and environmental conditions (Wang, 2020).

From a religious soundscape perspective, Putuo Mountain is one of China's four sacred Buddhist mountains, featuring numerous temples where bells and chanting form the core of its human soundscape. The resonant bell sounds, echoing through the mountains, create a distinct acoustic phenomenon that reinforces the temple's solemn atmosphere while also carrying deep cultural and historical significance (Liu, 2017). The soft yet solemn chanting of monks fills the temple halls, interacting with the temple's spatial structure to produce a unique acoustic effect that offers spiritual comfort to devotees and tourists (Zhao, 2021).

At the Guanyin Bodhisattva of the South Sea Square, annual Buddhist cultural activities such as lamp-lighting ceremonies, mountain pilgrimages, and Dharma teachings take place. These ritual events generate a complex soundscape, blending chanting, ritual instrument sounds, and devotees' prayers, which together embody the vibrant religious atmosphere of Putuo Mountain (Xu & Han, 2016).

In summary, the soundscape of Putuo Mountain represents a harmonious fusion of natural and human elements, where marine, avian, and Buddhist sounds coexist to create an acoustically rich and culturally significant environment. These soundscapes hold ecological, historical, and cultural value, making them worthy of in-depth research and conservation efforts (Zhang, 2022).

(2) Hangzhou West Lake's Nanping Evening Bell

The soundscape of Nanping Evening Bell at West Lake is a unique blend of natural and human acoustics. Located in the Nanping Mountain area on the south bank of West Lake, the bell sound from Jingci Temple serves as the acoustic focal point. The geological features of Nanping Mountain, composed of limestone formations with numerous caves, enhance sound transmission. When the temple bell is struck, the oscillation frequencies travel through the rock formations, creating a natural amplifier effect that enhances the resonance (Fang, 2018). The bell sound carries across West Lake, reflecting off the igneous rock formations of Geling, generating an ethereal echo that lingers in the air (He & Sun, 2020).

Jingci Temple, a key structure in the Nanping Evening Bell soundscape, was originally built in 954 AD during the Later Zhou Dynasty and has undergone multiple reconstructions and restorations. The bell tower houses a massive bronze bell that stands three meters tall, 1.3 meters in diameter, and weighs ten tons. Its deep, resonant tone has been a vital part of Buddhist rituals at Jingci Temple and remains an integral element of West Lake's cultural heritage (Chen, 2019).

On New Year's Eve, Jingci Temple rings the bell 108 times, symbolizing blessings and renewal for the new year. The bell's reverberations fill the night sky, carrying people's aspirations and wishes for the future, making it one of Hangzhou's most cherished traditions (Wu, 2021).



Figure 14 Hangzhou West Lake's Nanping Evening Bell

https://touch.travel.qunar.com/comment/10163797435?bd_source=huodong_145

As one of the ten scenes of West Lake, the soundscape of Nanping Evening Bell not only embodies the natural beauty of Hangzhou but also carries rich historical and cultural connotations. Since the Southern Song Dynasty, Nanping Evening Bell has become the object of praise for literati and poets, and countless poems and songs have depicted the beauty of this soundscape. The bell sound has witnessed the changes and development of Hangzhou in the long river of history and has become an important symbol of Hangzhou culture. Today, Nanping Evening Bell is not only a must-visit place for tourists to visit West Lake but also an emotional in the hearts of the people of Hangzhou. The bell sound echoes in the sky of West Lake, telling the history of Hangzhou and carrying people's hopes and expectations for the future.

2.4 Identification of Pujiu Temple's Soundscape

2.4.1 Historical and Cultural Background of Pujiu Temple's Soundscape

Pujiu Temple is located on the Emei Plateau, 3 kilometers east of the ancient city of Puzhou, Yongji City, Shanxi Province, and was originally built during the reign of Wu Zetian in the Tang Dynasty. It was originally named Yongqing Yuan and is a Buddhist ten-direction temple (Li, 2018). Pujiu Temple became famous for the Yuan Dynasty Wang Shifu's "Cui Yingying Waiting for the Moon in the West Chamber," becoming a symbol of love culture (Zhang, 2019).

"The Romance of the West Chamber" is the representative work of the famous Yuan Dynasty drama writer Wang Shifu, with five volumes and twenty-one acts. The story tells the love story between the scholar Zhang Sheng (Zhang Junrui) and the prime minister's daughter Cui Yingying in Pujiu Temple (Wang, 2020). Zhang Sheng met Cui Yingying in Pujiu Temple and they fell in love at first sight. However, Cui Yingying's mother, Madam Cui, opposed their love due to class differences. With the help of the matchmaker, Zhang Sheng and Cui Yingying made a private vow. When Madam Cui found out, although she was angry, she finally agreed to their marriage under the persuasion of the matchmaker, but required Zhang Sheng to go to the capital for the imperial examination first. After Zhang Sheng became the top scholar, they finally overcame all difficulties and got married (Chen, 2021).



The Yingying Tower in the temple, originally named the Stupa of Relics, was renamed "Yingying Tower" because of the story of Cui Yingying in "The Romance of the West Chamber," and is famous for its unique echo effect "Pujiu Toad Sound" (Liu & Fang, 2017). The architectural layout of Pujiu Temple is a three-tiered platform with three axes of east, middle, and west, which is grand and unique. The temple not only has buildings closely related to the story of "The Romance of the West Chamber," such as the "West Chamber" where Zhang Sheng stayed and the "Pear Blossom Deep Courtyard" where Cui Yingying's family lived, but also has attractions such as the back garden. Pujiu Temple is not only a place for the spread of Buddhist culture but also a crystallization of ancient Chinese literature and architectural art, carrying rich historical and cultural value (Sun, 2022).

The Yingying Tower also has rich acoustic research value. The architectural form of the Yingying Tower is a brick and stone structure of a pavilion-style tower. Its special stepped construction plays a great role in the formation of the echo phenomenon. In 1988, Ding Shizhang and others clarified the converging effect of the tower eaves on sound based on actual measurement and acoustic analysis (Ding et al., 1988). In the same year, Chen Tong and Cai Xiulan found through measurement that the main reason for the frog-like echo of the Pujiu Temple Tower is that the sound waves reflected by each layer of the tower eaves reach the receiving point to form a continuous sound signal, and this continuous sound signal is similar to the actual recording of frogs, indicating that the tower eaves are the key elements in producing the frog sound (Chen & Cai, 1988). In 2015, Li Yunpeng systematically analyzed the architectural construction elements of tower echo buildings, and summarized the general rules for the production of "frog sound" echo in tower echo buildings (Li, 2015).

2.4.2 The Connection Between Pujiu Temple's Soundscape and Spirituality

The connection between the soundscape of Pujiu Temple and its spirituality can be explored from three aspects: the love story of The Romance of the West Chamber, the natural soundscape, and Buddhist connotations.

(1) The Connection Between the Love Story of The Romance of the West Chamber and Spirituality

Pujiu Temple is the place where the love story between Zhang Sheng and Cui Yingying in the Yuan Dynasty drama The Romance of the West Chamber took place. In the play, Zhang Sheng and Cui Yingying met and fell in love in Pujiu Temple, and the Yingying Tower (originally named the Stupa of Relics) witnessed their love (Wang, 1998). The echo effect of the Yingying Tower, known as "Pujiu Toad Sound," is not only a natural phenomenon but also endowed with the symbolic meaning of love. When visitors knock on the tower with a stone on the side, the tower emits a clear and pleasant sound, as if telling the touching love story between Zhang Sheng and Cui Yingying (Li, 2015). The combination of this soundscape and the love story makes Pujiu Temple a place of emotional resonance, where people feel not only the beauty of sound but also the spirituality and sanctity of love.

(2) The Integration of Natural Soundscape and Spirituality

Pujiu Temple is located on the Emei Plateau, with a high terrain and a broad view. The natural soundscapes in the temple are rich and diverse, including the echo of the Yingying Tower, the clear sound of wind chimes, and bird songs (Zhao, 2003). These natural sounds are integrated with the quiet atmosphere of the temple, creating a spiritual space that transcends the secular world. When people are in such an environment, their souls are easily purified and sublimated, feeling a harmonious resonance with nature and the universe (Chen, 2012). The integration of natural soundscapes and spirituality makes Pujiu Temple not only a religious sanctuary but also a place for spiritual cultivation.

(3) The Spiritual Manifestation of Buddhist Connotations in Pujiu Temple's Soundscape

Pujiu Temple is a Buddhist temple, and its architecture and soundscape contain profound Buddhist cultural connotations. In Buddhism, sound is considered an important tool for practice, which can guide people into a state of meditation and enlightenment (Xu, 2011). The echo effect of the Yingying Tower, "Pujiu Toad Sound," is not only a natural phenomenon but also regarded as a manifestation of Buddhist spirituality (Liu, 2016). This sound seems to convey the teachings of Buddhism, guiding people to reflect on life and purify the soul. In addition, the Buddhist cultural atmosphere of Pujiu Temple also gives its soundscape a transcendent spirituality. What people hear here is not only sound but also the transmission of Buddhist wisdom (Zhang, 2018).

2.5 Summary

This chapter primarily analyzes the definition and constituent elements of

soundscape, as well as the application and role of soundscape in different religious and cultural contexts. At the same time, this chapter also discusses in detail the spiritual characteristics of Zen and Pure Land in Chinese Buddhism and their impact on soundscape, and through the analysis of the historical and cultural background of Pujiu Temple's soundscape, reveals the close connection between its soundscape and spirituality, providing a theoretical basis for subsequent soundscape design and optimization.



Chapter 3 Research Methods

3.1 Introduction

Pujiu Temple, an ancient temple blending Buddhist and love cultures, hosts a culturally and historically significant soundscape.



(Drawn by the author)

This chapter conducts a comprehensive study of Pujiu Temple's soundscape using the multi-modal soundscape walk method. It begins with an analysis of the temple's spatial layout, detailing its architectural structure and soundscape design areas, highlighting its symmetry and hierarchical design. Next, it employs sound pressure level measurements and questionnaires to comprehensively assess the temple's soundscape environment. The results reveal distinct zoning characteristics of the soundscape, with high and low sound pressure level areas each having unique soundscape elements and visitor experiences. Based on these findings, zoning optimization, sound element enhancement, noise reduction, and technological integration strategies are proposed to improve the overall soundscape quality. Finally, subjective experiments validate the effectiveness of the soundscape optimization strategies, providing a scientific basis for further soundscape enhancement at Pujiu Temple.



(Drawn by the author)

Overall, this chapter offers valuable insights for the protection and enhancement of Pujiu Temple's soundscape and provides theoretical support and practical guidance for similar cultural Locations' soundscape design and management. At the Pine Forest Path, the sound of wind chimes integrates with the natural environment, creating a unique soundscape experience. The combination of the random collision of wind chimes and natural sounds not only intensifies the serene atmosphere but also guides visitors into meditation and reflection. Master Yineng highlights that the sound of wind chimes symbolizes the transmission of Buddhist teachings and the concept of impermanence, enabling people to perceive Buddhist wisdom and compassion within the interplay of natural and cultural sounds (Yineng, 2018). Moreover, at Pujiu Temple's Pine Forest Path, wind chimes also serve to repel birds, protecting the building and natural environment. Their sound becomes a bridge connecting nature and culture (Zhang, 2020).

3.2 Research Object and Overview

Pujiu Temple is situated on the Emei Plateau, 3 km east of the ancient city of Puzhou in Yongji City, Shanxi Province. Originally constructed during the reign of Empress Wu Zetian in the Tang Dynasty and initially named Yongqing Yuan, it is renowned for its long-standing Buddhist cultural tradition and its symbolic representation of love culture due to its close connection with the Yuan Dynasty drama "Cuiyingying Waits for the Moon in the West Chamber" by Wang Shifu. The temple's architectural layout and soundscape design fully reflect the integration of traditional Chinese culture and Buddhist spirit, making it a unique research object.



Figure 18 Aerial view and position relationship map of Pujiu Temple (Drawn by the author)

3.2.1 Main Buildings of Pujiu Temple

The temple's floor plan reveals a layout marked by distinct symmetry and hierarchical structure. The main tour routes and soundscape design areas are indicated by red dashed lines in the figure 19, as follows:

Mountain Gate Entrance: The main entrance for visitors to enter Pujiu Temple.

Bell Tower and Drum Tower: Important landmarks of the temple and key nodes in the soundscape design, with the sounds of the bells and drums playing a significant role in the temple's soundscape.



(Drawn by the author)

Pine Forest Path: A path winding through a pine forest, characterized by the natural sounds of pine waves and bird songs.

Frog Listening Pavilion: Famous for its unique echo effect and an important node in the temple's soundscape design.

West Chamber: The main place to experience the love story of "The Romance of the West Chamber."

Pagoda Courtyard Corridor: The main venue for Buddhist rituals and blessing activities in the temple.

Mahavira Hall: One of the most important buildings in the temple, where monks often chant scriptures and play ritual instruments.

Dead Wood Hall: Reflects the living functions of the temple.

Matchmaker Hall: Recreates the matchmaker's image and story scenes from "The Romance of the West Chamber" through soundscape design.

Refectory: Provides visitors with a place to rest and experience temple life. The platform map clearly marks and lays out the spatial structure and key areas of soundscape design of Pujiu Temple, providing an important reference for the subsequent soundscape optimization strategies.

3.2.2 Spatial Structure Characteristics of Pujiu Temple

The architectural layout of Pujiu Temple follows the principles of symmetry and axiality in traditional Chinese temples, with a rigorous and hierarchical structure. According to the provided platform map of Pujiu Temple, the temple mainly unfolds along three axes: the west axis, the central axis, and the east axis.

(1) West Axis

The west axis is one of the main tour routes of Pujiu Temple. Starting from the mountain gate and ascending along the 108 stone steps, visitors first arrive at the Bell Tower and Drum Tower. These two structures are not only important landmarks of the temple but also key elements in the soundscape design, with the sounds of the bells and drums occupying an important position in the temple's soundscape. Continuing along the west axis, visitors will pass through the Pine Forest Path, a path winding through a pine forest characterized by the natural sounds of pine waves and bird songs. The end of the west axis is the Frog Listening Pavilion, known for its unique echo effect and an important node in the temple's soundscape design.

(2) Central Axis

The central axis is the core area of Pujiu Temple, concentrating on the temple's

religious functions and cultural atmosphere. Starting from the "West Chamber" at the beginning of the central axis, visitors can experience the love story of "The Romance of the West Chamber." Moving forward, visitors will enter the Pagoda Courtyard Corridor, the main venue for Buddhist rituals and blessing activities in the temple. Visitors participating in religious ceremonies can experience the solemnity and sacredness of Buddhist rituals. The end of the central axis is the Mahavira Hall, one of the most important buildings in the temple, where monks often chant scriptures and play ritual instruments.

(3) East Axis

The east axis mainly reflects the living functions and cultural heritage of Pujiu Temple. Starting from the "Dead Wood Hall" at the beginning of the east axis, visitors can feel the tranquility and harmony of the temple. Moving forward, visitors will enter the "Matchmaker Hall." The end of the east axis is the Refectory, which provides visitors with a place to rest and experience temple life.

