

A research on cognitive structure to sound events that stand out in one's memory with the use of written questionnaire

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ABSTRACT

Knowledge on what kinds of sound events stand out in one's memory under ordinary condition and produce good or bad impression to him contributes to design and manage soundscape. In the previous study, the data of written questionnaire that was carried out in the coursework of acoustics was analyzed, and general outline was reported. In the present study, an analysis on cognitive structure to sound events that stand out in one's memory are performed. The same answers of written questionnaire from 128 students are used for the purpose. They include 589 sound events that are labeled as good or bad impression sound. Furthermore, each labeled sound event has the data of freely written reasons why it is recalled as good or bad sound. In the analysis, each description of reasons is divided into elements in the perceptual construct of soundscape that are defined in ISO 12913-1. Therefore, whole image of cognitive structure is perceived. Results of analysis of context in the cognitive structure show that sound events that a person has active relationship with seem to be recalled easily with agreeable impression. However, sound events that interrupt one's psychological and emotional state are often recalled easily with unlikable impression.

Keywords: Soundscape, Cognitive structure, Written questionnaire

I-INCE Classification of Subject Number: 61

1. INTRODUCTION

For creating good soundscape, it is useful to know what kinds of sound events are memorable by a person in ordinary environment and why they stand out in one's memory with good or bad impression. ISO 12913-1¹ shows the perceptual construct of soundscape that makes it easy to understand the cognitive step of auditory information in the mind. It also indicates what kinds of context have an effect on each step of cognition.

In the present research, the data of freely described reasons why a person had good or bad impression to the sound events that were obtained from written questionnaire about

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easily recalled sound events in his mind are analyzed in accordance with the perceptual construct of soundscape shown in ISO.

2. INVESTIGATION

2.1. Method

The investigation about the memorable sound events using written questionnaire was carried out in the coursework of acoustics on April 2016. It is the same as the investigation in the previous research². The questionnaire is shown in Table 1. All of the questionnaire was written in Japanese, and students also wrote down their answer in Japanese.

Table 1: Questionnaire for the investigation².

Remember sound events that you have heard during the time from morning to this lecture. Write down as many sound events that stand out in your memory as possible. For each listed sound events, tick off the sound events that have good impression as "0", and that have not so good impression as "x". Write down the reason why the sound events are felt good or not so good. You do not have to mark up when a sound event is not felt good nor bad.

2.2. Overview of the results

1,302 sound events were obtained from 128 questionee. They include 343 sound events that had good impression, 353 sound events that had not so good impression, and 606 sound events that do not have good nor bad impression when they recalled. Though 696 data of sound events that have good or not so good impression are obtained, there are 589 sound events that has the reasons that answerer wrote down. The data about reasons for good or bad impression is analyzed in the present research.

3. ANALYSIS

3.1 Cognitive structure model

According to ISO 12913-1, the cognitive structure model of soundscape was made (Fig. 1.) This is the same model as defined perceptual construct of soundscape in ISO, but it describes the element of context that is illustrated in ISO and has some effects on each step of cognitive system.

ISO defines four steps of cognition, that is, auditory sensation, interpretation of auditory sensation, responses, and outcomes. Also, it defines the context as a background that has an impact on soundscape through the auditory sensation, the interpretation of auditory sensation, and the responses to the acoustic environment.

In accordance with these definitions and examples of factors of the context that are illustrated in ISO, elements of the context that may be major in the analysis of the present study are described in Figure 1. The model indicates that the context like meteorological conditions and hearing impairment has some impacts on auditory sensation, and that the context like attitude to the sound source and to the producer of the sound, experience and expectations, and other sensory factors has some effects on interpretation of auditory sensation. Likewise, it shows that the context like time of the day, weather, lighting, emotional state, psychological and physiological resources, the ability to control the situation, and personal activities and those of others affects the responses.

