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ABSTRACT

The rapid urban expansion has greatly transformed the urban sound ecology, the traditional sound is disappearing and environmental noise is becoming a typical issue. This article explores the theoretical basis and practical methods of urban soundscape research based on time-space relationship and listening relationship; besides, it examines the way of phonography and the means of creation, and discusses how to convey the new aesthetics and concept of sound design practice and how to design an inspection system based on the city audibility; it, finally, puts forward the significance of urban soundscape research -- providing advices to beautify the environment and optimize sound ecology for urban development planning.

Key words: urban soundscape, inspection system, phonography, sound ecology, sounder city strategy

TEXT

The history is not only narrated by time, it's also spatial. Sound can record such spatial dimension. However, we have to face the extinction of sound. The modern city civilization is filled with all kind of "happy sounds" of technology: the electronic sounds cover the natural sounds that already exist; the rapid urban expansion and the ecological changes have swallowed all kinds of the sounds of traditional life style. From the era of pictures into the social media age, people's attention was divided into nothing. The capability of "listening" is being degraded, on which people are lack of reflection.

As an auditory medium, sound has not always been valued as it deserves to within the area of communication science and academic circles. However, this inspection system on urban soundscape manages to fill up the research gap of sound. As recording equipment and technique has already been sophisticatedly developed today, how to break through the traditional way of doing sound design, it touches areas ranging from sound design to flexible applications of sound to other forms of design. On the other hand, the innovativeness of the urban soundscape research brings new concepts and theories like as sound ecology and sounder city strategy, which also gives ideas to design an inspection system based on the city audibility. Through collecting different recording materials by phonography in worldwide cities, the method of sonic points selection which is the crux of the urban soundscape inspection, comes up with a sound ecosystem that is comprised of spatial relation, temporal relation and listening relation.

1. From sound design to sound research

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I went to Tokyo for studying sound design in TV commercials in 2002. Most of my Japanese counterparts, regarding sound design as the by product of visual design, could not understand why I took it as the subject of my research. In the world of design, sound has always been a common blind spot and often been neglected. After a few talks and exchanges on cognitive experiences of sounds with groups of media planners, CM directors, producers, sound mixers, I, backed by phonographic theories in recording and film making, made up my mind to begin an academic journey to take a closer look at sound. By analyzing the effectiveness of using sound logo in TV commercials in improving brand communication and brand identity, I tried to figure out how to build brand value through the strategic use of sound. Over years of research, I gradually extend my focused areas to the use of sound and its creative practices in a variety of sound designs.

The year of 2005 marks a turning point for design in China. The first session of Get it Louder opened up that year when the country is enjoying an economic boom. For the first time ever, young designers in China took it as an opportunity to make them be heard. In the exhibition, the creative and flexible use of sound in design works caught the attention of the viewers, and the avant-garde art concepts in interactive experiences and sound experiment it displayed are thought-provoking and inspiring for those who are devoted to designing and design research. The exhibition demonstrates the possibility of combining sound research and design from different perspectives.

I did some research on Chinese ancient "Bayin", literally means the eight tunes, from the perspective of design. From the research, I recognized more than ever the importance of sound quality aesthetics in sound design. "Bayin" includes eight musical instruments in ancient China. They are made from eight different materials, namely, leather, earth, bottle gourd, wood, metal, stone, silk and bamboo. Different instruments are produced by fully capitalizing on the distinctiveness of each material, giving out eight different sweet and pleasing sounds to the ear at last. Taking into consideration the material and the unique sound it brings about are of great significance in contemporary product design, because it influences the users' acoustic experience in using the product. For example, NTT DoCoMo, a Japanese mobile phone operator, issued a cell phone with wooden case, which highlights a natural sound only gave out by wood. In product design, sound is no big deal from a common utility perspective, and sound quality improvement is no more than the additional aesthetic pursuit of designers. Saxophone-makers are sometimes invited to help exhaust vent-pipe manufacturers ensure the muffler they produce would not make any noisy sound. Let me use another case to explain. American Society for Testing and Materials stipulates that the noises made by toys shall not exceed 138 decibels for the safety of children, while Occupational Safety and Health Administration requires workers to wear ear protectors when exposed in an environment with an average noise over 85 decibels. How to improve the sound quality of toys and keep the noise made by toys below 138 decibels becomes a problem for toy design.