3.3 multi-modal soundscape Walk

The soundscape walk involves researchers traversing the Location on foot. Researchers immerse themselves in the auditory environment, meticulously capturing and recording the diverse sounds with appropriate equipment. During the soundscape walk at Pujiu Temple, researchers will hear sounds such as monks' chanting, the bell tower's bell sounds, the rustling of leaves in the wind, and occasional bird songs. Detailed records and descriptions are made of the specific locations, loudness, timbre characteristics, and duration of these sounds.

The "multimeasurement theory," also known as triangulation, involves combining different research theories and methods to analyze the same issue. Using this theory to improve the general soundscape walk forms the multi-modal soundscape walk

method, which includes three parts: questionnaire survey, "soundscape walk," and sound analysis. The questionnaire survey, combined with open-ended questions, can obtain people's subjective opinions on the sounds and pleasure of a specific location. During the "soundscape walk" process, group interview methods can be incorporated. Sound analysis mainly refers to the objective soundscape analysis of the research object, including the extraction and identification of soundscape elements, determination of sound pressure levels, and recording of the main sound characteristics.



This paper selects four Locations in Pujiu Temple for multi-modal soundscape walks. Figure 21 shows the specific locations of the four Locations, namely Location 1 Pine Forest Path (referred to as PFP), Location 2 Dream Return to the West Chamber (referred to as DWC), Location 3 Pagoda Courtyard Corridor (referred to as PCC), and Location 4 Echoes in the Mountain Valley (referred to as EIWV).

3.3.1 Objective Analysis of the Soundscape Environment at Pujiu Temple

Sound pressure level measurements were conducted at the four Locations (Figure 21). Three measurement points were selected at each Location, with the points relatively dispersed and equidistant to comprehensively represent the sound

pressure environment of the measurement Location. Each Location was measured once in the morning, afternoon, and evening using an Ai Hua 6228+ sound level meter.



Figure 21 Sound pressure level measurements at four soundscape design Locations (Drawn by the author)

The sound pressure level (SPL) test results of the four sites are presented in Figure 22. Among them, the mean SPL of site four (EIMV) is the lowest, at 42 dB. This is attributed to its location in the southeast corner of Pujiu Temple, where visitor density is low. Surrounded by walls on three sides, EIMV effectively blocks the noise from the temple's interior. Additionally, the front of EIMV faces a natural valley environment dominated by the sounds of wind and birds. The overall acoustic environment remains consistently quiet, resulting in minimal deviation of SPL measurements from the average value across different times.

In contrast, PCC, located at the center of Pujiu Temple, is the area with the highest visitor density. The average SPL here is 76 dB. Variations in visitor density throughout the day—morning, noon, and evening—lead to significant fluctuations in SPL measurements. Specifically, the SPL at noon is notably higher, exceeding 80 dB, indicating a particularly noisy period. In contrast, the SPL in the morning is significantly lower, falling below 65 dB. The high concentration of visitors in PCC generates substantial human-made noise, such as talking and laughter, which contributes to the elevated SPL.

DWC has a mean SPL of 58 dB, lower than that of PCC. Similar to PCC, the dispersion of SPL measurements at DWC is highly influenced by visitor density, resulting in considerable variability.

PDZP exhibits a relatively low SPL, with a mean value of 48 dB, indicating a generally quiet environment.



Figure 22 Box plot of sound pressure level measurement results for four Locations at Pujiu Temple (Drawn by the author)

Based on the sound pressure level measurement results for the four Locations and supplementary data from other areas of Pujiu Temple, this paper created a sound

pressure level distribution map for Pujiu Temple, as shown in Figure 23. It can be seen that PFP and EIMV are in low sound pressure level areas, while DWC and PCC are in high sound pressure level areas. Therefore, the four design areas can be divided into high and low sound pressure level zones according to their sound pressure levels, providing guidance for the subsequent soundscape design.



Figure 23 Sound pressure level distribution map of Pujiu Temple (Drawn by the author)

As shown in figure 24, location 1 Pine Forest Path (PFP) and Location 4 Echoes in the Mountain Valley (EIWV) are areas with low sound pressure levels, which are closely related to the Zen Buddhist concept of "emptiness". In Zen Buddhism, "emptiness" emphasizes that all things lack inherent self - nature, and all phenomena are temporary and interdependent. This concept is reflected in the soundscape as the acoustic characteristics of natural tranquility. For example, the sound of the wind in

the pine forest and the echo in the valley not only create a peaceful atmosphere but also guide people to experience the inner peace and harmony with nature pursued by Zen.



Figure 24 Sound Pressure Level Measurement and Classification of Locations (Drawn by the author)

In contrast to the low sound pressure level areas, Location 2 Dream of the Western Chamber (DWC) and Location 3 Pagoda Courtyard Corridor (PCC) exhibit high sound pressure levels, which are closely related to the "existence" cultural attribute of Pure Land Buddhism. As shown in Figure 25, these high sound pressure level soundscapes reflect the philosophical concept of "existence" in Pure Land Buddhism, which emphasizes the manifestation of faith through concrete rituals and sonic practices.

In Pure Land Buddhism, "existence" highlights the pursuit of rebirth in the Pure Land through rituals such as reciting Buddha's name and chanting sutras. These rituals are typically accompanied by sounds, such as the chanting of sutras, recitation of Buddha's name, and the ringing of bells. These sounds are not only integral to religious ceremonies but also serve as a means for believers to express their faith and emotions. Thus, the high sound pressure level areas reflect the "existence" cultural attribute of Pure Land Buddhism, demonstrating the importance believers place on strengthening their faith and practicing religious rituals through sound.

This soundscape not only enhances the religious experience but also enables visitors to more deeply appreciate the connotations and power of Buddhist culture. In contrast, the low sound pressure level areas are associated with the Zen Buddhist concept of "emptiness," which emphasizes that all things lack inherent self-nature and that all phenomena are temporary and interdependent. This concept is reflected in the soundscape as acoustic features of natural tranquility, such as the sound of the wind in the pine forest and the echo in the valley, creating a peaceful atmosphere that guides people to experience the inner peace and harmony with nature pursued by Zen.



Figure 25 Relationship between geographical location and Buddhist philosophy. (Drawn by the author)

3.3.2 Subjective Analysis of the Soundscape Environment at Pujiu Temple

The subjective evaluation analysis of Pujiu Temple's soundscape was conducted via 200 questionnaires, covering semantic differential evaluation of the overall soundscape and subjective preference for individual elements. The collected questionnaire data were analyzed.



📕 Location 1 Pine Forest Path 🛛 🌒 Location 2 Dream of the Western Chamber 🔺 Location 3 Pagoda Courtyard Corridor 🔍 Location 4 Echoes in the Mountain Valley

Figure 26 Radar chart of semantic differential evaluation results for five pairs of

adjectives at Pujiu Temple

(Drawn by the author)

(1) Semantic Differential Evaluation of the Overall Soundscape of Pujiu Temple

The semantic differential survey of Pujiu Temple used the Semantic Differential (SD) method and a 5-point single-factor Likert scale, with adjective pairs scored as follows: very poor (1), somewhat poor (2), neutral (3), somewhat good (4), and very good (5). A total of 40 adjective pairs were collected in the preliminary stage of the study, and after scoring by landscape experts, the final five pairs of oppoLocation adjectives related to the characteristics of the Pujiu Temple Location and spirituality were determined: Quiet—Noisy, Natural—Man-made, Religious—Secular, Cultural—Acultural, and Open—Closed. The survey results are shown in Figure 26.

In the Quiet—Noisy semantic differential pair, both EIMV and PFP were perceived as quieter, while DWC and PCC were perceived as noisier, indicating consistency between visitors' subjective feelings and the sound pressure level measurement conclusions mentioned earlier. In the Natural—Man-made semantic differential pair, PFP received the highest score, falling between somewhat natural and very natural. PCC, being an artificial architectural environment, had results between very Manmade and somewhat Man-made. EIMV's results leaned towards natural, while DWC leaned towards Man-made. In the Religious—Secular semantic differential pair, PFP, being primarily a natural environment lacking religious landscape features, scored lower, close to the Secular attribute. In contrast, PCC, influenced by the core architecture of Pujiu Temple, such as the Yingying Tower, had the highest religious attribute. DWC and EIMV had more balanced results. In the Cultural—Acultural semantic differential pair, DWC scored the highest in Cultural attribute due to the story background of "The Romance of the West Chamber." PFP and EIMV, dominated by natural landscapes, had lower cultural scores, while PCC also had a higher score. In the Open—Closed semantic differential pair, PFP and EIMV, being in open outdoor environments, had higher Open attributes, explaining their perceived quietness. In contrast, DWC and PCC, being in indoor enclosed spaces, had noisier soundscapes.



Figure 27 Classification of three types of soundscape elements and noise (Drawn by the author)

(2) Subjective Preference Evaluation of Soundscape Elements

The subjective preference evaluation for soundscape elements and noise at Pujiu Temple was divided into 7 levels, represented by numbers indicating different satisfaction levels: 3: very satisfied; 2: quite satisfied; 1: somewhat satisfied; 0: neutral; -1: somewhat dissatisfied; -2: very dissatisfied; -3: extremely dissatisfied. The mean satisfaction evaluation results from the 200 questionnaires are shown in the heatmap in Figure 28. For ease of calculation, all evaluation scores were increased by 4, resulting in an evaluation range of (1, 2, 3, 4, 5, 6, 7), with higher scores indicating higher satisfaction levels and increasing red intensity, while lower scores indicate lower satisfaction levels and increasing blue intensity.



Figure 28 Heatmap of satisfaction evaluation results for soundscape elements and

(Drawn by the author)

noise
From the heatmap evaluation results in Figure 28, it can be seen that the 6 noise elements had low satisfaction values, predominantly showing blue, indicating that visitors were averse to all types of noise. Among them, the sound of people talking received extremely low satisfaction scores in all four Locations, indicating that the noise from visitors' conversations was a key factor in reducing satisfaction evaluations. Additionally, the sound of mobile phones also received low soundscape satisfaction evaluations in PFP, PCC, and EIMV. The sound of car engines had low evaluations in PFP, suggesting that this outdoor open Location was susceptible to car engine noise.

In PFP, there were 8 soundscape elements with the highest satisfaction evaluation results and scores greater than 5, namely bird, wind, stream, rustle of leaves, drum, guzheng, wind chime, and synthesizer effect, with the highest score of 6.96 for wind chime. In DWC, the soundscape elements with the highest satisfaction were drip, guzheng, synthesizer effect, flute, guqin performance, and Peking Opera, with flute scoring 6.89. In PCC, the main soundscape elements were bird, drum, monk's bowl, wind chime, wooden fish, chanting, and prayer, with chanting and prayer having the highest scores. This is because visitors enjoyed experiencing the rich Buddhist ritual atmosphere in PCC. In EIMV, there were only three soundscape elements with scores greater than 5, namely monk's bowl, bell, and qing, indicating that visitors preferred a quiet soundscape in this area.

3.4 Soundscape Design Strategies for Pujiu Temple

Based on the subjective and objective analyses, we propose the following four soundscape design strategies. Wind chimes are an effective soundscape element that can enrich the Buddhist cultural atmosphere and spiritual experience of a site. During the design phase, their placement can be carefully planned to harmonize with the natural environment and create a cohesive soundscape. Master Yineng's research shows that the sound of wind chimes can enhance the religious atmosphere and guide people into meditation and reflection, thereby improving the overall soundscape effect (Yineng, 2018). Furthermore, wind chime design can be combined with modern soundscape technology, such as synthesized sound effects, to enhance their expressiveness and infectivity in soundscape design (Wang, 2019).

3.4.1 Zoning Optimization

(1) High Sound Pressure Level Areas (DWC and PCC)

Crowd Management: Given the high visitor density and noise levels, strategies to manage and disperse crowds should be implemented.

Sound Absorbing Materials: Installing sound-absorbing materials (such as soft wall coverings or special flooring) in PCC to reduce visitor noise reverberation and enhance the clarity of religious ritual sounds.

Noise Source Control: In DWC, signs should be placed to remind visitors to keep quiet and reduce the use of loud electronic devices to minimize human-made noise.

(2) Low Sound Pressure Level Areas (PFP and EIMV)

Sound Enrichment: In the relatively quiet EIMV area, subtle natural sound elements such as wind chimes or small water features could be introduced to enhance the sense of tranquility without disrupting the overall peaceful atmosphere.

Protection of Natural Soundscape: In PFP, efforts should be made to preserve the existing pine forest natural soundscape. For example, excessive construction or human intervention should be avoided to maintain the area's natural sound characteristics.

3.4.2 Sound Element Enhancement

(1) Natural Sound Elements

Birdsong and Wind Sounds: Across all areas, particularly PFP and EIMV, natural habitats that attract birds should be maintained and enhanced to ensure a continuous pleasant birdsong. Additionally, planting more trees or shrubs that produce pleasant wind sounds should be considered.

Water Sounds: More water-related sound elements should be added in suitable locations. For example, a stream or fountain could be designed in the DWC area, or water sound background could be combined with existing cultural elements to provide a soothing water soundscape.

(2) Buddhist-Related Sound Elements

Chanting and Instrument Sounds: The quality and propagation of chanting and Buddhist instrument sounds should be improved in PCC. This could be achieved by using better audio equipment to ensure clear audibility without being overly loud and intrusive.

Ritual Sound Experiences: More interactive Buddhist sound experiences should be created within the temple. For example, visitors could be guided by monks to participate in simple chanting or instrument playing activities to deepen their understanding and appreciation of Buddhist culture.

3.4.3 Noise Reduction

(1) Human-Made Noise

Education and Awareness: Activities should be conducted to educate visitors about the importance of maintaining quietness and respecting the soundscape environment in the temple. This could be achieved through signs, brochures, or announcements.

Designated Quiet Areas: Specific areas should be clearly marked as quiet zones, requiring visitors to keep their voices extremely low. These areas could be EIMV and

PFP to maintain their tranquil soundscapes.

(2) Environmental Noise

Barriers and Buffers: In areas affected by external environmental noise (such as those near roads or other noise sources), noise barriers or trees should be planted as buffers to reduce unwanted noise entering the temple.

3.4.4 Technological Integration

Audiovisual Technology: Audiovisual technology should be utilized to enhance cultural experiences related to sound. For example, in the DWC area, multimedia displays could be set up to introduce the story of "The Romance of the West Chamber," accompanied by appropriate sound effects and music to create a more immersive atmosphere.

3.5 Subjective Experiments

To further validate the effectiveness of the soundscape strategies, a threedimensional model of Pujiu Temple was constructed to simulate the Location conditions and acoustic characteristics. The actual soundscape of Pujiu Temple was recorded and labeled as Scheme O. A soundscape optimization Scheme D was designed based on Scheme O, suppressing the noise in O, enhancing bird songs and wind sounds, and improving the effects of chanting and instrument sounds.

The soundscape satisfaction evaluation experiment was conducted in an indoor environment (free from external interference) with the same group of participants rating the satisfaction of both soundscape schemes. Figure 29 shows the listening process of the participants, who were first exposed to the original soundscape of Pujiu Temple and then to the optimized Scheme D soundscape through a virtual model video.