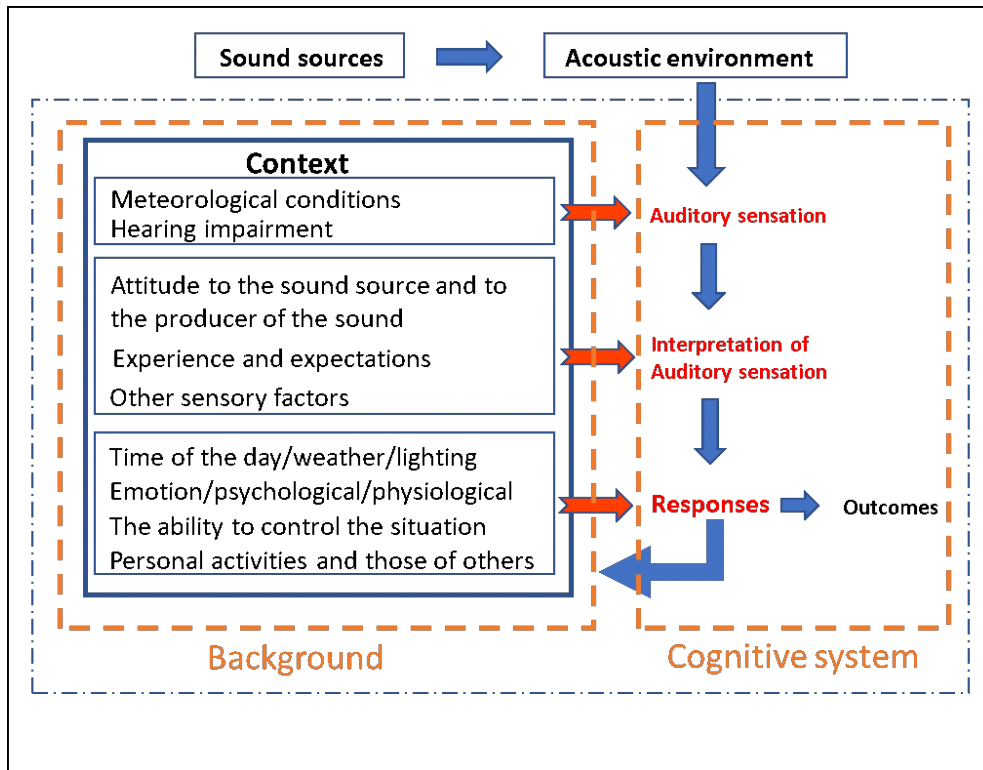


Fig. 1: Cognitive structure model

3.2 Analysis method

The data of reasons is obtained in the format of free description. First of all, each of 589 description of reasons is divided into words or short sentences, and they are classified according to the defined elements of cognitive structure model, that is, auditory sensation, interpretation of auditory sensation, responses, and context. As the questionnaire did not mention about long-term effect, outcomes are not dealt with in the present analysis.

For example, when the reason of good impression to a piece from music player is "Because my spirits were raised by my favorite piece", the words "my favorite piece" and the short sentence "my spirits were raised" are obtained. And "my favorite piece" is classified into context and "my spirits were raised" is classified into responses.

After these procedures, each element that is classified into context is categorized into factors shown in Table 2.

Table 2: Categories of context

1. Meteorological conditions and hearing impairment
2. Attitude to the sound source and to the producer of the sound
3. Experience
4. Expectations
5. Other sensory factors
6. Time of the day / weather / lighting
7. Emotional state, psychological or physiological resources
8. The ability to control the situation
9. Personal activities and those of others

3.3 Results of analysis

Results of the first classification are shown in Table 3. All elements in auditory sensation are mentions about masking. And words classified into interpretation of auditory sensation are concerned with perception of sound. Responses does not include the conclusive impression of "good" nor "bad".

Table 3: Results of the first classification. Number of elements that were divided into each classification of cognitive structure is shown.