Sounds are widely used in visual design, product design, space design, interface design and interactive design nowadays, and much attention has been paid in these areas. However, professionals seem lack interest in soundscape and sound ecology research. China's city audibility research is still in the preliminary phase, and the research focus is mostly on noise prevention. To further the research, three relevant keywords should be specified here: soundscape that includes various sounds with different forms, the sounds indicate the real life flow of the

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places where they've been recorded; sound form refers to different types of sounds such as natural sound and man-made sound, it also refers to the character and peculiarity of each sound; sound ecology is composed of various sound forms and the sound distribution of a particular region, it vividly reflects how the inhabitants live, and examines the interaction between human life and their social surroundings.

I started to focus more on urban soundscape and sound ecology under the influences of the works by sound artists like Peter Cusack, Malachi Farrel, Christian Holl, Susan Philipsz and Akio Suzuki, as well as the work done in sound research by Chinese sociological researchers Dajun Yao and Qiwei Lin. Strictly speaking, I am more an observer practicing sound recording to look through the beauty of a city than a professional researcher inspecting sound ecology. I tend to treat all the sonic pieces I collected in a specific city as an integral one when analyzing the elements constituting the local soundscape. Take each city as a unit, use the three-dimensional framework of time, space and listening, build a system to feel sound and inspect soundscape, and finally find out answers to urban issues related to sound ecology. Field recording in this context is a means to inspect urban sound, and it is different from that in art creation. The former is about interpreting and getting to know a city through sound, and it focuses on the universality and uniqueness of a city. However, the latter emphasizes on the subjects' feeling to sound and their interpretation of the contingency and vividness of the sonic pieces.

It is worthwhile doing sound research because its result can be applied in an extensive range of areas and of great value in ecology, sociology, psychology, city planning, and the exploration and preservation of historical and cultural heritage.

2. To record the urban soundscape by the method of phonography

A common feature of the modern city is the homogenized quality of sounds. People deal with it by "no listening" at most of time. Early in the 1960s, Canadian acoustician Robert Murray Schafer made the words "sound" and "landscape" combined into a new word "soundscape". He pointed out: the description of "soundscape" is divided into three different levels: keynote, signal, soundmark. And he also emphasized that the contemporary soundscape has the total different tone with the past, traffic noise on the road, the roar of electrical equipment replace the sound of wind, water and birdsong in past.

In short, the "soundscape" is the landscape or space formed by a series of sounds. Phonography (field recording) is the best way to record soundscape. The early time in Europe and America, "phonography" refers to collect and record the sound of nature, for the creation of "musique concrete". In recent years, phonography has become a new method of sound creation, often appearing in installation art, modern dance or multimedia theatre.

How a city sounds, whether it has landscape impressions, depend on the unique urban sound ecology. Just like what the Turkish writer Orhan Pamuk wrote, "Every city has a sound which cannot be heard elsewhere. All the people living here are well-known about it, and share this secret: metro whistle in Paris, motorcycle skirr in Rome, as well as the unique roaring in New York. Istanbul also has a sound, known only for its residents. That is a sound for sixty years, when the ferry into the wooden pier, they heard the roar of the metal." Sound is the most active factor that constitutes the city landscape, but the sound is also very "fragile", as John Cage said, "A sound has no legs to stand on." Even

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though it can be recorded and saved, it is only a limited recording of sounding process.

Admittedly, the sound ecology is ecology. As an investigator or a researcher, when you intervene to an unfamiliar city environment, what does the "capture" of sounds mean? How to select the type and paragraph of sound to record the city soundscape and showcase a city's specific sound environment, for highlighting the recognition of the city? Phonography, as an inspection means of sound ecology, more concern about the sound ecological environment, which is the integrity distribution or the characteristics of the sound. Furthermore, sound contains a overlapping relationship between the city's natural and cultural landscapes.