Figure 29 Experimental workshop (Drawn by the author) Table 1 Subjective experiment results for soundscape strategy

	Subjective experiment scores				
20	PFP	DWC	PCC	EIMV	
0	0.47	0.42	0.57	0.53	
D	0.92	0.84	0.89	0.91	
D/O	1.96	2.00	1.56	1.71	

The normalized scores from eight participants are shown in Table X. Scheme D scored significantly higher than the original soundscape O in all four scenarios, with the score multiples exceeding 1.5. This indicates that Scheme D was clearly superior to the original soundscape in all four areas, validating the effectiveness of the soundscape optimization strategy.

3.6 Summary

This chapter provides a comprehensive study of Pujiu Temple's soundscape using the multi-modal soundscape walk method. It begins with an analysis of the temple's spatial layout, detailing its architectural structure and soundscape design areas, highlighting its symmetry and hierarchical design. Next, it employs sound pressure

level measurements and questionnaires to comprehensively assess the temple's soundscape environment. The results reveal distinct zoning characteristics of the soundscape, with high and low sound pressure level areas each having unique soundscape elements and visitor experiences. Based on these findings, zoning optimization, sound element enhancement, noise reduction, and technological integration strategies are proposed to improve the overall soundscape quality. Finally, subjective experiments validate the effectiveness of the soundscape enhancement at Pujiu Temple. Overall, this chapter offers valuable insights for the protection and enhancement of Pujiu Temple's soundscape and provides theoretical support and practical guidance for similar cultural Locations' soundscape design and management.



Chapter 4 Design and Development

4.1 Introduction

This chapter translates the theoretical insights from prior sections into actionable strategies through the soundscape design of four key Locations in Pujiu Temple. The soundscape design process involves five stages: Location analysis, target setting, element selection, design implementation, and on-Location integration with noise control. While complete noise elimination is unfeasible in the open-air Pujiu Temple, strategic design and management can significantly mitigate noise, enhancing soundscape quality.

Chapter 3 utilized the multi-modal soundscape walk method to thoroughly analyze Pujiu Temple's soundscape, elucidating its characteristics and visitors' subjective experiences. Specifically, questionnaires gathered extensive data on visitors' perceptions of various soundscape elements, visually represented via radar charts to identify preferences and satisfaction levels. These results underpin the theoretical framework and guide the practical application of soundscape design in this chapter.

Building on the literature review, this study scrutinized the current state and gaps in soundscape research, applying Chapter 3's theoretical insights to Pujiu Temple's soundscape design to validate its enhancement of spiritual experiences. As an important venue for the dissemination of Buddhist culture, the soundscape design of Pujiu Temple needs to integrate natural and cultural backgrounds while taking into account visitors' spiritual experiences and cultural identification. This chapter targets four Locations—Pine Forest Path, Dream Return to the West Chamber, Pagoda Courtyard Corridor, and Echoes in the Mountain Valley—tailoring soundscape design and optimization to their unique features. The findings offer practical guidance for optimizing Pujiu Temple's soundscape and serve as a reference for other Buddhist temple designs.



Figure 30 Design and development of four location (Drawn by the author)

This chapter aims to systematically enhance Pujiu Temple's soundscape, enriching its spiritual experience as a Buddhist cultural Location and providing innovative approache

4.2 Analysis of Location Characteristics

4.2.1 Location 1: Pine Forest Path

1. Location Description: The Pine Forest Path is located on the side of the summit of Pujiu Temple and is a 300 - meter - long, 6 - meter - wide winding stone path situated in an open outdoor space. The Location is dominated by natural landscapes, with the primary soundscape elements being the rustling of the wind through the pine forest and the chirping of birds among the trees. The sound - insulating effect of the pine forest results in a relatively low sound pressure level in the area, creating an overall quiet soundscape. However, visitors generally report that the length of the Pine Forest Path is excessive and the scenery monotonous, lacking appeal and prompting a desire to pass through quickly. Direct sunlight in summer

and cold winds in winter further diminish the desire for social interaction among visitors as they walk, thereby reducing the overall experience.

Design Development:

Location 1 Pine Forest Path ——Nature -Harmonious



Problems
1. It's a long way,
and the walking
experience is boring.
2. There's strong
wind here, but the
design doesn't
make use of the
site's features.
3. Tourists are
reluctant to stay
here.

 Design process

 1. Analysis of site characteristics

 2. Determine the direction of soundscape design

 3. Design source

 4. Selection of sound elements

Soundscape design
 Field application and

feedback

 Solution

 1. Enhance the soundscape design.

- 2.Use site features to introduce wind into the soundscape design.
- 3.Enhance the interactivity of the soundscape



Figure 31 The characteristics of location 1 (Drawn by the author)

desig

2. Soundscape Characteristics and Integration with Buddhist Connotations:

(1) Dominance of Natural Sounds and the Buddhist Concept of "Emptiness": The soundscape of the Pine Forest Path is primarily characterized by natural sounds, with wind and bird calls being the most representative. As the breeze brushes through the pine forest, the waves of sound from the pines interweave with the crisp chirping of birds, creating an atmosphere of tranquility and depth that evokes a sense of inner peace and harmony. This natural soundscape aligns with the Buddhist concept of "emptiness." The evergreen nature of the pines symbolizes resilience and eternity, while their swaying in the wind and the resulting sounds convey a sense of impermanence and ethereality. The growth of the pines, which relies on conditions such as soil, climate, and moisture, reflects the Buddhist notion of dependent origination. The wind, as a symbol of the dissemination of Buddhist teachings, offers

a unique opportunity for soundscape design in the Pine Forest Path. The sound of the wind can be transformed into an interactive experience that conveys the doctrine of "emptiness." The soundscape of the Pine Forest Path is mainly composed of the rustling produced by the wind blowing through the pines. This sound, known as "pine waves" in traditional Chinese gardens, is highly valued for its natural and serene qualities. The stone path of the Pine Forest, together with the surrounding pines, forms a tranquil and solemn picture that provides visitors with a spatial experience of transitioning from the hustle and bustle of the secular world to a serene spiritual realm. This natural soundscape is itself an embodiment of dependent origination: the wind is the cause, the sound of the pines is the effect, and the interaction between the wind and the pines produces the sound of the pine waves, a concrete manifestation of the Buddhist philosophical principle that "when this exists, that exists; when this arises, that arises."

(2) Low Sound Pressure Level and Zen Ambiance Creation: The overall sound pressure level is relatively low, with an average of 42 dB. This subdued volume level facilitates relaxation and immersion in Zen contemplation. The low sound pressure environment makes natural sounds more clearly audible, enhancing the tranquil atmosphere of the Zen path and making it easier for people to experience the inner peace and tranquility advocated by Buddhism.

(3) Rich Sound Layers and Natural Harmony: In addition to the wind and bird calls, occasional subtle natural sounds such as the rustling of leaves and the falling of pine cones can be heard. These sounds together form a rich and layered soundscape that fills the entire Zen path with vitality while maintaining a state of tranquility, reflecting the Buddhist concept of natural harmony.

3. Soundscape Design Objectives: Based on the above - mentioned Location characteristics and analysis of Buddhist connotations, the soundscape design aims to

enhance the natural sounds, such as wind, bird calls, and the crisp sound of wind chimes, to strengthen the spiritual awakening and inner peace pursued by Zen Buddhism. It seeks to create a harmonious coexistence soundscape where visitors can experience inner calm and harmony through natural sounds, thereby enhancing the appeal and visitor experience of the Location.

4.2.2 Location 2: Dream of the Western Chamber

1. Location Description: The Dream of the Western Chamber area is located in the central part of Pujiu Temple and is one of the most densely viLocationd areas by tourists. The area is themed around the folk culture of "The Romance of the West Chamber," with sculptures of characters from the story's plot.

Design Development:



Location 2 "Dream of the Western Chamber" Story- Dream like



Problems
1. There are only static character sculptures, without showing story plot.
2. There is an over- reliance on tour guides, and the visitors are not familiar with the key plots of "The Romance of the West Chamber."

Design process

2 Determine the direction

1. Analysis of site

of acoustic design

3. Design source

feedback

characteristics

1. According to the storyline, add soundscape prompt elements

Solution

2. Add human body sensors for remote audio

4. Selection of acoustic

elements 5. Sound design 6. Field application and



Figure 32 The characteristics of location 2

(Drawn by the author)

2. Soundscape Characteristics and Integration with Buddhist Connotations:

(1) Folk Culture Theme and the Buddhist Concept of "Existence": The soundscape of Dream of the Western Chamber is themed around the folk culture of "The Romance of the West Chamber." Only during special festivals at Pujiu Temple, such as the Spring Festival and summer vacation, can one hear melodious traditional Chinese music, operatic arias, or sound effects related to the story of "The Romance of the West Chamber." These sound elements evoke associations and emotional resonance with this classic literary work. From a Buddhist perspective, this rich cultural soundscape and narrative sounds echo the Pure Land Buddhism concept of "existence." Through the presentation of sound, the cultural experience and emotional resonance of visitors are enhanced, allowing them to feel the profound cultural heritage of Buddhism within the soundscape.

Table 2 Stories Related to The Romance of the West Chamber



(2) Soundscape Design and the Dissemination of Buddhist Culture: During the soundscape creation on special festivals, Buddhist culture and the folk culture of "The Romance of the West Chamber" intermingle. Through the medium of sound, visitors can appreciate the unique charm of Buddhist culture while enjoying the folk culture, further promoting the dissemination and inheritance of Buddhist culture.

3. Soundscape Design Objectives: Utilizing technologies such as human - body sensors to trigger relevant sound effects when visitors approach specific areas,

exploring sound and story through changes in physical space, and increasing visitor interactivity and participation. This approach allows for a more profound experience and understanding of the culture and spiritual connotations of "The Romance of the West Chamber." By incorporating the unique folk culture of "The Romance of the West Chamber," the cultural experience of visitors is enriched. They can feel a strong cultural atmosphere and emotional resonance within the soundscape, as if immersed in a dream - like story of the West Chamber, while also deepening their understanding and identification with Buddhist culture.



4.2.3 Location 3: Pagoda Courtyard Corridor

1. Location Description: The area for Pagoda Courtyard Corridor is located in the central part of Pujiu Temple and is the core area for Buddhist rituals and visitor blessing activities. The area is dominated by the sounds of religious ceremonies, creating a strong religious atmosphere.



Design Development:

Location 3 Pagoda Courtyard Corridor Prayer-Sacred



 Insufficient integration of sound, scenery, and people.
 Lack of respect for the venue: the prayer area is usually crowded and noisy
 No many participation in prayer

Problems

activities.

Design process 1. Analysis of site characteristics 2. Determine the direction of acoustic design 3. Design source

4. Selection of acoustic

elements 5. Sound design

 Field application and feedback

Figure 34 The characteristics of location 3

(Drawn by the author)

Solutions
1. Improve the
integration of sound,

scape and people.

2. Enhance the participation of blessing activities..



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2. Soundscape Characteristics and Integration with Buddhist Connotations:

(1) Religious Ceremony Sounds and the Pure Land Buddhism Concept of "Existence": The soundscape of Pagoda Courtyard Corridor is centered around the sounds of religious ceremonies, such as the deep and resonant bell sound and the low and soothing chanting. The bell sound, with its lingering resonance over the temple, conveys a sense of solemnity and reverence. The chanting, on the other hand, creates an atmosphere of tranquility and harmony, allowing people to experience spiritual purification and sublimation during the blessing process. This emphasis on religious ceremony sounds echoes the Pure Land Buddhism concept of "existence." Through the concrete presentation of sound, the religious experience and spiritual purification of visitors are enhanced, allowing them to feel the sanctity and solemnity of Buddhist faith within the soundscape. (2) Sound Pressure Level Control and Optimization of Religious Experience: To create a sacred and solemn atmosphere, the sound pressure level is generally maintained at a moderate level. This ensures that the sounds are clearly audible without being overly loud or harsh, allowing visitors to maintain a focused and devout mindset during the blessing process and to better engage in the religious ceremonies, thereby enhancing the quality of the religious experience.

3. Soundscape Design Objectives: By enhancing the sounds of religious ceremonies, such as bell and chanting sounds, the design aims to strengthen the sense of ritual and sacredness for visitors. This allows them to experience the profound cultural heritage of Buddhism and the power of religious faith within the soundscape, further promoting the rooting and inheriting of Buddhist faith in the hearts of visitors.

4.2.4 Location 4: Echoes in the Mountain Valley

1. Location Description: The Echoes in the Mountain Valley area is located in the southeast corner of Pujiu Temple, in a relatively secluded location with few visitors. The area is dominated by natural soundscapes, surrounded by valleys and natural landscapes, creating a tranquil environment suitable for meditation and reflection.

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Design Development:

Location 4 Echoes in the Mountain Valley Calm - Meditation



Problems 1. The environment is serene and the view is broad, but visitors stay for a short time, leading to a waste of space.

2. The design of this area does not integrate with Buddhist culture.

Design process 1. Analysis of site

- characteristics 2. Determine the direction of acoustic design
- 3. Design source
- 4. Selection of acoustic elements
- 5. Sound design

 Field application and feedback

Figure 35 The characteristics of location 4

(Drawn by the author)

Solutions

- 1. Make use of the field view, increase the design of meditation and prolong the stay time of tourists.
- 2. Add Buddhist culture to soundscape design.



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2. Soundscape Characteristics and Integration with Buddhist Connotations:

(1) Echo Effect and the Zen Concept of "Emptiness": Due to the unique topography and spatial structure of the Location, sounds produce a noticeable echo effect in the valley. When a sound is made, it reflects back and forth between the valley walls, creating a long and ethereal echo that gives a sense of mystery and depth. This echo effect resonates with the Zen concept of "emptiness," emphasizing a quiet and ethereal soundscape that helps practitioners experience the spiritual awakening and inner peace pursued by Zen.

(2) Tranquil Atmosphere and Meditation Guidance: The overall sound pressure level is low, with an average of 48 dB. The tranquility of the environment is a key feature. The subdued volume level makes the echo more clearly audible and also allows people to feel a sense of peace and harmony in the valley. This tranquil atmosphere helps people relax and engage in meditation and contemplation. Guided by the natural soundscape, it becomes easier for individuals to enter a meditative state and experience the Zen state of egolessness.

3. Soundscape Design Objectives: Based on the Location characteristics and Buddhist connotations, the soundscape design aims to enhance the spiritual experience of meditation. By creating a supportive meditative soundscape, it helps visitors more easily enter a meditative state and guides them through sound to experience egolessness. This allows visitors to feel inner calm and freedom within the soundscape, further enhancing their functional experience and value identification with the area.

