

Research on Urban Sound Landscape Design Elements Based on Field Recording

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Abstract: With the development of urbanization, the sound landscape of green cities has been replaced by the surrounding reinforced concrete, and the elegance of traditional urban sound landscape has also been drowned in the noisy sound. In this case, urban sound landscape designers have also started thinking. This paper studies the production and application of sound landscape map based on field recording. The existing sound landscape studies were investigated and analyzed in detail, and the framework of making and using sound landscape maps based on field recording was established. Based on sound landscape map, this paper studies the interaction between sound and scenery in urban environment. On the premise of understanding sound landscape evaluation, this paper summarizes the elements and methods of sound landscape design in cities, hoping to provide reference value for sound landscape design research in China.

1. Introduction

sound landscape is an important part of sound ecology research. This paper discusses people's perception of sound environment in different cultural and social backgrounds, breaks the cognitive habit of visual dominance, emphasizes the initiative of hearing, and pays attention to the neglected sounds in life [1]. In the aspect of improving urban acoustic environment, with the deepening of the research on urban noise, acoustic landscape of public space and acoustic landscape ecology, people realize that acoustic landscape can be used as a kind of design resource, and propose to use acoustic landscape to improve urban acoustic environment, and suggest comprehensively considering the characteristics of psychoacoustics and social, historical and cultural significance [2-3].

Sound landscape is an interdisciplinary research field, and the research must be inter-disciplinary communication and thinking, so that sound landscape research can be carried out in depth. In this paper, the field recording can well meet this requirement, which provides a new way for the study of sound landscape, and is also conducive to the analysis and research of sound landscape from different angles and levels.

2. Overview of Sound Landscape Design

sound landscape design is based on sound landscape science, which processes sound in environmental landscape design. According to previous researches, gender, professional knowledge, cultural background, familiarity with the environment, living environment, etc. will all affect the visual aesthetics of the evaluator. Besides, it also includes aspects of work and life, and users' auditory experience. For example, as far as music is concerned, teenagers are more willing to accept exciting sounds, such as rock music, while as the elderly, they prefer drama music.

The sound in the landscape must be combined with the present environment to interpret the artistic conception of beauty [4]. For example, there is a thin river on the grassy grassland, which is exposed in the sun; The breeze through this bamboo forest, a ripple; I awake light-hearted this morning of spring, everywhere round me the singing of birds and other poems, these are the perfect embodiment of ecological and natural beauty.

The elements of the concept of sound landscape mainly include two aspects. On the one hand, the sounds contained in nature, such as wind, water, birdsong, etc., are characterized by no artificial carving. This can make the sound landscape design of the whole city fully reflect the ecological

artistic conception.

On the other hand, it is artificial voice, which mainly involves the voice generated during the dialogue between people and the voice generated during the activities of people. When the traditional design work of urban sound landscape is being carried out, most of them reject artificial sounds and try to avoid “noise” by effective means. However, the design of urban sound landscape from the perspective of sound landscape advocates creating artificial sounds with positive auditory experience in the process of urban sound landscape design, so as to effectively enrich the auditory experience of visitors [5-6].

3. The Design Level of Sound Landscape

3.1 Environmental Design Level

Today's landscape design has virtually involved the problem of urban noise, such as planting a large number of plants to reduce noise, using water to cover traffic noise in public space, and creating micro-topography to cover the spread of noise, etc. However, these are not enough to meet the requirements of our scientific living environment, and sound landscape design should also play other great roles.

Sound is a kind of memory in urban landscape, which can make people feel nostalgic and belonging to the city. In the sound landscape system, all kinds of sounds in the city, such as hawking, shouting, noise, etc., are not only aesthetics, but also important objects of social observation. Use “sound” to increase the sense of place, rich regional characteristics and cultural connotation of space. These sound landscapes not only contain objective sound entities, but also include inaudible voices, which is an important embodiment of the social nature of sound environment.