Then, if you want the research of urban sound ecology included by a description system, how to select a representative sound landscape has become the focal point. And the factors, such as history, geography, culture, social patterns, are all considered. In such systematic research, the city's audibility (sound landscape) and readability (visual landscape) are able to clarify and finally reach consensus.

Phonography is a kind of judgments and choice made by the investigators when they face to a sound environment. It comes with a subjective tendency and attitude, even includes the desire of expression. In the inspection of urban soundscape, I tend to give priority to consider those life sounds which have obvious environmental or geographical characteristic. Tokyo is the origin to start the sound research. And the first piece of sound which impressed me a lot is "Gyoza (dumpling)" from those chapmen, which is like the voice of call the ghost. In fact, this may be considered as the portrayal of historical Tokyo in Edo period: No peddlers, no fast-paced Edo and later Tokyo. Another example is in New York. When you are standing on the streets of New York and pay attention, you can always hear three sounds: cooing from pigeons; whistling from police cars; the roar from the hovering helicopters in air - which embody the characteristics of New York City.

Phonography is recording a kind of soundscape, in such sound field which is formed by a series of sounds, the "integrity" and "procedural" is the most important. What kind of space to be chosen and what kind of sound to be recorded by the inspection body become the key of phonography, the behavior of record and research. When the "hearing" turns to "listening" actively, the soundscape becomes rich, strange and multi-meaningful. Sound can reflect the characteristics and texture of a city. A city is located inland or coastal, its sounds and soundscapes have obvious traces. For a variety of the city's transport system, its sounds often investigated by sound researchers. Due to the difference of road conditions, floor materials, tire textures, vehicle sounds will be different. Each city's subway system, not only the design of the information broadcast and tone are having characteristics, but also its sense of speed and friction sound is not the same.

As the research focus changing from sound itself to the social or cultural significance behind the sound research, the phonography is not only the method of recording. When the city sounds are be recorded, be listened to, be preservation and researched as evidence samples, has become an attitude and aesthetics into humanities research.

3. The inspection system of sound ecology based on the relationship of space-time and the relationship of listening

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City is a spatial structure firstly, which needs process and time to perceive. The moving elements in a city, particularly humans and their activities, make the changes of details never stopped. Staying in a city, our every sense will react. And after a comprehension, they constitute "city impression." And the urban soundscape is based on the perception of auditory experience to outline the city. It is the understanding and distinction to the flow and change of the sounds.

Secondly, city is also a strong symbol of the complex society. Investigators act as a dynamic role. The urban soundscape in essence is the result of bidirectional function between the investigators and their environment. Listening to the city sounds, what's the value of its mystery, bizarre and surprises? What kind of role do the sounds play in shaping the city landscape and imagery? What the impact? Reflection on these issues determines the direction of the inspection of city sound ecology and system description.

For example, why the sound of flowing water can be heard in the metro stations in Paris? Yet to date, it relates closely to the comprehensive sewage system—one major project of the "Creative Destruction" of Paris launched by Baron Georges-Eugene Hausmann. This spacious brick sewage system, designed by Hausmann and the engineer Eugene Belgrand, became an engineering wonder of nineteenth century and improved the quality of the city life in Paris dramatically. When wondering in the historical blocks, people can still see a small stream of water spewing from crevices of pebbles to wash the ground. This is the creation of Hausmann, and he firmly believed that modern Paris needed beauty and it needed efficiency as well, so he advocated this tridimensional construction both on and under the ground. Hence, today we still can find grooves and hear water-sound at the stairway of metro stations in Paris. Just like what George Simmel summarized: "Here contains some exclusive thing in metropolis sociology. The interpersonal relationship in metropolis is more about the movements of eyes rather than ears. The main reason is the public transport. Before the development of buses, railways and trolley cars in nineteenth century, it is quiet impossible for people to stare at each other face-to-face without a word to be spoken for minutes even for hours." The way to experience the metropolitan space of Paris has been changed greatly since then.