Table 3 Conditions of the Four Locations

(Drawn by the author)

Location	Site	Soundscape Feature	Buddhist Connotation	Soundscape Design Goal
PFZP	Side of the summit of Pujiu Temple	Dominated by natural sounds, low sound pressure level, rich in sound layers	Reflection of Zen "emptiness," manifestation of dependent origination	Enhance the spiritual experience of harmonious coexistence
DWC	Center of Pujiu Temple	Prominent cultural sounds, fusion of natural and cultural sounds	Reflection of Pure Land Buddhism "existence"	Enhance the spiritual experience of dreams
PCC	Center of Pujiu Temple	Predominantly religious ritual sounds, moderate sound pressure level	Reflection of Pure Land Buddhism "existence"	Enhance the spiritual experience of sacred
EMV	Southeast corner of Pujiu Temple	Prominent echo effects, tranquil atmosphere	Reflection of Zen "emptiness"	Enhance the spiritual experience of meditation

4.3 Location 1: Design Output of Pine Forest Path

4.3.1 Selection of Soundscape Elements

In the soundscape design of the Pine Forest Path, this study identified the soundscape characteristics of the Pine Forest Path (PFP) area and visitors' subjective feelings based on the questionnaire results and radar chart scores from Chapter 3. When selecting wind chimes as a soundscape element, we considered their symbolic significance in Buddhist culture. Wind chimes not only produce pleasant natural sounds but also enhance the sanctity of the space (Kang & Zhang, 2010). According to relevant research, the sound of wind chimes can guide people into a meditative state, thereby enhancing the spiritual experience (Zhang & Kang, 2016).

For example, in South Korea's Haeinsa Temple, wind chimes are widely used in the temple's soundscape design, blending with the natural environment to create a unique religious atmosphere (Masuno, 2012). Our design draws on this successful case, strategically placing wind chimes so that their sound interweaves with pine waves and bird songs, forming a harmonious soundscape.Combining the data from Figures 27 and 28, the following matching soundscape elements were selected to fit the cultural and emotional characteristics of the Location:



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Table

(Drawn by the author)

Category	Sound Elements	Features of Soundscape Elements	Function	Application Sites	Soundscape Attributes	Classification of Emptiness and Existence
	Bird	Symbolize natural vitality and seasonal changes, randomness enhances spatial dynamism	Create a natural atmosphere, alleviate anxiety	Temple gardens, rest areas	Regular	Emptiness
Natural	Wind	Metaphor for impermanence and flow; dynamic changes enhance spatial openness	Symbolize the impermanence of Dharma, enhance spatial openness	Mountain gates, open squares	Occasional	Emptiness
Sounds	Stream	Metaphor for the flow of Dharma; rich acoustic textures enhance spatial layers	Complement water landscapes, enhance landscapes in natural immersion	Release ponds, dry landscape gardens, back gardens	Regular	Emptiness
	Rustle of leaves	Symbolize natural harmony, randomness enhances ecological authenticity	Create a natural immersive experience	Ancient tree groves, bamboo paths	Occasional	Emptiness
	Drum	Symbolize ritual summons and dispelling distractions; strong transient energy activates spatial dynamics	Ritual summons, dispel distractions	Dharma assembly ceremonies, in front of the Great Hall	Occasional	Existence
Buddhist	Guzheng	Symbolize cultural heritage: melodic nature bridges nature and culture	Cultural performances, bridge refined and popular aesthetics, connect past and present	Cultural exhibition halls, tea rooms, story exhibition halls	Added	Existence
Sounds	Wind Chimes	Symbolize the free flow of nature and spatial boundaries; random collisions enhance spatial layers	Markers of natural flow within space	Eaves, pagoda spires, wish-making areas, meditation zones	Added	Combination of emptiness and existence
	Synthesizer Effects	Symbolize modern spirituality and cross-media narratives; spatialized sound enhances experimental qualities	Modern spiritual experiences, cross-media narratives	Digital exhibition halls, soundscape installation areas	Added	Combination of emptiness and existence

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1.Existing Soundscape Elements

Natural sounds:

(1) Birdsong: According to Figure 26, PFP scores high on the "Natural" dimension, indicating visitors' preference for natural sounds. The heatmap in Figure 28 shows that the satisfaction score for birdsong in PFP is 5.41, greater than 5, falling into the extremely satisfied range. Birdsong symbolizes natural vitality and seasonal changes. Its randomness enhances the vitality of the space, creates a natural atmosphere, and helps alleviate anxiety. Consider protecting and optimizing the bird habitat to increase the richness and clarity of birdsong, further enhancing visitors' natural experience.

(2) Wind sound: Figure 26 shows that PFP scores high on the "Open" dimension, indicating that the openness of the area is suitable for the propagation of wind sounds. Figure 28 shows that the satisfaction score for wind sound in PFP is 6.39, falling into the extremely satisfied range. Wind sound has the metaphor of impermanence and fluidity. Its dynamic changes give the space a sense of permeability, symbolizing the impermanence of Buddhist teachings and enhancing the openness of the space. Vegetation and architectural layout can be planned reasonably to guide the flow of wind, making the wind sound richer and more layered.

(3) Stream sound: Figure 28 shows that the satisfaction score for stream sound in PFP is 6.64, falling into the extremely satisfied range. Stream sound symbolizes the flow and purification of Buddhist teachings. Its continuity can mask environmental noise, promote meditation focus, and create a tranquil atmosphere.

(4) Rustling of leaves: Figure 28 shows that the satisfaction score for the rustling of leaves in PFP is 6.57, falling into the extremely satisfied range. The rustling of leaves

symbolizes natural harmony. Its randomness enhances the sense of ecological authenticity and creates a natural immersive experience.

Buddhist sounds:

Drum sound: Figure 28 shows that the satisfaction score for drum sound in PFP is 6.37, falling into the extremely satisfied range. Drum sound symbolizes the summoning of rituals and the dispelling of distracting thoughts. Its strong transient energy activates the dynamics of the space and can be used for ritual summoning and dispelling distracting thoughts. The design selected a low - pitched drum that is closer to the characteristics of the Location, retaining the characteristic rhythm and reverb of the drum sound with a relatively lower sound pressure level. In practical application, the playback time and rhythm of the drum sound can be arranged reasonably according to the time and content of Buddhist rituals to enhance its guiding role in the soundscape.

Added soundscape elements:

(1) Guzheng sound: Figure 28 shows that the satisfaction score for guzheng sound in PFP is 6.49, falling into the extremely satisfied range. Guzheng sound symbolizes cultural heritage. Its melody connects nature and human culture and can be used for cultural performances to bridge the gap between elegance and vulgarity and link the past and present. Guzheng music can be played in specific time periods or areas, or guzheng performances can be added, allowing visitors to experience the charm of traditional culture while enjoying the natural soundscape.

(2) Wind chime sound: Figure 28 shows that the satisfaction score for wind chime sound in PFP is 6.96, falling into the extremely satisfied range. Wind chime sound symbolizes the natural flow within the space. Its random collisions enhance the spatial sense of the area and add to the soundscape, achieving a combination of

emptiness and form. Hanging wind chimes in suitable locations along the Pine Forest Path, the sound of the wind chimes will blend with the natural sounds according to the strength and direction of the wind, creating a unique soundscape effect.

(3) Synthesizer effects: Figure 28 shows that the satisfaction score for synthesizer effects in PFP is 6.55, falling into the extremely satisfied range. Synthesizer effects symbolize modern spirituality and cross - media storytelling. Their sound - image space enhances the sense of spatial reality. By reasonably using synthesizer technology, sound effects that match the atmosphere of the Location can be created, such as simulating changes in natural sounds and creating a mysterious atmosphere, providing visitors with a brand - new auditory experience.



(Drawn by the author)

3. Soundscape materials:

(1) Wind chimes: The introduction of wind chimes greatly enriches and expands the original soundscape system of the Pine Forest Path, while deeply embedding cultural and religious dimensions, endowing it with a more profound connotation. The wind chimes sway gracefully in the wind, and the crisp sounds they produce blend and echo with the grand sound of the pine waves, creating a new mode of harmonious

resonance between nature and human culture. According to Buddhist traditional concepts, the sound of wind chimes can be regarded as an alternative representation of chanting. With each gust of wind, the tinkling of the wind chimes is like the devout chanting of monks reading Buddhist scriptures, conveying the wisdom and compassion of the Buddha. From the perspective of the philosophy of dependent origination, the elements of wind, pine, bell, sutra, and vow are interrelated and interact with each other, jointly constructing a complete and rigorous chain of dependent origination: wind serves as the condition for origination, and the wind chime is the initial element arising from the combination of conditions. The two work together to produce sound as the result. This sound is both a harmonious sound of nature and a carrier for the dissemination of Buddhist teachings.



(Drawn by the author)

The wind chimes hanging on the Pine Path are made of copper. Copper bells have excellent corrosion resistance and are not afraid of erosion by rain and humid climates. Due to their unique material properties and exquiLocation shape design, they can easily resonate in a gentle breeze, producing crisp and dense sounds. This sound symbolizes the constancy and universality of Buddhist teachings, highlighting the eternity and vastness of the Dharma with its continuous melody. (2) Five - colored thread: Below the copper bell, five - colored thread is used to string wish - making plaques. The five - colored thread contains profound Buddhist cultural connotations, corresponding to the five types of wisdom in Buddhism, namely the wisdom of the nature of the Dharma realm, the wisdom of the great perfect mirror, the wisdom of equality, the wisdom of wonderful observation, and the wisdom of accomplishment. It also fits the concept of the inter - generation and inter - overcoming of the five elements in the cosmic view. The color matching and texture selection of the five - colored thread form a harmonious and vivid contrast with the surrounding natural environment, greatly enhancing the visual and auditory synesthetic experience of visitors. In the fusion of sound and color, people can more deeply perceive the unique charm of Buddhist culture.



Figure 38 Wish - Making Plaque (Drawn by the author)

(3) Wish - making plaque: To explore the impact of different - width wish - making plaques on the diversity of the soundscape and personalized expression under the same wind conditions, this study carefully designed and conducted an experiment to test three different - width wish - making plaques, as follows:

21cm×7cm: This wider wish - making plaque, when dancing in the wind, produces dense and continuous sounds, like the continuous flow of Buddhist teachings, leading visitors into a deeper state of contemplation and introspection, and feeling the profoundness and vastness of the Dharma.

21cm×3.5cm: The medium - sized wish - making plaque sways gracefully in the wind, and its sound presents a unique rhythm that is loose and spaced, just like the diverse and personalized expression of individual wishes, adding a touch of liveliness and personality to the soundscape, allowing visitors to find resonance with their own inner voices while listening.

21cm×2cm: The narrower wish - making plaque produces weak and barely perceptible sounds in the wind, and it is difficult to leave a clear mark in the soundscape.

Based on the experimental data and visitor feedback, this study ultimately selected the 21cm×7cm and 21cm×3.5cm sizes of wish - making plaques. The sounds played by these two sizes of wish - making plaques in the wind not only inject a rich sense of layering into the soundscape of the Pine Forest Path but also greatly enhance the interactivity and participation of visitors. On the wider wish - making plaques, the Buddhist scriptures copied by visitors sway gently in the wind, like the chanting of wisdom, guiding visitors towards deeper spiritual exploration. The medium - width wish - making plaques, on which visitors write their wishes with their own hands, have a loose and spaced sound that perfectly highlights the diversity and uniqueness of individual wishes, making each wish - making plaque a vocal carrier of the visitors' inner world.



Not only does it fully enhance the layering and richness of the soundscape, but it also shapes the Pine Forest Path into a highly interactive and deeply participatory soundscape space. From the philosophical height of dependent origination, the visitors' wishes and the monks' sutra chanting, with the help of the lively medium of wind chimes, blend with the gentle blowing of the wind to jointly draw a Zen - filled, dynamically emerging picture of dependent origination, profoundly demonstrating the profoundness and infinite charm of Buddhist philosophy of dependent origination. By skillfully applying these soundscape elements and design materials, the soundscape design of the Pine Forest Path presents a more diverse and rich appearance, creating an immersive, in - depth cultural and religious experience space for visitors. The soundscape design of the Pine Forest Path is not just a simple enhancement of environmental beautification or sensory experience. It is actually a vivid practice and profound embodiment of Zen. It creates a harmonious and tranquil environment where heaven and humanity are integrated, allowing visitors to truly experience the integration of nature and human culture while walking, which

coincides with the Zen pursuit of natural harmony. Zen pays particular attention to the awakening of the mind and inner peace. The crisp sound of the copper bell, the devout copying of Buddhist scriptures, and the sincere wishes of visitors all become powerful media to touch the soul and guide introspection. This ingenious design allows visitors to be subtly touched in the process of walking, gradually entering a state of Zen meditation, and achieving sublimation and transcendence of the soul under the influence and inspiration of the soundscape.

4.3.2 Soundscape Design Process and Application Outcomes

In the soundscape design of the Pine Forest Path, a four - stage design process is employed to guide visitors from the hustle and bustle of the secular world to a tranquil spiritual realm, experiencing the harmonious coexistence of nature and Buddhist culture. The detailed design and application outcomes of each stage are as follows:

 Table 5 Main and Auxiliary Soundscape Elements in Four Stages

 (Drawn by the author)

Stage	Main Soundscape Elements	Supporting Soundscape Elements
Start (0-3 sec)	Drum (A1)	Bird (B1), Wind (C1), Rustling leaves (D1)
Development (3-10 sec)	Wind chimes (A2)	Guzheng (B2), Wind (C2), Stream (D2)
Climax (10-20 sec)	Synthesizer effect (A3)	Wind chimes (B3), Rustling leaves (C3), Drum (D3)
Fall back (20-25 sec)	Bird (A4)	Wind (B4), Synthesizer effect (C4)

1. Initial Stage (0 - 3 seconds):

(1) Main soundscape element: Drum (A1)

(2) Auxiliary soundscape elements: Bird (B1), Wind (C1), Rustling of Leaves (D1)

(3) Design concept: The drum sound is used as the starting element. In Buddhist rituals, the drum sound holds significant symbolic importance. It not only dispels distracting thoughts but also quickly focuses the visitors' attention, creating a solemn and tranquil atmosphere. The strong transient energy of the drum sound acts like a symphony between nature and culture, activating the dynamics of the entire space. As visitors step into the Pine Forest Path, they experience a transition from the secular world to a pure land.

(4) Soundscape element combinations:

B1 (Bird): Bird sounds played at 0.5 times speed add a natural atmosphere, bringing a sense of peace reminiscent of early morning or quiet moments.

C1 (Wind): Gentle wind sounds add dynamism to the soundscape, simulating the soft breeze in a natural environment.

D1 (Rustling of Leaves): The rustling of leaves enriches the environmental soundscape, providing a natural feeling of being in a forest.

The main soundscape element A1 (Drum) is kept constant, while other soundscape elements B1 (Bird), C1 (Wind), and D1 (Rustling of Leaves) are varied in combination experiments. These experiments aim to guide the audience's emotions and experiences through different sound combinations, creating a layered and varied soundscape. Specifically:

A1 (Drum) + B1 (Bird): Creates a tranquil and vibrant morning scene.

A1 (Drum) + C1 (Wind): Provides a sense of tranquility with dynamic changes.

A1 (Drum) + D1 (Rustling of Leaves): Adds depth and naturalness to the soundscape.

A1 (Drum) + B1 (Bird) + C1 (Wind): Combines three sounds to create a lively and dynamic natural environment.

A1 (Drum) + B1 (Bird) + C1 (Wind) + D1 (Rustling of Leaves): Provides a comprehensive and rich natural environment, laying a solid foundation for the soundscape.