3.2 Coordination Level

When designing urban sound landscape, designers must fully consider the harmony of sound landscape, so that sound landscape and landscape elements can effectively form a unified whole. At the same time, the original environmental sound should be highlighted as effectively as possible, and some external environmental noise and its interference to the sound landscape environment should be weakened as much as possible.

Man-made sound itself is an important element that is most likely to destroy the coordination between visual landscape and sound landscape. Therefore, when designing, it is necessary to enhance the warning sound and announcement sound as much as possible, improve the sound quality and avoid the adverse effects of man-made sound on natural sound landscape as much as possible [7]. In addition, it is necessary to further improve the sound quality in the design process, and actively use the hidden sound with clear sound quality and moderate volume.

3.3 Sound Device Design Level

As for the sound generating device, different devices will have different functions and effects in different environments. Generally, the main function of the sound device is to increase the diversity of the sound landscape in the small environment, complement or strengthen the sound of the sound device to the original sound landscape in the small environment, and make the sound landscape in the strengthened small ring more in line with the natural or social needs, thus increasing the richness of the sound landscape level in the environment or enhancing the artistic conception of the environment.

4. Urban Acoustic Landscape Design Elements

4.1 Field Recording

The recording tool is usually a portable digital recorder or mini hard disk recorder with an external stereo microphone. In the sense of hearing, such as the sound landscape along the river, the

vast river surface, the churning sound of water and the distant whistle of ships. Through subjective conception, if the main goal is to record the overall atmosphere of the riverside, it is suitable for recording with omnidirectional condenser microphone. The relationship between the recorded sound elements is realistic, and the main purpose is to truly record the sound atmosphere in the objective ecology.

For some sound landscape collectors, there may be a misunderstanding, that is, to weaken the sense of self-existence as much as possible for the purpose of restoring the real auditory environment, including wearing soft-soled shoes to avoid artificial noise. When I hear my own footsteps while walking, then I am already a part of the ecological environment. In the way of sound walking, the Rambler is not only the listener, but also a member of sound creation in the environment due to his own actions [8].

4.2 Production of Sound Landscape Map

The research object of sound landscape map is different from that of noise mapping, and it needs some features to make map drawing and analysis more meaningful. First of all, the production object should contain abundant sound landscape resources and be full of changes. With the help of sound landscape map, we can master the distribution and change law of sound landscape in the region, and provide guidance for sound landscape planning and construction. Secondly, the features of sound landscape in the study area should be more obvious. Through the analysis of sound landscape map, the characteristic sound landscape can be refined and summarized, the quality of scenic spots can be improved, and tourists' enthusiasm for enjoying sound landscape can be stimulated.

IDW (Inverse Distance Weighted) is a common and simple spatial interpolation method. It takes the distance between the interpolation point and the sample point as the weight for weighted average, and the closer the sample point to the interpolation point, the greater the weight. The calculation principle is as follows:

Assuming that a series of discrete points are distributed on the plane, the coordinates of which are X_i, Y_i , and the values of discrete points are $Z_i, (i=1, 2, \dots, n)$, according to the values of surrounding discrete points, the values of Z points are calculated by distance weighting, then:

$$Z = \left[\sum_{i=1}^n \frac{z_i}{d_i^2} \right] / \left[\sum_{i=1}^n \frac{1}{d_i^2} \right] \quad (1)$$

IDW is the interpolation unit value obtained by averaging the values of each sampling point in the adjacent area. This is an equalization process, which is suitable for the uniform distribution of discrete points, and the density is enough to meet the field points that reflect local surface changes in the analysis.

From the law of sound propagation, the inverse distance weighting method and the natural neighborhood method are the closest to it. Take a point sound source as an example, in an open outdoor space, its energy propagation formula is:

$$I = \frac{W}{4\pi r^2} \quad (2)$$

Where: I is the sound intensity value at any distance from the point sound source; W is the sound power value of the point sound source; r is the distance from the point sound source.