However, the sound has a "fleeting" feature, the significance of soundscape, which is composed by different sounds, lies in its relationship among time, space and the listener. According to Murray Schafer's sound doctrine, there are three different levels of perceived listening: Simple listening (visualized listening), semantic listening (coded listening under special circumstances) and restore listening (to consider the sound itself as an object of observation and precede an intentional, man-made abstract behavior from the source to the feeling). Such three kinds of listening help the author to analyze the interaction between city soundscape and listeners.

Therefore, the construction of urban sound ecology inspection system is based on the triple considerations of time, space and listening relationships. Listening relationship is a prerequisite. The selection and judgment to the city sound is essentially to examine the relationship between sound and the city, which is a process of significant discovery and value judgments. The so-called space-time relationship, it refers that after a more comprehensive understanding of the city, the subject of the inspection includes the influencing factors of history, geography, culture and social morphology into the overall planning of sound ecology inspection, establish the view of space time of phonography, feature the node states of sound ecology, collect and record sound resources. At the same

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time, the subject of the inspection must accumulate some experience awareness, find meaningful sound in the inspection process at any time, and can judge the value of the occasional sound or event immediately, then collect and record the sound.

Specifically, the research of urban soundscape should begin with the systematical inspection of city's layout, choose the geographically coordinate point - landmark sound nodes, consult and run through time linear node - the sonic points combined with the city's historic and cultural features, such as traditional festivals, folk activities, rituals, and those historic, iconic events, and some also involves the special soundscape arising from the season, climatic factors. Therefore, the timing nodes and geographical coordinate's nodes are inseparable in certain areas. Further, the timing nodes were divided into two types: pre-selection and accidental selection. "Pre-selection" is an event known in advance on a particular time, it may be directly related to the city, or may be the feedback effects of major events. Fixed-point recording should be ready for. "Accidental selection" refers that the listening relationship between subject and the sound of city may change at any time and should be capture sounds or soundscape real-time in the investigation process due to infrequent events.

Visibly, the inspection system of urban sound ecology is the three-dimensional structure based on the triple considerations of time, spatial and listening relationships, showing the outline of the city's soundscape through sound recording. For instance of the inspection of Paris, to further elaborate the selection of recordings points: the geographic coordinates nodes based on spatial relationships reflects the characteristics of city layout and regional ecological profile of Paris, with consideration of another type of spatial coordinate simultaneously which combine city functions and cultural characteristics; the sonic points of pre-selection based on the time relationship should be associated with the history of the city, such as the of Bastille Day parade, the sounds in the end stage of the a-hundred-years-history Tour de France, etc.; the "accidental selection" based on listening relationship reflects more subjective judgment and sound preferences, which does not necessarily make other listeners resonate and recognition, but reflects the sound of "uncertain" precisely, and also proved that the diversity of urban soundscape.

4. The city's auditory aesthetics: from reducing noise to the plan of "sunder city"

After the modern city is infiltrated and surrounded by highways or the Beltway, quiet is almost no longer possible. People become accustomed to the noise accompanied. The city's hearing aesthetics is unnoticed. "Learn to listen," was the striking topics of TED lecture. In 2013, the Mexican musician Enrico Chapela created the tracks "Black Noise" for "International Environmental Day". He changed all kinds of noise recorded in the streets of Mexico City into a music that can be enjoyed.

In the city of Beijing, where the author lived, even closed the windows on weekdays, you can still effortlessly hear the sound of vehicle, which is like viscous liquid attached to the eardrum. Such commonplace environmental noise are pervasive, continuing the adverse effects on human health, therefore, reducing the noise is an issue of city renaissance and improving the quality of human. The thoughts of how to deal with continuing exposed or high-decibel environmental noise, how to give out the solutions for different noise sources, how to create a "Sunder City" are all revealed.