(5) Application results: Through on - Location testing, it was found that visitors' attention became significantly focused after hearing the drum sound, and their emotions gradually calmed down. This laid a good foundation for the subsequent soundscape experience. Visitor feedback indicated that the soundscape design of the initial stage effectively captured their attention, allowing them to quickly enter the state of soundscape experience and look forward to the subsequent stages.

Table 6 Soundscape Element Combination Experiment





2. Development Stage (3 - 10 seconds):

(1) Main soundscape element: Wind chime sound (A2)

(2) Auxiliary soundscape elements: Guzheng sound (B2), Wind sound (C2), Stream sound (D2)

(3) Design concept: The wind chime sound has the highest satisfaction score in PFP and is suitable as the main soundscape element. The wind chime sound resonates with the wind sound, as if it is a dialogue between nature and culture, enhancing the sense of spatial layering and permeability. The random collisions of the wind chime sound symbolize the impermanence and harmony of nature, guiding visitors to further relax and immerse themselves in the integration of nature and Buddhist culture. The addition of guzheng sound adds a sense of harmony between culture and nature to the soundscape. The melody of the guzheng sound resonates with the random collisions of the wind chime sound, enhancing the cultural depth and natural beauty of the soundscape.

(4) Soundscape element combinations:

B2 (Guzheng): The melodious sound of the guzheng adds a cultural atmosphere, giving a sense of tranquility and depth.

C2 (Wind): The continuous presence of wind sound, combined with the wind chime sound, enhances the natural feeling of the soundscape.

D2 (Stream): The stream sound played at 0.4 times speed provides a continuous natural background music for the soundscape, increasing the sense of tranquility in the environment.

The main soundscape element A2 (Wind chime) is kept constant, while other soundscape elements B2 (Guzheng), C2 (Wind), and D2 (Stream) are varied in combination experiments. These experiments aim to guide the audience's emotions and experiences through different sound combinations, creating a layered and varied soundscape. Specifically:

A2 (Wind chime) + B2 (Guzheng): Creates a feeling of harmony between culture and nature.

A2 (Wind chime) + C2 (Wind): Provides a fresh and tranquil feeling.

A2 (Wind chime) + D2 (Stream): Increases the fluidity and natural beauty of the soundscape.

A2 (Wind chime) + B2 (Guzheng) + C2 (Wind): Creates a culturally rich and naturally harmonious environment.

A2 (Wind chime) + B2 (Guzheng) + C2 (Wind) + D2 (Stream): Combines cultural and natural sounds to create a culturally rich and naturally harmonious environment.

 Table
 7 Soundscape
 Element
 Combination
 Experiment



(5) Application results: During the development stage, visitors' emotions gradually relaxed, and they began to actively explore the surrounding soundscape. Observations and questionnaire surveys found that visitors showed high interest and satisfaction with the combination of wind chime sound and guzheng sound. They

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believed that this combination created a tranquil and culturally rich atmosphere, allowing them to more deeply experience the integration of nature and Buddhist culture. Visitor feedback indicated that the soundscape design at this stage made them feel physically and mentally pleased and enhanced their understanding of the integration of nature and Buddhist culture.

3. Climax Stage (10 - 20 seconds):

(1) Main soundscape element: Synthesizer effects (A3)

(2) Auxiliary soundscape elements: Wind chime (B3), Rustling of leaves (C3), Drum (D3)

(3) Design concept: Synthesizer effects have a very high satisfaction score in PFP and are suitable as the main element for the climax stage. Synthesizer effects enhance the sense of spatial reality and layering through the expansion of sound - image space, making visitors feel as if they are in a modern - technology - filled Buddhist world. This design not only reflects the inclusiveness of Buddhist culture but also demonstrates the perfect combination of modern technology and traditional culture. The addition of wind chime sound and rustling of leaves further enhances the natural atmosphere, allowing visitors to feel the vitality and harmony of nature. The continuous presence of drum sound enhances the dynamics of the soundscape, making visitors feel a sublimation from the inside out.

(4) Soundscape element combinations:

B3 (Wind chime): The variation of wind chime sound simulates the interaction between wind and wind chimes, enhancing the dynamics of the soundscape.

C3 (Rustling of leaves): The rustling of leaves enhances the natural atmosphere, making visitors feel the vitality and harmony of nature.

D3 (Drum): The continuous presence of drum sound provides a stable rhythmic base for the soundscape.

The main soundscape element A3 (Synthesizer effects) is kept constant, while other soundscape elements B3 (Wind chime), C3 (Rustling of leaves), and D3 (Drum) are varied in combination experiments. These experiments aim to guide the audience's emotions and experiences through different sound combinations, creating a layered and varied soundscape. Specifically:

A3 (Synthesizer effects) + B3 (Wind chime): Creates a modern and mysterious feeling.

A3 (Synthesizer effects) + C3 (Rustling of leaves): Provides a modern and natural feeling.

A3 (Synthesizer effects) + D3 (Drum): Increases the depth and rhythm of the soundscape.

A3 (Synthesizer effects) + B3 (Wind chime) + C3 (Rustling of leaves): Creates a modern, mysterious, and natural soundscape.

A3 (Synthesizer effects) + B3 (Wind chime) + C3 (Rustling of leaves) + D3 (Drum): Simulates the interaction between humans and nature, creating a dynamic and emotionally rich soundscape.

Application results: The soundscape design at the climax stage brought strong emotional experiences to visitors. Many visitors reported feeling a spiritual shock and sublimation at this stage. Field tests found that the combination of synthesizer effects and natural soundscape elements effectively evoked emotional resonance among visitors, allowing them to more deeply experience the connotations and charm of Buddhist culture. Visitor feedback indicated that the soundscape design at this stage made them feel spiritually shocked and enhanced their understanding of Buddhist culture.

Table 8 Soundscape Element Combination Experiment



(Drawn by the author)

(3) Design concept: Bird sound has a high satisfaction score in PFP and is suitable as the main element for the decline stage. The randomness and naturality of bird sound make visitors feel a return from the inside to nature, as if they have found a tranquil piece of land in the hustle and bustle of the secular world. The continuous presence of bird sound not only enhances the natural atmosphere but also provides a spiritual comfort for visitors. The addition of wind sound further enhances the natural atmosphere, making visitors feel the flow and change of nature. The gradual

⁽²⁾ Auxiliary soundscape elements: Wind sound (B4), Synthesizer effects (C4)

weakening of synthesizer effects symbolizes the end of the soundscape, allowing visitors to end this soundscape experience in tranquility.

(4) Soundscape element combinations:

B4 (Wind): The return of wind sound emphasizes the cycle and continuity of natural sounds.

C4 (Synthesizer effects): The gradual weakening of synthesizer effects symbolizes the end of the soundscape.

The main soundscape element A4 (Bird) is kept constant, while other soundscape elements B4 (Wind) and C4 (Synthesizer effects) are varied in combination experiments. These experiments aim to guide the audience's emotions and experiences through different sound combinations, creating a layered and varied soundscape. Specifically:

A4 (Bird) + B4 (Wind): Creates a tranquil and harmonious atmosphere.

A4 (Bird) + C4 (Synthesizer effects): Provides a tranquil and modern feeling.

A4 (Bird) + B4 (Wind) + C4 (Synthesizer effects): Provides a peaceful and profound ending to the soundscape through the cycle of natural sounds.

Application results: The soundscape design at the decline stage effectively helped visitors gradually calm down from the emotional excitement of the climax stage, allowing them to end the entire soundscape experience with a peaceful mindset. Visitor feedback indicated that at the decline stage, they could feel inner peace and satisfaction, leaving a deep impression on the entire soundscape experience. Visitor feedback showed that the soundscape design at this stage made them feel calm inside and satisfied with the entire soundscape experience.



Table 9 Soundscape Element Combination Experiment

(Drawn by the author)



Figure 40 Final Design of Location 1

(Drawn by the author)
4.3.3 Soundscape Layout and Calibration

In the soundscape design of the Pine Forest Path, the layout and calibration of the soundscape are key to ensuring the presentation of the design effects.





Number of sound sources: 10 Figure 41 Sound Source Location Map (Drawn by the author)

1. Sound Source Layout

(1) Sound source location selection: 10 sound sources are evenly distributed on both sides of the Pine Forest Path, hidden in trees. This layout not only ensures even sound distribution but also prevents visitors from directly seeing the sound sources, enhancing the naturality and mystery of the sound. The location of the sound sources takes into account the distribution and height of the trees to ensure that the sound can be effectively transmitted to the entire area.

(2) Sound source equipment selection: Selecting appropriate sound source equipment is key to ensuring the quality of the soundscape. The following equipment is mainly used in the Pine Forest Path:

Audio equipment: Used to play natural sounds such as drum sound, bird sound, wind sound, rustling of leaves, as well as cultural sounds such as guzheng sound and

synthesizer effects. The audio equipment should have good sound quality and volume control functions to ensure the clarity and comfort of the sound.

Wind chimes: As a supplement to natural sounds, wind chimes are hung on trees and produce crisp sounds as they sway in the wind. The selection of wind chimes should consider their material and shape to ensure the naturality and aesthetic of the sound.

Drum: As one of the main soundscape elements, the drum is set in the position of the bell and drum tower at the entrance to attract visitors' attention.

Spatial layout optimization: The layout of the sound sources takes into account the walking route and stopping points of visitors to ensure that visitors can experience a rich soundscape at different locations.

2. Soundscape Calibration

(1) Sound calibration: Adjust the frequency, volume, timbre, and other parameters of the sound to ensure the clarity, fullness, and layering of the sound. For drum sound, adjust its low - frequency part to make it deeper. For bird sound and wind sound, increase their high - frequency part to make them clearer and more pleasant to the ear.

(2) Soundscape effect calibration: After the completion of the soundscape layout, observe whether the soundscape effect meets the expectation. Collect their feedback and further adjust and optimize the soundscape based on the feedback.



Figure 42 Visitor Feedback (Drawn by the author)

4.3.4 SWOT Analysis

A SWOT analysis of the soundscape design for the Pine Forest Path is conducted to assess its internal strengths and weaknesses, as well as external opportunities and threats, thereby informing optimization strategies.

Location 1 Pine Forest Path





(Drawn by the author)

Strengths: The Pine Forest Path boasts abundant natural sounds, such as wind and bird calls, which are highly random and natural, laying a solid foundation for soundscape design. As part of Pujiu Temple, it is closely connected to Buddhist culture. Wind chimes, with their special symbolic significance in Buddhism, can guide people into meditation and reflection, adding depth to the design. The path's open, outdoor layout, stretching 300 meters by 6 meters, is conducive to sound propagation and reverberation, enhancing the soundscape's richness and spatial quality.

Weaknesses: The current soundscape is dominated by natural sounds, lacking diversity and change. Apart from occasional tourist chatter, few other human - made sounds exist, making the soundscape monotonous. Tourists find the path too long and scenically uninteresting, leading to a desire to pass through quickly and reducing dwell time and experience. Additionally, the open-air environment exposes soundscape equipment to natural erosion, increasing maintenance difficulty and costs.

Opportunities: Technological advancements allow the use of audio equipment to play natural sounds like bird chirping and wind, strengthening the natural atmosphere. Wind chimes and other elements can be introduced to add layers to the soundscape. The rich Buddhist and love cultures of Pujiu Temple can be tapped into, with stories and doctrines presented through sound. For instance, inscribing Buddhist scriptures or love stories on wind chimes can deepen visitors' cultural experience. Human - body sensing technology can trigger sound effects as visitors approach specific areas, boosting interactivity and engagement.

Threats: The open location of the Pine Forest Path makes it susceptible to environmental noise from nearby roads and temple activities, potentially disrupting the soundscape and diminishing visitor experience quality. Soundscape equipment in outdoor settings is prone to damage from natural elements like wind and rain, increasing maintenance challenges. Over - commercialization, such as excessive advertising audio or artificial sounds, may disrupt the natural and cultural ambiance of the Pine Forest Path, conflicting with the temple's spiritual and cultural goals.

4.3.5 Summary

Through the soundscape design practice of the Pine Forest Path in Pujiu Temple, this study successfully transformed the theoretical research results of the previous stage into practical and feasible strategies. Through the four stages of the soundscape design process, visitors experienced different emotions and experiences at different stages, from the concentration of attention at the initial stage, to the relaxation of body and mind at the development stage, to the spiritual shock at the climax stage, and finally to the inner peace and satisfaction at the decline stage. The layout and calibration of the soundscape further optimized the soundscape effect, guiding visitors from the hustle and bustle of the secular world to a tranquil spiritual realm, experiencing the harmonious coexistence of nature and Buddhist culture.

4.4 Location 2: Design Output of Dream of the Western Chamber

4.4.1 Selection of Soundscape Elements

In the soundscape design of "Dream of the Western Chamber," the selection of soundscape elements is crucial. It needs to not only fit the cultural background of the literary work "The Romance of the West Chamber" but also evoke emotional resonance among visitors. Specifically, the selected soundscape elements include natural sounds, Buddhist-related sounds, and cultural sounds. In terms of natural sounds, such as bird chirping, wind, and water sounds, these sounds can create a tranquil and natural atmosphere, making visitors feel as if they are in the natural environment where the story takes place. Buddhist-related sounds include chanting, bell, and wooden fish sounds, which not only reflect the Buddhist cultural

characteristics of Pujiu Temple but also enhance visitors' experience of Buddhist rituals. Cultural sounds mainly include traditional musical instruments related to "The Romance of the West Chamber," such as Peking Opera singing, guzheng, and guqin. These sound elements can evoke visitors' memories of the story, enhancing the depth of the cultural experience:



 Table 10 Selection of Soundscape Elements

 (Drawn by the author)

Sound E	lements	Features of Soundscape Elements	Function	Application Sites	Soundscape Attributes	Classification of Emptiness and Existence
D	rip	Symbolizes the passage of time; intervals enhance ritualistic ambiance	Creates a tranquil and mysterious atmosphere, marks the rhythm of time	Stone basin landscapes, in front of the Dripping Guanyin statue, and other narrative-themed landscapes	Added	Existence
Guz	cheng	Symbolizes cultural heritage; melodic nature bridges nature and human culture	Cultural performances, bridges refined and popular aesthetics, connects past and present	Cultural exhibition halls, tea rooms, story exhibition halls	Added	Existence
Synthes	izer effect	Symbolizes modern spirituality and cross-media narratives; spatialized sound enhances experimental qualities	Modern spiritual experiences, cross-media narratives	Digital exhibition halls, soundscape installation areas	Added	Combination of emptiness and existence
H	lute	Symbolizes ethereality and the connection between nature and human culture; rich overtones enhance spatial layering	Bridges nature and human culture, creates an ethereal ambiance	Waterside pavilions, moon gates, story exhibition halls	Added	Existence
Guqin p	erformanc	The Romance of the Western Chamber is a symbol of literary artistic conception and cultural imagination, and the spatial narrative is enhanced by the technique of	Reproduction of literary artistic conception and activation of cultural imagination	Opera museums, cultural corridors, story exhibition halls	Added	Existence
Pekir	ig Opera	A symbol of cultural identity and the inheritance of traditional art, the sound cavity enhances the cultural identity of the West Chamber.	Strengthening cultural identity and inheriting traditional art	Opera stages, immersive theaters, story exhibition halls	Occasional	Existence

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Existing Soundscape Elements

Cultural sound:

Peking Opera: As a symbol of cultural identity and the inheritance of traditional art, Peking Opera's unique singing style and performance form enhance the cultural identity of "The Romance of the West Chamber" and have high cultural recognizability. The Peking Opera soundscape is only displayed on special festivals. This design ensures the uniqueness and importance of the Peking Opera soundscape in the venue while avoiding overuse that may cause visitors to feel aesthetic fatigue.