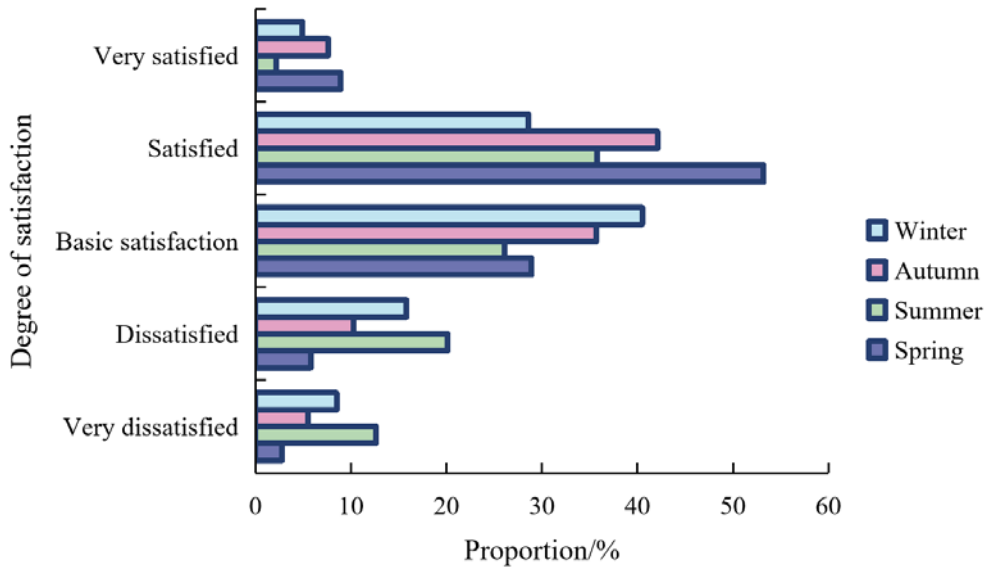


Fig.1 Survey Results of Overall Satisfaction of Sound Landscape in Parks

Fig. 1 shows the satisfaction of respondents to the overall sound landscape in the park in spring, summer, autumn and winter. From the results, the respondents were satisfied with the overall sound landscape environment in the park, with the highest satisfaction in spring, the second in autumn and the lowest in summer. Therefore, the sound landscape should be built mainly in spring, followed by autumn.

According to the setting of subjective evaluation index system of sound landscape and the method of taking landscape patches as the object of investigation and evaluation, the evaluation values of sound landscape satisfaction and coordination in each patch area can be obtained. Then, using the grid interpolation tool-natural neighborhood method in GIS, the distribution map of sound landscape satisfaction and coordination is drawn.

4.3 Elements of the Relationship between Hearing and Vision

People can feel the landscape should be a combination of rationality and sensibility. What the eyes can see is the most intuitive reflection of the objective environment, which is rationality; What the ear hears will be influenced by all aspects, with more subjective color and sensibility. Only when the combination of vision and hearing is designed can a three-dimensional landscape experience be formed and a complete landscape environment be conveyed.

There are contrasting themes and tones between auditory and visual landscapes. It refers to the use of different sound sizes and speeds to set off the artistic atmosphere. Hearing and vision change with each other. That is, the auditory landscape and the visual landscape interact with each other, and the sound of other spaces is used to enrich the acoustic effect of their own space. Through the pleasant and changeable sounds of nature, the interaction between sound and scenery can be achieved through the vibrant sound of life or activity.

Seize the space features and environmental images, use sound to create special artistic conception of space under different environmental conditions, make up for the sound that is due to various reasons and slowly or has disappeared in space, and increase the sense of place, rich regional characteristics and cultural connotation of space with “sound”. These sound landscapes not only contain objective sound entities, but also include inaudible voices, which is an important embodiment of the social nature of sound environment.

4.4 Sound Landscape Evaluation

In a noisy environment, the sound can only be heard around the sounder, while in a quiet environment, the sound can be heard at a distant location. For the evaluation of sound landscape, the scale of auditory space can also be used as one of the reference standards. The larger the scale of auditory space, the higher the evaluation of sound landscape in the space.