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The strategy of "Sounder City" was first proposed by London. It is a part of Ambient Noise Strategy. And how to deal with noise pollution and city environmental issues creatively, make the standard of "beautifying sound" mean that the city's landscapes and soundscape require the same concern. For noise reduction, all the parties should make adjustments to design to jointly improve the urban soundscape. For example, the design of road traffic should consider using the material which can reduce road noise, and also the regularly conservation; the design of motor vehicle should reduce the noise of engine when start and drive a car, develop pro- environment and clean energy, make the trial of new hybrid vehicles; and also re-plan and design some streets to raise the people's interest in walking and convenience of cycling.

British sound artist Peter Cusack once did a project named Favourite Sounds of London. He used countless daily experience of Londoners to prove the significance of sound's diversity; he captured the signs of city sound changes, to reflect the changes of modern lifestyle; he presented the issues of city sound convergence and endangered sound in the age of globalization, to warn the people. Affected by his "London Project", China has the series of "Sound and City". Coincidentally, Susan Philipsz, who was the first artist won the British Turner Art Prize by sound artwork in 2010, adhere to placed her sound work and play repeatedly in public spaces, such as under the Glasgow Bridge, the financial district of London, and even Tesco supermarket, so that people listen these sound works inadvertently, and then think about the relationship between the sounds and construction, environment, city history.

By its nature, the idea of "beatifying sound" will help to redefine the space in a new way, created auditory dominant with great sound, and provide opportunities of improving the soundscape. In the summer of 2014, the campus where the author works starts the plan of new campus: the expansion of green space as well as digging four lakes, re-planning and re-laying the roads. It not only weakened the traffic noise, but also to enhance the sound quality of outdoor space. Greenfield and lakes attract birds. People can occasionally hear the sound of wind, the birds, the running water and fountains, relaxed and happy. Visible, audible and visual aesthetic must complement each other.

"City can be like a story, a graphic reflecting people's relations, a space where integrity and fragments coexist, a territory where substances work, a series of related decisions or a territory full of contradiction." It also can be seen in Kevin Lynch's research *The Image of City*, in his opinion, good city is not made by the blueprint design, but by observation, analysis and planning. Every subtle and sensitive detail should be taken into consideration, and the urban planning should be able to be felt. So will the soundscape of city be able to reflect the rich texture and inner meaning of city forms? Will the soundscape keep its unique style during the large expansion and fast changes of the city? Will relatively pleasant soundscape create the auditory environment of an acoustic city, in order to achieve complementarity with visual landscape? To achieve this does not only rely on the strategic integrated planning of the city management layer, but also on that the design researchers and practitioners use their different specialities to coordinate the coexistence relationship of spaces, to optimize the way how substance works, and all these will help to reduce the possibility of conflict between crowds and consequently to make the city story full of pleasant sounds.

Every city faces sound design issues closely related to urban planning and its further development. The issue could be as big as the improvement of regional

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environment, and could also be as small as the use of sound in different function spaces, such as the voice guides in the airport, metro and bus station, voice prompts in hospitals, banks or other commerce services providers, or in the auditory environment planning of retail sales and catering industry. Sounds, as a medium, are involved in the process of planning and design in a more active way. It is better to take advantage of sounds than merely kill the noise. Sounds also help us understand better its relationship with architecture, environment and the history of a city.

Nearly three decades, many sound artists, musicians and sound researchers are consciously thinking of urban soundscape, in order to understand the capabilities of sounds in human society. Ordinary people who live in the city can establish a close relationship with the city by listening, and to feel the deeper "texture", more lively "ecology", and more fertile "image" of the city. Only when people get together to focus on the city environment and sound, it can be improved the soundscape from the quality level.

At last, we are able to work out an interactive city sound map, which is different from the powerful Google 360 View. The map is made up of fixed-point sonic pieces that well explain a city's charm and splendor. It enriches the visualization of city landscape by additionally giving it an auditory imagination. Hearing it before seeing it. It gives the listener a chance to pre-experience a city where he/she has never set foot. The map is not only a design product that shows the value of sound research, it is also a reason for cities to keep improving and optimizing its soundscape.

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