Added Soundscape Elements

Natural sound:

Dripping water sound: In the soundscape design, the dripping water sound symbolizes the passage of time. By carefully designing a dripping water device to produce intermittent dripping sounds, it can enhance the sense of ritual and วิทยาลัยศิลปาก mysterious atmosphere of the space.

Buddhist sound:

(1) Guzheng sound: When telling the plot of "The Romance of the West Chamber" where Cui Yingying plays the guqin to express her emotions, the corresponding guzheng music is played. The combination of sound and story allows visitors to more deeply feel the characters' emotions and the cultural connotations of the story.

(2) Synthesizer effects: In the exhibition hall of "The Romance of the West Chamber" story, synthesizer effects are used to create a mysterious atmosphere. Visitors feel as if they are in a world full of fantasy, enhancing the attractiveness and infectiousness of the story. They feel the close connection between sound and space, sound and story, and enhance their understanding and experience of the culture of "The Romance of the West Chamber."

Cultural sound:

(1) Flute sound: In the soundscape design, the flute sound symbolizes the connection between spirituality, nature, and human culture. Its rich overtones can enhance the spatial sense of the area. With its crisp tone and beautiful melody, it can create an ethereal atmosphere. When playing the corresponding flute music during the plot of "The Romance of the West Chamber" where Zhang Sheng listens to the guqin at night, the combination of sound and story allows visitors to more deeply feel the characters' emotions and the cultural connotations of the story.

(2) Guqin performance: "The Romance of the West Chamber" is a symbol of literary artistic conception and cultural imagination. Spatial storytelling is enhanced through guqin performance techniques. The characters' emotions and the artistic conception of the story are conveyed through guqin performance, allowing visitors to more deeply appreciate the cultural connotations and artistic charm of the story.



Figure 44 Selection of Soundscape Elements

(Drawn by the author)

4.4.2 Soundscape Design Process and Application Outcomes

In the soundscape design of "Dream of the Western Chamber," a four-stage design process is employed to guide visitors from the natural soundscape area to the cultural area, experiencing the cultural experience of "Dream of the Western Chamber." The detailed design and application outcomes of each stage are as follows:

Table 11 Four Stages of Soundscape Design

Stage	Main Soundscape Elements	Supporting Soundscape Elements
Start (0-7 sec)	Drip (A1)	Synthesizer effects (B1)
Climax (7-22 sec)	Peking Opera (A2)	Guzheng (B2), Gugin performanc (C2)
Fall back (22-30 sec)	Flute(A3)	Drip (B3)

(Drawn by the author)

1. Initial Stage (0 - 7 seconds):

(1) Main soundscape element: Dripping water (A1)

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(2) Supporting soundscape element: Synthesizer effects (B1)

(3) Design concept: The dripping water sound symbolizes the passage of time. The intervals enhance the sense of ritual, creating a tranquil and mysterious atmosphere that marks the rhythm of time. Synthesizer effects add depth and spatial sense to the sound, making the dripping water sound more substantial and stable, as if entering the depths of a dream.

(4) Soundscape element combination:

A1 (Dripping water) + B1 (Synthesizer effects): Creates a tranquil and mysterious atmosphere, guiding the audience into a dream-like state.

A 📢 A+B 🥌 05-75 Start Underwat В A1: Drip B1: Synthesizer effects

Table 12 Soundscape Element Combination Experiment

(Drawn by the author)

(5) Application outcomes:

Field tests have shown that visitors are attracted by the dripping water sound and begin to focus their attention on the character sculptures displayed in the exhibition hall of "The Romance of the West Chamber." This quickly puts them into the state of experiencing the soundscape and builds anticipation for the subsequent soundscape experience. ยสิลปาก

- 2. Climax Stage (7 22 seconds):
- (1) Main soundscape element: Peking Opera (A2)

(2) Supporting soundscape elements: Guzheng (B2), Guqin (C2)

(3) Design concept: The Peking Opera singing conveys the thematic emotions of "The Romance of the West Chamber," while the sounds of the guzheng and guqin enhance the cultural atmosphere and emotional depth. Application outcomes show that visitors have shown great interest in the combination of sounds at this stage and have emotionally resonated strongly, gaining a deeper understanding and experience of the story. The Peking Opera singing is selected from "The Romance of the West Chamber" and is processed to sound slightly blurred and distant, as if coming from afar or a dream, directly expressing the theme of "The Dream of the West Chamber." The guzheng melody is soft and echoes the melody of the Peking Opera singing, adding a sense of layering. The overtones and deep tone of the guqin add a sense of mystery and antiquity to the atmosphere, mainly serving to enhance the ambiance.

(4) Soundscape element combinations:

A2 (Peking Opera singing) + B2 (Guzheng): Creates a feeling of harmony between culture and nature.

A2 (Peking Opera singing) + C2 (Guqin): Adds depth and mystery to the soundscape.

A2 (Peking Opera singing) + B2 (Guzheng) + C2 (Guqin): The integration of cultural and natural sounds creates a culturally rich and naturally harmonious environment.

Table 13 Soundscape Element Combination Experiment(Drawn by the author)



(5) Application outcomes:

During the climax stage, visitors' emotions gradually relax, and they begin to actively explore the surrounding soundscape. Observations show that visitors have expressed high interest and satisfaction with the combination of Peking Opera singing and guzheng. They believe that this combination creates a tranquil and culturally rich atmosphere, allowing them to more deeply experience the integration of nature and Buddhist culture. Visitor feedback indicates that the soundscape design at this stage makes them feel physically and mentally pleased and enhances their understanding of the integration of nature and Buddhist culture.

- 3. Decline Stage (22 30 seconds):
- (1) Main soundscape element: Flute (A3)
- (2) Supporting soundscape element: Dripping water (B3)

(3) Design concept: The sound of the flute symbolizes the dissipation of the dream and the return of consciousness, breaking the dream and awakening visitors from it. The dripping water sound reemerges, combining with the flute sound to create an image of awakening from a dream. The dripping water sound gradually becomes clearer and finally disappears together with the flute sound, leaving a lingering aftersound that feels both real and illusory.

(4) Soundscape element combination:

Table 14 Soundscape Element Combination Experiment

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(Drawn by the author)

A3 (Flute) + B3 (Dripping water sound): The cycle of natural sounds provides a peaceful and profound ending to the soundscape.

(5) Application outcomes:

The soundscape design at the decline stage effectively helps visitors gradually calm down from the emotional excitement of the climax stage, allowing them to end the entire soundscape experience with a peaceful mindset. Visitor feedback indicates that at the decline stage, they can feel inner peace and satisfaction, leaving a deep impression on the entire soundscape experience. Visitor feedback shows that the soundscape design at this stage leaves them feeling calm and satisfied with the entire soundscape experience.

4.4.3 Soundscape Layout and Calibration

1. Sound Source Layout

Sound source location selection:

Hidden design: According to the sound source map of the venue, the sound source is hidden at the projector location (see the red circle marked in the figure 45). This layout not only ensures even sound distribution but also prevents visitors from directly seeing the sound source, enhancing the naturalness and mystery of the sound.



Figure 45 Sound Source Location Map (Drawn by the author)

2. Soundscape Calibration

Adjust the volume of the sound according to the actual situation of the venue to ensure that the sound is neither too loud and harsh nor too weak and inaudible. The volume of the Peking Opera singing should be moderate to highlight its cultural characteristics, while the volume of the dripping water sound should be low to create a tranquil atmosphere.

4.4.4 SWOT Analysis

A SWOT analysis of the soundscape design for the "Dream of the Western Chamber" area is conducted to evaluate its internal strengths and weaknesses, as well as external opportunities and threats, thereby guiding optimization strategies.



Location 2 "Dream of the Western Chamber"

Strengths: The "Dream of the Western Chamber" area is deeply rooted in the cultural heritage of Pujiu Temple, with a strong connection to the classic Chinese literary work "The Romance of the West Chamber." This rich cultural background provides a solid foundation for soundscape design, allowing for the integration of traditional music, storytelling, and other cultural elements. The design incorporates interactive sound effects, such as those triggered by human - body sensing technology, which enhances visitor engagement and participation. These interactive elements create a dynamic and immersive experience, making the soundscape more engaging and memorable.

Weaknesses: The soundscape design in this area is highly dependent on technological equipment, such as audio systems and sensors. The functionality and quality of the soundscape are directly influenced by the performance and reliability of this equipment. If the equipment malfunctions or requires maintenance, it can disrupt the visitor experience. The narrative elements of "The Romance of the West Chamber" are complex and nuanced, requiring visitors to have a certain level of cultural knowledge and understanding to fully appreciate. This may pose a barrier for visitors who are unfamiliar with the story, limiting their emotional resonance and connection with the soundscape. Visitors may have limited time to fully engage with and appreciate the intricacies of the soundscape design. This time constraint can reduce the effectiveness of the design in conveying cultural and emotional depth.

Opportunities: The rich cultural theme of "The Romance of the Western Chamber" offers opportunities for the development of derivative products, such as souvenirs, apps, and multimedia content. These products can extend the cultural experience beyond the physical site and provide additional revenue streams. New media platforms can be utilized to promote the soundscape design and the cultural heritage of Pujiu Temple. Social media, virtual reality, and other digital tools can reach a broader audience and enhance the visibility and appeal of the site.

Threats: There is a risk of over - commercialization, where excessive commercial elements may dilute the cultural and spiritual essence of the area. This can lead to a loss of authenticity and visitor dissatisfaction. The site faces competition from other cultural and tourist attractions, which may draw visitors away. Changing visitor preferences and aesthetic trends may affect the long-term relevance and appeal of the soundscape design, requiring continuous adaptation and innovation.

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4.4.5 Summary

Through the soundscape design practice of "Dream of the Western Chamber," the theoretical research has been successfully transformed into practical application, creating an immersive cultural experience space for visitors. The design objectives have been achieved, with visitors' understanding and experience of "The Romance of the West Chamber" significantly enhanced. The integration experience of nature and Buddhist culture has become more profound, and emotional resonance has been effectively evoked. The phased design process has proven its effectiveness, and the selection and layout of soundscape elements, as well as calibration, have met the

needs of visitors. Visitors have given positive feedback, expressing satisfaction with the soundscape experience and believing that the design has improved the touring experience and deepened their understanding of the culture of Pujiu Temple.



4.5 Location 3: Design Output of Pagoda Courtyard Corridor

4.5.1 Selection of Soundscape Elements

In the soundscape design of "Pagoda Courtyard Corridor," the selection of soundscape elements needs to be closely integrated with the solemn atmosphere of Buddhist rituals and the blessing experience of visitors. The specific soundscape elements selected are as follows: Table 15 Selection of Soundscape Elements

(Drawn by the author)

Category	Sound Elements	Features of Soundscape Elements	Function	Application Sites	Soundscape Attributes	Classification of Emptiness and Existence
	Drum	Symbolize ritual summons and dispelling distractions; strong transient energy activates spatial dynamics	Ritual summons, dispel distractions	Dharma assembly ceremonies, in front of the Great Hall	Occasional	Existence
	Monk's Bowl	The symbol of meditation guidance and sound wave somatosensory, metal reverberation enhances the sense of space sacredness.	Meditation guidance, acoustic somatosensory vibration	Meditation room, retreat room, meditation experience	Occasional	Combination of emptiness and existence
Buddhist	Wind Chimes	Symbolize the free flow of mature and spatial boundaries; random collisions enhance spatial layers	Meditation instruction	Eaves, pagoda spires, wish-making areas, meditation zones	Added	Combination of emptiness and existence
Sounds	Wooden Fish	The symbol of spiritual practice order and time rhythm, rhythmically maintaining the sense of space ritual.	Chanting metronome to maintain the order of practice.	Buddhist Scripture Pavilion, Buddhist Temple and Dharma Ceremony	Regular	Combination of emptiness and existence
	Chanting	The symbol of religious field and group identity, and the group voice enhances the spatial cohesion.	Constructing religious field and triggering emotional resonance	Daxiong Hall, Buddha Hall and Dharma Ceremony	Regular	Existence
	Prayer	The symbol of belief resonance and emotional expression, and the emotional fluctuation texture enhances the spatial appeal.	Strengthen belief resonance and promote group identity	Chapel, wishing area, ritual ceremony	Regular	Existence

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1. Existing Soundscape Elements

(1) Drum sound: The drum sound holds significant symbolic importance in Buddhist rituals, capable of dispelling distracting thoughts and quickly focusing the attention of visitors, creating a solemn and tranquil atmosphere.

(2) Monk's bowl sound: The clear and pleasant sound of the monk's bowl can guide visitors into a state of tranquility and concentration, enhancing the sanctity of religious ceremonies.

(3) Wooden fish sound: The rhythmic sound of the wooden fish maintains the order and rhythm of religious practice, helping visitors stay focused and devout, and enhances the spatial layers.

(4) Chanting sound: The low and soothing chanting sound conveys a sense of peace and harmony, allowing visitors to experience spiritual purification and sublimation during the blessing process.

(5) Prayer sound: The prayer sound expresses the resonance of faith and emotional expression, and the emotional fluctuation texture enhances the spatial appeal.

2. Added Soundscape Elements

Birdsong: Symbolizing the vitality and harmony of nature, the randomness and naturalness of birdsong can add a peaceful and natural atmosphere to the blessing area, allowing visitors to experience the beauty and tranquility of nature during the blessing process.



Figure 48 Selection of Soundscape Elements (Drawn by the author)

4.5.2 Soundscape Design Process and Application Outcomes

In the soundscape design of "Pagoda Courtyard Corridor," a four-stage design process is employed to guide visitors from entering the blessing area to deeply participating in Buddhist rituals, experiencing the solemnity and sanctity of religion. The detailed design and application outcomes of each stage are as follows:

1. Initial Stage (0 - 3 seconds):

(1) Main soundscape element: Monk's bowl (A1)

(2) Supporting soundscape element: Wooden fish sound (B1)

(3) Design concept: The soundscape begins with the monk's bowl sound, which holds significant symbolic importance in Buddhist rituals and can guide visitors into a state of tranquility and concentration. The addition of the wooden fish sound further enhances the sense of order in religious ceremonies, helping visitors stay focused and devout.

(4) Soundscape element combination:

A1 (Monk's bowl) + B1 (Wooden fish): Creates a peaceful and focused atmosphere, guiding visitors into a blessing state.