Classification of cognitive structure	Number of elements	Ratio to 589 reasons
Auditory sensation	8	1.4 %
Interpretation of auditory sensation	135	22.9 %
Responses	310	52.6 %
Context	323	54.8 %

The results show that half of the described reasons have context. The context does not include auditory sensation nor perception, but it includes the background factors of the answerers to the cognition of soundscape. Therefore, as it is supposed that the context may have the significant effect on soundscape, further analysis was carried out on the context.

Figure 2 shows the tendency of numbers of words and sentences that are divided into each category of context. It also shows that the ratio of good or bad impression in each category.

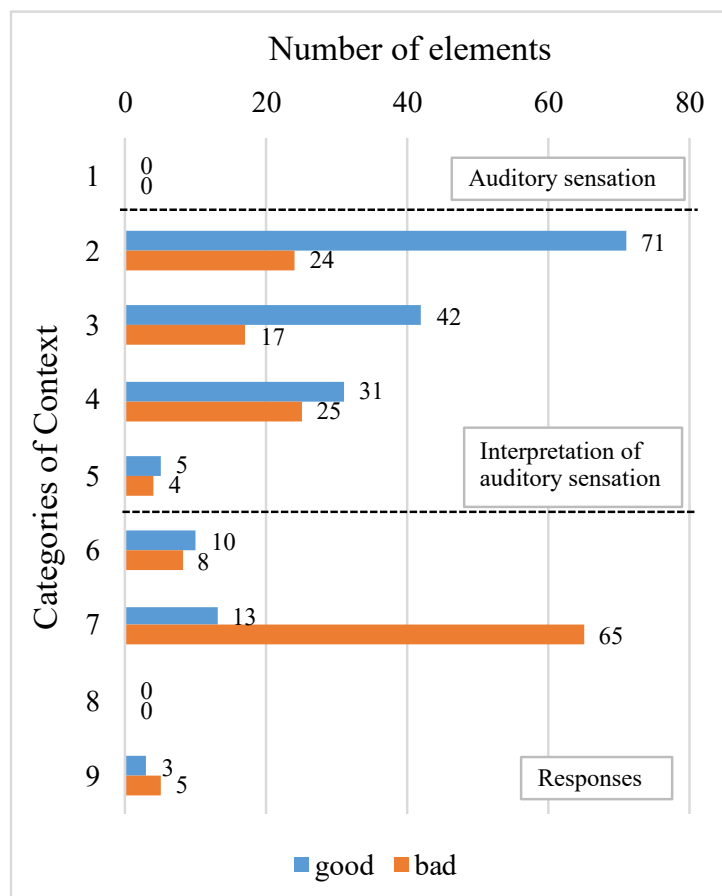


Fig. 2: Results of analysis of context

The results show that there are many context elements especially concerned with attitude to the sound source and to the producer of the sound, experience, expectations, and emotional state or psychological and physiological resources.

4. DISCUSSIONS

From the results in attitude category, it is suggested that sound events that a person has active relation with are recalled easily with agreeable impression. However, sound events with passive relation for a person cause not so good impression.

On the other hand, from the results in emotion or psychology / physiology category, it is suggested that interruption of one's psychological and emotional state often produces unlikable impression on recalling of sound events.

Overall, in the analysis, there were some difficulties about classification of words and sentences. Some words and sentences did not fit in with only one category, but also two or three. In the present research, they were decided to be classified into only one category in such situation. It is supposed that further analysis with multi category may be necessary.

5. CONCLUSIONS

Cognitive structure model was presented in accordance with ISO 12913-1. The described reasons that were obtained from questionee of written questionnaire were divided into elements and they are also classified as one of the cognitive categories. Analysis of context indicated that attitude to the sound source and to the producer of sound, experience, expectations, and emotional state or psychological and physiological resources have significant effect on cognition of soundscape. A person may recall sound events correlated with these context in his mind.

6. REFERENCES

1. ISO 12913-1, "Acoustics - Soundscape-, Part 1: Definition and conceptual framework", (2014)
2. T. Akita, " A research on sound events that are easy to be recalled by people - An analysis of questionnaire that is conducted in the coursework of acoustics -", Proc. of INTER-NOISE 2018, 2118, (2018)