Environment, color, scale, sound types and tourists' instant mood may all be the factors that influence the evaluation of sound landscape. However, to explore the rules or standards of the listener's subjective evaluation, we need to explore the rules of the listener's environmental impression of sound landscape instead of taking theory as the measurement standard.

By studying the hydrophilic space of the square, through the distribution of no less than 100 questionnaires in the square every quarter, and finally through the analysis of 380 questionnaires, it is concluded that in spring, summer and autumn, compared with winter, the distinction between sound elements is higher, which is more conducive to the design of sound landscape.

And through the questionnaire survey in the four seasons, the voice that people hear is evaluated as “like” and “dislike”, and the voice that “likes” is classified as a voice with high favorable feeling. Because the distinction between sound landscape in winter is too vague, which is not conducive to sound landscape design, the expected sounds in spring, summer and autumn are summarized, as shown in Figure 2.

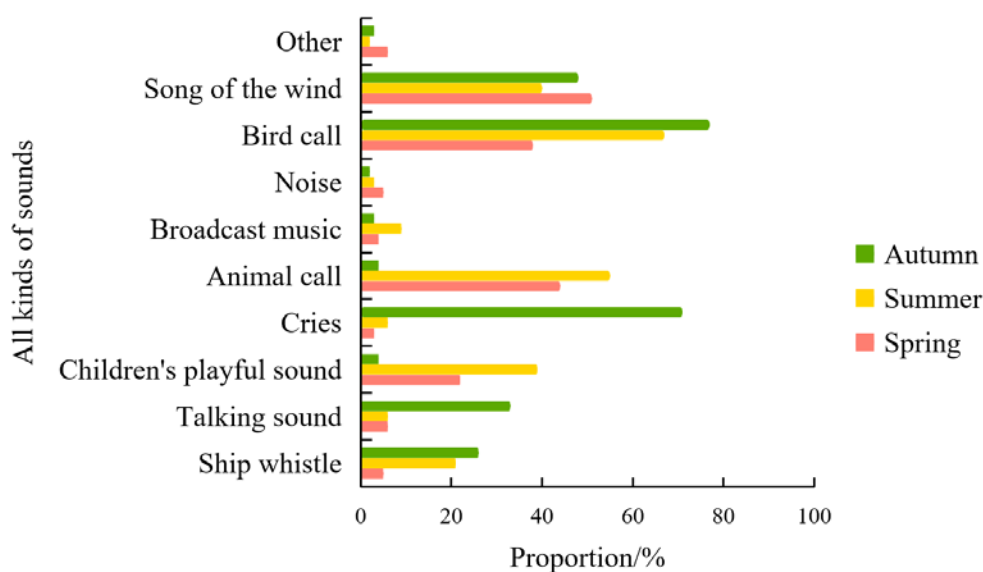


Fig.2 Sound Scale Chart of Different Season Expectations

In the survey, it can be found that people's evaluation of natural sounds, such as birds, wind and leaves, is relatively high. At the same time, due to the comprehensive environmental nature of the square, people need certain radio music to enliven the atmosphere of the square, especially in spring and autumn, when people have abundant activities in the square.

5. Conclusion

Acoustics is the main influencing factor in urban acoustic landscape design. Applying it to urban acoustic landscape design can effectively enrich the design content and innovate the design ideas and methods before, so as to design the whole ecological landscape more systematically, comprehensively and objectively. This paper studies the elements of sound landscape based on the field recording system, expounds the framework of sound landscape and its production technology, and emphatically analyzes the objective sound field indexes and subjective evaluation indexes collected from the field. In the urban design work of sound landscape concept, we can change the urban sound landscape, improve the urban sound environment and create a beautiful and livable urban space by increasing, decreasing or changing the sound and sounding objects in the environment and changing the urban building environment and the occurrence and duration of sound landscape.

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