Table 16 Soundscape Element Combination Experiment



(Drawn by the author)

(5) Application outcomes: Field tests have shown that after hearing the monk's bowl sound and the wooden fish sound, visitors' attention is significantly focused, and their emotions gradually calm down, laying a good foundation for the subsequent soundscape experience. Visitor feedback indicates that the initial stage of the soundscape design can effectively attract their attention, quickly guiding them into a blessing state and building anticipation for the subsequent soundscape experience.

2. Development Stage (3 - 10 seconds):

(1) Main soundscape element: Chanting (A2)

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(2) Supporting soundscape elements: Monk's bowl (B2), Wooden fish (C2)

(3) Design concept: Chanting conveys the core content of Buddhist rituals. The addition of the monk's bowl sound and the wooden fish sound further enhances the solemnity and order of religious ceremonies. The low and soothing chanting sound

conveys a sense of peace and harmony, allowing visitors to experience spiritual purification and sublimation during the blessing process.

(4) Soundscape element combinations:

A2 (Chanting) + B2 (Monk's bowl): Creates a solemn and sacred atmosphere, enhancing visitors' religious experience.

A2 (Chanting) + C2 (Wooden fish): Adds rhythm and order to the soundscape, guiding visitors to stay focused and devout.

A2 (Chanting) + B2 (Monk's bowl) + C2 (Wooden fish): The integration of multiple sounds creates a solemn, sacred, and orderly religious environment.

Table 17 Soundscape Element Combination Experiment



(5) Application outcomes: During the development stage, visitors' emotions gradually relax, and they begin to actively participate in the blessing activities. Observations show that visitors express high interest and satisfaction with the combination of chanting, monk's bowl sound, and wooden fish sound. They believe that this

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combination creates a solemn and sacred atmosphere, allowing them to more deeply experience the solemnity and sanctity of Buddhist rituals. Visitor feedback indicates that the soundscape design at this stage makes them feel physically and mentally pleased and enhances their understanding of Buddhist culture.

3. Climax Stage (10 - 20 seconds):

(1) Main soundscape element: Drum (A3)

(2) Supporting soundscape elements: Chanting (B3), Monk's bowl (C3), Wooden fish (D3)

(3) Design concept: The drum sound holds significant symbolic importance in Buddhist rituals, capable of dispelling distracting thoughts and quickly focusing the attention of visitors, creating a solemn and tranquil atmosphere. The continuous presence of chanting, monk's bowl sound, and wooden fish sound further enhances the solemnity and sanctity of religious ceremonies, allowing visitors to experience spiritual shock and sublimation during the blessing process.

(4) Soundscape element combinations:

A3 (Drum) + B3 (Chanting): Creates a solemn and sacred atmosphere, enhancing visitors' religious experience.

A3 (Drum) + C3 (Monk's bowl): Adds depth and sanctity to the soundscape, guiding visitors into a deep blessing state.

A3 (Drum) + D3 (Wooden fish): Enhances the rhythm and order of the soundscape, helping visitors stay focused and devout.

A3 (Drum) + B3 (Chanting) + C3 (Monk's bowl) + D3 (Wooden fish): The integration of multiple sounds creates a solemn, sacred, and modern-feeling religious environment.



Table 18 Soundscape Element Combination Experiment

(Drawn by the author)

(5) Application outcomes: The soundscape design at the climax stage brings strong emotional experiences to visitors. Many visitors report feeling a spiritual shock and sublimation at this stage. Field tests show that the combination of drum sound and traditional religious sounds can effectively evoke emotional resonance among visitors, allowing them to more deeply experience the connotations and charm of Buddhist culture. Visitor feedback indicates that the soundscape design at this stage makes them feel spiritually shocked and enhances their understanding of Buddhist culture.

- 4. Decline Stage (20 25 seconds):
- (1) Main soundscape element: Wind chime (A4)
- (2) Supporting soundscape element: Drum (B4)

(3) Design concept: The clear and pleasant sound of the wind chime symbolizes freedom and liberation, guiding visitors from a deep blessing state back to a state of calmness and satisfaction. The gradual weakening of the drum sound symbolizes the end of the blessing ceremony, allowing visitors to end this soundscape experience in tranquility.

(4) Soundscape element combination:

A4 (Wind chime) + B4 (Drum): The cycle of natural sounds provides a peaceful and profound ending to the soundscape.





(5) Application outcomes: The soundscape design at the decline stage effectively helps visitors gradually calm down from the emotional excitement of the climax stage, allowing them to end the entire soundscape experience with a peaceful mindset. Visitor feedback indicates that at the decline stage, they can feel inner peace and satisfaction, leaving a deep impression on the entire soundscape experience. Visitor feedback shows that the soundscape design at this stage makes them feel calm inside and satisfied with the entire soundscape experience.

(Drawn by the author)

4.5.3 Soundscape Layout and Calibration

1. Sound Source Layout

Sound source location selection:

Even distribution: 12 sound sources are evenly distributed around the blessing area, mainly hidden in eaves, corners, and trees. This layout ensures even sound distribution throughout the area, allowing visitors to experience a rich soundscape from different locations. The specific locations are shown in the figure 49, covering the entire blessing area to ensure effective sound delivery to every corner.

Hidden design: Sound sources are hidden in eaves, corners, and trees to avoid direct visibility. This enhances the naturalness and mystery of the sound, making visitors feel as if the sound naturally comes from the surrounding environment. For example, some sound sources are hidden in eaves, integrating with architectural features, while others are hidden in trees, blending with the natural environment.



Figure 49 Sound Source Location Map (Drawn by the author)

2. Soundscape Calibration

Adjust the volume of the sound to ensure that it is not too loud and harsh. The volume of the chanting sound is kept at a moderate level to highlight its cultural characteristics, while the volume of the birdsong is relatively low to create a peaceful atmosphere. Collect feedback from visitors and further adjust and optimize the soundscape based on their suggestions.

4.5.4 SWOT Analysis

A SWOT analysis of the soundscape design for the Pagoda Courtyard Corridor is conducted to evaluate its internal strengths and weaknesses, as well as external opportunities and threats, thereby guiding optimization strategies.



Location 3 Pagoda Courtyard Corridor

Figure 50 SWOT Analysis

Strengths: The Pagoda Courtyard Corridor boasts a strong religious atmosphere and diverse soundscape elements, creating a rich auditory experience. The existing soundscape is characterized by a strong religious ambiance, with elements such as chanting, drumming, and the use of ritual instruments like the wooden fish and monk's bowl. These elements not only define the corridor's spiritual significance but

⁽Drawn by the author)

also provide a structured and rhythmic soundscape that guides visitors through their meditation and reflection. The layout of the corridor, with its defined entrance and exit points, facilitates a natural flow of visitors and allows for strategic placement of sound sources to enhance the overall experience. The corridor's design, including architectural features like eaves and corners, offers opportunities to integrate sound sources in a way that complements the existing structure and minimizes visual intrusion.

Weaknesses: The soundscape design is heavily reliant on technological equipment, such as audio systems and sensors, making it susceptible to technical failures and requiring consistent maintenance. The corridor's soundscape, while rich in religious elements, may lack diversity in terms of natural or cultural sounds, potentially limiting its appeal to visitors seeking a broader sensory experience. Additionally, the corridor's layout, while conducive to sound propagation, may also amplify unwanted noises from adjacent areas, such as tourist chatter or environmental sounds, which can disrupt the intended soundscape.

Opportunities: The corridor's rich cultural and religious context presents opportunities for developing derivative products and experiences, such as guided meditation sessions, cultural performances, or interactive exhibits that could enhance visitor engagement and provide additional revenue streams. New media technologies, such as virtual reality (VR) and augmented reality (AR), could be leveraged to create immersive sound experiences that deepen visitors' connection to the corridor's spiritual and cultural heritage. For instance, VR could simulate historical soundscapes or provide immersive narratives that complement the physical environment.

Threats: The corridor faces competition from other cultural and tourist attractions, which may divert visitors' attention and reduce the unique appeal of its soundscape. Additionally, changing visitor preferences and aesthetic trends may necessitate continuous adaptation of the soundscape design to maintain its relevance and attractiveness. There is also a risk of over-commercialization, where excessive integration of commercial elements could dilute the corridor's spiritual essence and authenticity, potentially leading to visitor dissatisfaction and a diminished sense of place.

The SWOT analysis provides a comprehensive understanding of the Pagoda Courtyard Corridor's soundscape design, highlighting its strengths in creating a spiritually immersive environment while acknowledging challenges related to technological dependence and potential disruptions from external noises. By capitalizing on opportunities for cultural enrichment through derivative products and new media technologies, and mitigating threats of commercialization and visitor diversion, the corridor can enhance its soundscape to better serve spiritual practices and cultural preservation goals.

4.5.5 Summary

Through the soundscape design practice of "Pagoda Courtyard Corridor," an immersive religious experience space has been created for visitors. Visitors' understanding and feelings of Buddhist rituals have been significantly enhanced, and the integration experience of nature and Buddhist culture has become more profound, with effective emotional resonance. Visitors have given positive feedback, expressing satisfaction with the soundscape experience and believing that the design has improved the touring experience and deepened their understanding of the culture of Pujiu Temple. In the future, the soundscape design will be further optimized, equipment maintenance and management will be strengthened, and more elements related to the cultural connotations of Pujiu Temple will be explored to be integrated into the soundscape, making the soundscape of "Pagoda Courtyard Corridor" better serve the religious experience of visitors and the cultural inheritance of Pujiu Temple.



(Drawn by the author)

4.6 Location 4: Design Output of Echoes in the Mountain Valley

In the soundscape design of the Echoes in the Mountain Valley area, the selection of soundscape elements aims to enhance the meditative experience, guiding visitors into a state of deep meditation and leading them to experience a state of egolessness through sound. The specific soundscape elements selected are as follows:



Elements
Soundscape
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		(Drawn	on of soundscape Elements t by the author)			
Category	Sound Elements	Features of Soundscape Elements	Function	Application Sites	Soundscape Attributes	Classification of Emptiness and Existence
	Drum	Symbolize ritual summons and dispelling distractions; strong transient energy activates spatial dynamics	Ritual summons, dispel distractions	Dharma assembly ceremonies, in front of the Great Hall	Occasional	Existence
	Monk's Bowl	The symbol of meditation guidance and sound wave somatosensory, metal reverberation enhances the sense of space sacredness.	Meditation guidance, acoustic somatosensory vibration	Meditation room, retreat room, meditation experience	Occasional	Combination of emptiness and existence
Buddhist	Wind Chimes	Symbolize the free flow of nature and spatial boundaries; random collisions enhance spatial layers	Meditation instruction	Eaves, pagoda spires, wish-making areas, meditation zones	Added	Combination of emptiness and existence
Sounds	Wooden Fish	The symbol of spiritual practice order and time rhythm, rhythmically maintaining the sense of space ritual.	Chanting metronome to maintain the order of practice.	Buddhist Scripture Pavilion, Buddhist Temple and Dharma Ceremony	Regular	Combination of emptiness and existence
	Chanting	The symbol of religious field and group identity, and the group voice enhances the spatial cohesion.	Constructing religious field and triggering emotional resonance	Daxiong Hall, Buddha Hall and Dharma Ceremony	Regular	Existence
	Prayer	The symbol of belief resonance and emotional expression, and the emotional fluctuation texture enhances the spatial appeal.	Strengthen belief resonance and promote group identity	Chapel, wishing area, ritual ceremony	Regular	Existence
		3				

4.6.1 Selection of Soundscape Elements

Monk's bowl: The monk's bowl, commonly used in Buddhism as a signal for gathering during meals or as a ritual utensil for offering food, produces a clear and serene sound with strong penetrating power. It can quickly capture the attention of visitors, conveying a sense of simplicity, purity, and introspection. Symbolizing spiritual awakening and detachment from material desires, the sound of the monk's bowl helps guide people into a more introspective and meditative state. In Buddhist rituals, the sound of the monk's bowl is often used to guide people into a state of introspection and meditation, conveying a sense of simplicity, purity, and introspection.

Bell: As a commonly used instrument in Buddhist rituals, the sound of the bell is solemn and profound, capable of guiding people into a meditative state. In the Echoes in the Mountain Valley area, the bell can be used as a signal to mark the beginning and end of meditation, helping visitors set temporal boundaries for their meditative practice. The bell holds significant symbolic meaning in Buddhist rituals, capable of dispelling distracting thoughts and quickly focusing the attention of visitors, creating a solemn and tranquil atmosphere.

Qing (a traditional Chinese percussion instrument): The clear and serene sound of the qing helps create a peaceful meditative environment. Its sound resonates in the valley, enhancing the layers of the soundscape. It can be used during the meditation process as a guiding sound to help visitors concentrate and enter a deeper state of meditation.

Table 21 Selection of Soundscape Elements

(Drawn by the author)

Category	Sound Elements	Features of Soundscape Elements	Function	Application Sites	Soundscape Attributes	Classification of Emptiness and Existence
	Monk's Bowl	The symbol of meditation guidance and sound wave somatosensory, metal reverberation enhances the sense of space sacredness.	Meditation guidance, acoustic somatosensory vibration	Meditation room, retreat room, meditation experience	Occasional	Combination of emptiness and existence
Buddhist Sounds	Bell	The sanctification of time and space and the symbol of belief radiation, the slow attenuation of sound pressure level enhances the sense of spatial authority.	Sanctifies time and space, radiates faith	Bell towers, Main Hall (Great Buddha Hall), reverberation meditation zones	Occasional	Combination of emptiness and existence
	Qing	Ritual opening and closing and sacred moment symbol, crystal sound attenuation characteristics enhance the sense of space purity.	Marks the opening and closing of rituals, signifies sacred moments	Altars, ordination platforms, Dharma assembly ceremonies, meditation zones	Occasional	Combination of emptiness and existence



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4.6.2 Soundscape Design Process and Application Outcomes

1. Soundscape Design Process:

(1) Initial stage (0-5 seconds): The design begins with the sounds of natural wind and gentle flowing water to create a tranquil and peaceful atmosphere, providing a comfortable environment for the start of meditation.

(2) Development stage (5-15 seconds): The sound of the monk's bowl gradually joins in, guiding visitors into a state of introspection and meditation, helping them transition into a deeper meditative state.

(3) Climax stage (15-30 seconds): The sounds of the bell and qing ring out, creating a solemn and harmonious atmosphere that guides visitors into a state of deep meditation, facilitating a sense of spiritual elevation and awakening.

(4) Decline stage (30-40 seconds): The sounds of the bell and qing gradually fade, while the sound of the monk's bowl continues, guiding visitors back from deep meditation to a state of calm. All sound elements gradually decrease in volume until they completely disappear, leaving visitors with a serene space.

2. Application Outcomes:

(1) Enhanced meditative experience: The soundscape design effectively guides visitors into a state of deep meditation. Through the guidance of sound, visitors experience a state of egolessness during meditation, enhancing their spiritual sensations.

(2) Enhanced experience of egolessness: The soundscape design makes it easier for visitors to experience a state of egolessness during meditation, deepening their understanding and appreciation of Buddhist teachings.

(3) Spiritual purification: The soundscape design helps visitors achieve spiritual purification during meditation, allowing them to find tranquility amidst the hustle and bustle of daily life, and facilitating mental relaxation and elevation.


(Drawn by the author)

4.6.3 Soundscape Layout and Calibration

1. Sound source layout: Sound sources are evenly distributed at the four corners of the Echoes in the Mountain Valley area. This layout not only ensures even sound distribution but also prevents visitors from directly seeing the sound sources, enhancing the naturalness and mystery of the sound.

2. Sound source equipment selection: Choosing appropriate sound source equipment is crucial for ensuring the quality of the soundscape. In the Echoes in the Mountain Valley area, audio equipment is primarily used.





Figure 54 Sound Source Location Map (Drawn by the author)

4.6.4 SWOT Analysis

A SWOT analysis of the soundscape design for "Echoes in the Mountain Valley" is conducted to evaluate its internal strengths and weaknesses, as well as external opportunities and threats, thereby guiding optimization strategies.



Location 4 Echoes in the Mountain Valley

Figure 55 SWOT Analysis (Drawn by the author)

Strengths: The natural environment of "Echoes in the Mountain Valley" is a significant asset for soundscape design. The location features beautiful natural surroundings with rich birdlife and wind sounds, providing a serene and peaceful atmosphere. The valley's unique topography creates impressive echo effects, which can be harnessed to enhance the meditative and spiritual experience. These natural sounds, when integrated with minimal human-made elements, can create a tranquil soundscape that promotes reflection and inner calm. The existing soundscape already has a certain level of natural sound integration, which can be further developed to create a harmonious auditory environment.

Weaknesses: The location's quiet and remote nature may limit its appeal to visitors seeking a more interactive or varied experience. The soundscape's reliance on natural conditions means it can be affected by weather and seasonal changes, potentially reducing its consistency and impact. For instance, strong winds or rain might overpower the subtle natural sounds, while extreme silence could make the environment feel isolating rather than peaceful. Additionally, the lack of diverse sound elements might make the experience monotonous for some visitors, requiring careful consideration of how to balance natural sounds with subtle enhancements.

Opportunities: The location presents opportunities for developing meditation programs and tourist attractions. The serene environment is ideal for creating structured meditation sessions that incorporate sound elements, such as guided sessions with soft instrumental music or nature sounds. These programs could attract visitors interested in wellness and spiritual retreats. Additionally, the site can be promoted as a destination for cultural and ecological tourism, highlighting its unique acoustic properties and natural beauty. Developing educational content about the acoustic phenomena and ecological significance of the valley could also enhance visitor engagement and provide a deeper appreciation of the environment.

Threats: The fragile environment of "Echoes in the Mountain Valley" poses a threat to its sustainability. The natural ecosystem could be easily disrupted by excessive tourist activity or poorly planned infrastructure development. This fragility necessitates careful management to preserve the area's acoustic and ecological qualities. Furthermore, the high professional requirements for soundscape design and implementation mean that only skilled professionals can maintain the quality of the soundscape. The competitive tourism market also means that the location must continuously innovate and enhance its offerings to remain attractive to visitors in the face of other cultural and natural attractions.

In summary, the SWOT analysis of "Echoes in the Mountain Valley" highlights the need to carefully balance the preservation of its natural soundscape with strategic enhancements that can improve visitor experience and ensure the location's longterm appeal and sustainability.

4.6.5 Summary

Through the soundscape design practice in the Echoes in the Mountain Valley area, the study successfully integrates the natural environment with Buddhist culture, creating a tranquil and transcendent soundscape space conducive to meditation. Visitors experience spiritual elevation and achieve mental purification during the meditation process. The soundscape design not only enhances the spiritual experience of visitors but also promotes the inheritance and dissemination of the culture of Pujiu Temple, providing a rich spiritual and cultural experience. However, there is still room for improvement and perfection in the coordination of soundscape elements, the in-depth integration of cultural elements, and the long-term maintenance and management of equipment. In the future, the soundscape design will continue to be optimized based on feedback from visitors and management personnel. Equipment maintenance and management will be strengthened, and more elements related to the cultural connotations of Pujiu Temple will be explored to be integrated into the soundscape, making the soundscape of the Echoes in the Mountain Valley area better serve the meditative experience of visitors and the cultural inheritance of Pujiu Temple.

Location	Direction	Theme	Site photo	Output
L1. Pine Forest Zen Path	Nature	Harmonious		Video
L2 . Dream of the Western Chamber	Story	Dream like		Video
L3.Pagoda Courtyard Corridor	Pray	Sacred		Video
L4. Echoes in the Mountain Valley	Calm	Meditation		Video

Figure 56 Design summary of four locations



Chapter 5 Conclusion

5.1 Conclusion:

This dissertation has undertaken a comprehensive investigation into the pivotal role of soundscape design in enriching the spiritual ambiance of Buddhist temples, with a specific focus on Pujiu Temple. By meticulously integrating established theoretical frameworks with empirical analysis and innovative design strategies, this research makes significant contributions to the nascent field of sonic spirituality within architectural and heritage contexts. The study not only provides a nuanced understanding of the intricate relationship between auditory experiences and spiritual engagement but also proposes a novel, context-sensitive soundscape paradigm that holds considerable promise for enhancing visitor experiences and preserving the intangible heritage of religious sites.



5.1.1 Body of Knowledge

This research significantly advances the theoretical underpinnings of soundscape design within religious settings. By synthesizing interdisciplinary perspectives from soundscape ecology, environmental psychology, religious studies, and architectural acoustics, it establishes a robust theoretical framework for understanding how carefully curated sonic environments can actively contribute to spiritual experiences. The detailed analysis of Pujiu Temple's existing soundscape, employing multi-modal soundscape walks and visitor feedback mechanisms, provides empirical validation for

the profound impact of specific auditory elements on visitors' sense of peace, devotion, and mindfulness. Furthermore, the practical strategies developed and tested for enhancing Pujiu Temple's soundscape contribute directly to the growing body of knowledge on heritage preservation and the adaptive reuse of historical religious sites, demonstrating how contemporary design interventions can respectfully augment their spiritual and cultural significance.

5.1.2 New Paradigm of Soundscape

A key contribution of this research is the development and articulation of a novel soundscape model specifically tailored for Buddhist temples. Inspired by the architectural form of the prayer corridor encircling the Pagoda Courtyard at Pujiu Temple, this spiral model transcends a purely visual metaphor, embodying the cyclical nature of spiritual practice and the immersive journey of seeking enlightenment. The model's four cardinal elements: H (Harmonious), D (Dreamlike), S (Sacred), and M (Meditation), represent the core spiritual values identified as central to the Pujiu Temple experience. These are not treated as abstract ideals but are intentionally manifested through a carefully curated palette of sonic elements, ranging from naturally occurring sounds (e.g., wind chimes resonating in the courtyard) to culturally significant auditory cues (e.g., the subtle strains of guzheng music evoking traditional Buddhist atmospheres) and strategically designed synthesized effects aimed at fostering specific emotional and contemplative states. This innovative model emphasizes the importance of context-specificity in soundscape design, recognizing that the spiritual impact of sound is deeply intertwined with the architectural, cultural, and experiential nuances of the sacred space. By integrating traditional Buddhist sonic elements with contemporary design approaches, the model achieves a critical balance between preserving the temple's auditory heritage and innovating to enhance its spiritual resonance for modern visitors.

Figure 58 New paradigm of soundscape model (Drawn by the author)

5.2 Suggestions

The findings of this dissertation open several promising avenues for future research and offer practical suggestions for enhancing the spiritual ambiance of religious and cultural sites:

5.2.1 Enhanced Precision through VR/AR Technology Integration

The integration of Virtual Reality (VR) and Augmented Reality (AR) technologies holds significant potential for advancing the field of soundscape design in religious settings. VR can serve as a powerful tool for creating immersive sonic simulations, allowing designers to rigorously test and refine proposed soundscapes in controlled environments and gather detailed psychophysiological and experiential data from users before physical implementation. AR can augment the visitor experience by seamlessly layering digital sound elements onto the physical temple environment, providing real-time auditory information that enriches their understanding and deepens their spiritual engagement. Future research should explore the efficacy of these technologies in creating personalized and adaptive soundscape experiences within temples, potentially tailoring the sonic environment to individual visitor needs and preferences to maximize spiritual impact.

5.2.2 Broadening the Impact: Extension to Diverse Temples and Spiritual Places

The soundscape design principles and the novel model developed in this study possess a significant potential for broader application across a diverse range of Buddhist temples and other spiritual sites. Recognizing that each location possesses its unique cultural, historical, and environmental context, future research should focus on adapting and refining the proposed model to suit these specific characteristics. Comparative studies employing multi-modal soundscape analysis across different religious traditions and architectural styles could yield valuable insights into the universal and context-specific aspects of sonic spirituality. This crosscultural and cross-religious exploration would enrich our understanding of how soundscapes contribute to the sacrality and visitor experience of diverse spiritual spaces.

5.2.3 Interdisciplinary Synergies: Applications in Parks, Museums, and Beyond

The methodologies and key findings of this research offer valuable insights that extend beyond the realm of religious architecture. The principles of thematic soundscape design and the focus on creating immersive and emotionally resonant auditory environments can be readily adapted and applied to other disciplines concerned with shaping visitor experiences. For instance, in park design, a carefully curated soundscape can enhance visitor well-being, foster a deeper connection with nature, and mitigate the negative impacts of anthropogenic noise. In museum settings, strategically designed soundscapes can enrich exhibitions, providing immersive historical and cultural contexts through auditory storytelling and ambient sounds that complement visual displays. Future interdisciplinary collaborations between soundscape researchers, architects, landscape architects, and museum curators could unlock innovative approaches to enhancing visitor engagement and creating more meaningful and impactful experiential environments across a wide range of settings.

5.3 Contributions

This dissertation makes several significant contributions to both the theoretical understanding and the practical application of soundscape design in religious contexts:

5.3.1 Successful Completion and Evaluation of Pujiu Temple Soundscape Design

This research has culminated in the successful development and implementation of a comprehensive soundscape design for Pujiu Temple. The iterative and phased design process, meticulously crafted to guide visitors through a carefully orchestrated journey of spiritual awakening, has been rigorously evaluated through visitor feedback and observational studies. The positive outcomes of these evaluations demonstrate the effectiveness of the integrated soundscape in enhancing the meditative and reflective qualities of the temple environment. The thoughtful integration of natural sounds, such as the gentle rustling of leaves and the melodic resonance of wind chimes, with culturally significant auditory elements, such as the calming strains of guzheng music and the reverent chanting of sutras, has demonstrably created a more serene and spiritually conducive atmosphere for meditation, introspection, and religious practice. This tangible outcome provides a successful case study for the intentional design of soundscapes in sacred spaces.

5.3.2 Providing a Replicable Framework and Guiding Principles for Other Temples

Beyond the specific case of Pujiu Temple, this research offers a valuable and replicable theoretical framework and a set of practical guiding principles that can assist other temples and religious institutions in enhancing their spiritual atmospheres and visitor experiences through thoughtful soundscape design. The novel soundscape model, with its emphasis on context-specificity and the identification of key spiritual themes, provides a structured approach for analyzing existing sonic environments and developing targeted design strategies. By adapting the principles of balancing traditional auditory elements with contemporary design techniques and prioritizing the integration of architecture, sound, and human perception, diverse religious sites can leverage this research as a foundational guide for creating sonic environments that more effectively support worship, contemplation, and a deeper connection to the sacred. This contribution has the potential to significantly impact the preservation and adaptive development of religious heritage sites by highlighting the often-overlooked yet profoundly influential role of sound in shaping spiritual experience.

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Pujiu Temple Soundscape Design Survey Questionnaire

Dear Visitor:Hello! In order to enhance the overall visiting experience of Pujiu Temple, we are conducting research on the soundscape design of Pujiu Temple, aiming to optimize the sound environment and enhance visitors' spiritual and cultural experiences. Your feedback is crucial to us. Please take some time to fill out this questionnaire. All data will be used for academic research and strictly confidential. Thank you for your support and cooperation!

I. Your Basic Information

Question	Option		
1. What is your gender?	A. Male B. Female		
2. What is your age?	A. Under 18 B. 18 - 30 C. 31 - 50 D. 51 - 70 E. Over 70		
3. What is your	A. Student B. Enterprise employee C. Government official		
occupation?	D. Freelancer E. Retired person F. Other:		
4. What is your religious	A. Buddhism B. Taoism C. Christianity D. Islam E. No		
belief?	religious belief F. Other:		

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II. Necessity of Soundscape Design

1. Do you think it is necessary to carry out soundscape design in Pujiu Temple? (Multiple choices allowed)

A. Very necessary, as sound can create a unique religious atmosphere and enhance spiritual perception

B. Necessary, as sound can enhance the fun and immersion of the visit, enriching the experience

C. Uncertain, as I am not very familiar with soundscape design and its effects

D. Not very necessary, as Pujiu Temple is already good enough in its current state

E. It is completely unnecessary, because I am worried that the soundscape design may destroy the original tranquility and simplicity.

2. What problems do you think exist in the current sound environment of Pujiu Temple? (Multiple choices allowed)

A. Too noisy, with tourist noise, business noise and other interference experiences.

B.some areas are too quiet, appearing to suppress or gloomyC. Lack of diversity, with monotonous sound elements that fail to reflect the temple's cultural heritage

D. Existing sounds (such as broadcasts, sutra recitations) have inappropriate volume or content

3. What positive impacts do you think soundscape design can bring to Pujiu Temple? (Multiple choices allowed)

A. Enhance the spiritual atmosphere, making it easier for people to meditate and perceive the charm of religion

B. Enrich the cultural connotations by telling the temple's history and legends through sound

C. Improve the visiting experience, making the trip more enjoyable and unforgettable

D. Attract more visitors and enhance Pujiu Temple's reputation and competitiveness

III. Semantic Segmentation of Soundscape Design Combined with Site Characteristics

Location	Open	Quiet	Natural	Religious	Cultural
Pine Forest Zen Path (PFZP)					
Dream of the Western Chamber (DWC)					
Pagoda Courtyard Corridor (PCC)	2				
Echoes in the Mountain Valley (EMV)					
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Soundscape Element	Pine Forest Zen Path (PFZP)	Dream of the Western Chamber (DWC)	Pagoda Courtyard Corridor (PCC)	Echoes in the Mountain Valley (EMV)
Birdsong				
Wind				
Rain				
Stream				
Dripping water				
Waves				
Rustling leaves				
Drum				
Monk's bowl				
Guzheng				
Pipa				
Wind chime				
Wooden fish				
Bell				
Chanting				
Prayer				
Synthesizer effect				
Flute				
Guqin performance				
Reading				
Peking Opera				
Talking				
Horn				
Laughter				
Footsteps				
Mobile phone				
Engine sound				

IV. Evaluation of Soundscape Elements in Four Sites

For the following 28 soundscape elements, please evaluate your satisfaction in each of the four sites on a scale of 0-7 (0 means "very dissatisfied" and 7 means "very satisfied").

Thank you again for your support and cooperation! If you have any other suggestions or ideas about the soundscape design of Pujiu Temple, please feel free to add them in the space below:

VITA

NAME

MINTING ZHAO

INSTITUTIONS ATTENDED Silpakorn University

