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INVESTIGATION OF SOUND INFORMATION THAT AFFECTS PERSON'S ATTENTION AND BEHAVIOR

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ABSTRACT

Two investigations and a measurement are carried out to reveal what kind of sound information people take into account when they determine their behavior similarly to visual information around him. Results show that people use sound information to decide their immediate and short-term action, for example avoidance of danger, when sound information attracts their attention. Results of a measurement that intends to reveal a physical characteristics of sound information show that nighttime signal-to-noise ratio is larger than daytime at the distant point from the signal. It is suggested that the physical character of sound information should be controlled according to the variation of the intensity of back ground noise for proper transmission of sound information. It is necessary that sound information is controlled spatially and timely.

1 - INTRODUCTION

A person usually realizes his surroundings by means of the sense of sight and hearing. There exist many kinds of visual and auditory information around a person under ordinary environment. Some of them attract his attention and draw some behavior from him. For example, concerning such visual information, some researches are made in order to know what kind of information a person uses when he finds out which way to go. [1] However, in such a case, it is supposed that a person does not only use visual information but also auditory information, because there is much sound information that is designed for people to use as sign.

In the present research, investigations are made to reveal what kind of sound information that attracts one's attention and affects his behavior a person recognizes under usual sound environment in a building and a city. The results will make it clear how people use sound information to determine their behavior, and how such sound signs are planned.

2 - INVESTIGATIONS

2.1 - Investigation 1

Method. A preliminary questionnaire survey and a field study are carried out to obtain knowledge about the variety of sound that transmits some information from environment to a person. Five subjects participated in the questionnaire survey. The investigator asked them what kind of sound they use in their daily life, and wrote down their answers. In the field study, an investigator looked for sound information in a department store, a shopping mall, an international conference center, and four stations where there seemed to exist many kinds of such sound, and wrote down the sound that was planned to transmit some information.

Results. Finally, 40 pieces of sound information were recorded. They were classified into two groups, that is, verbal and non-verbal information. Each group was divided again into two classes, that is, planned and temporary information. Planned information, as warning of a traffic signal is semi permanent equipment settled for the public, and temporary information as a siren of ambulance is a short-term accidental sound or something personal. The classified results are shown in Table 1.

	Verbal	Non-verbal
Planned	announcement (a cash dispenser, in a train, at bus stop, in a shop, at a station, a ticket vending machine, at an underground pathway) warning (at an escalator, at an automatically moving pavement) voice from giant display unit in the city	warning (elevator, oven, traffic signal, parking lot, railroad crossing), announcement (elevator, starting train, the starting bell)
Temporary	television, radio, alarm clock, voice of salesperson, singing, whistle, campaign speech, warning of a car, receiving e-mail	warning (a siren of an ambulance, a horn of a bicycle, a horn of a car), announcement (washing machine, telephone), alarm clock, receiving e-mail, knocking

Table 1: Classification of sound information (summary).

2.2 - Investigation 2

Method. To reveal the sound that people pay attention to and that affects ones' behavior in their ordinary life, an investigation that requires subjects to record sound information during the visual way-finding task was carried out. Six subjects participated in the present investigation. Each of them was instructed to go alone to the square in the shopping mall in the city from the nearest station, and to write down the sound information that attracts his attention and the behavior that he did using the information during the task. The distance they walked in the investigation was about 800 meter. Two of them were quite strangers to the city.

Results. Forty-one pieces of sound information were recorded. They were classified into verbal and non-verbal information, and planned and temporary information equally to the result of the investigation 1. Actions that subjects got into using sound information were divided into five categories, that is, to realize, to look at the source, to try to understand the content, to avoid danger, and to find out which way to go. Results are shown in Table 2.

Behavior: 1: to realize, 2: to look at the source, 3: to try to understand the content, 4: to avoid danger, 5: to find out which way to go

	Verbal		Non-verbal	
	Sound	Behavior	Sound	Behavior
Planned	announcement (publicity through loud speaker, automatically moving pavement, escalator, about non-smoking)	3	warning of parking lot, machinery noise from automatic door,	4
			artificial waterfall, giant display,	2
			fountain (the goal of the task)	5
Temporary	voice (passers-by, advertisement,	1, 2, 4	music from a shop, noisy sound from amusement arcade, coughing, helicopter, walking noise,	1,2
	information counter)		construction noise, car, motorcycle, warning (a siren of an ambulance,	
			a horn of a bicycle, a horn of a car), brake noise of bicycle	4

Table 2: Classification of recorded sound (summary).

3 - PHYSICAL ASPECTS OF SOUND INFORMATION

As a result of previous investigation, it was shown that two kinds of classification could be made on sound information. Among the categories, non-verbal and planned sound must be easy to aware for the public, although the meaning is not so obvious according to circumstances. In order to get some knowledge about physical characteristics of such sound information, a measurement was carried out. A signal sound that indicated the entrance of a building in the international conference center was measured in the daytime and at night. Each data was analyzed in 1/3 octave band. Figure 1 shows the frequency component that is measured at two meter distant point from the source, and figure 2 is a result at twenty meter distant point. Finally, though the signal sound has large signal to noise ratio at 2 m point during the day and night, the frequency component of back ground noise masks that of signal at 20 m point because of traffic only in the daytime.

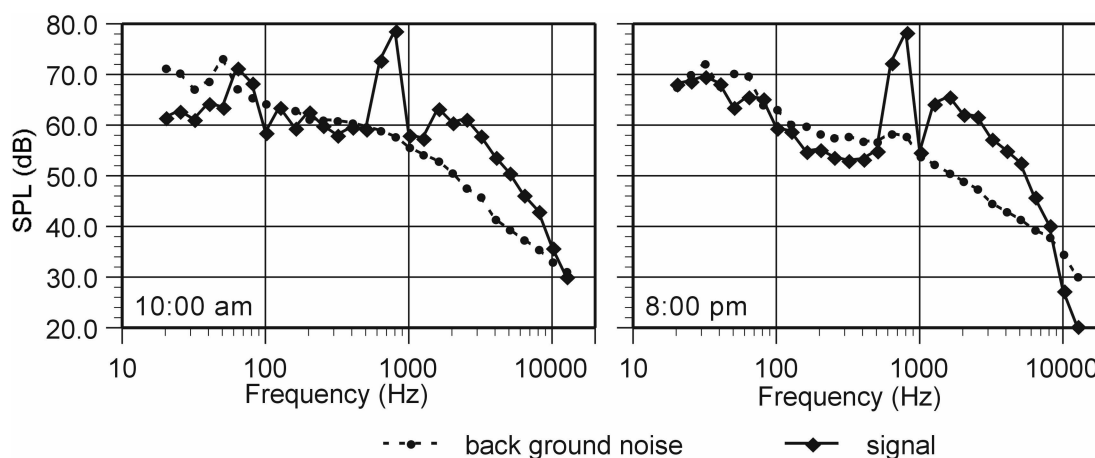


Figure 1: Frequency component of a signal sound at 2 m point.

4 - DISCUSSION

The results of two investigations show that sound information is classified by means of two classifications. They suggest that planned sound information must be clear whether it is a verbal information or not,

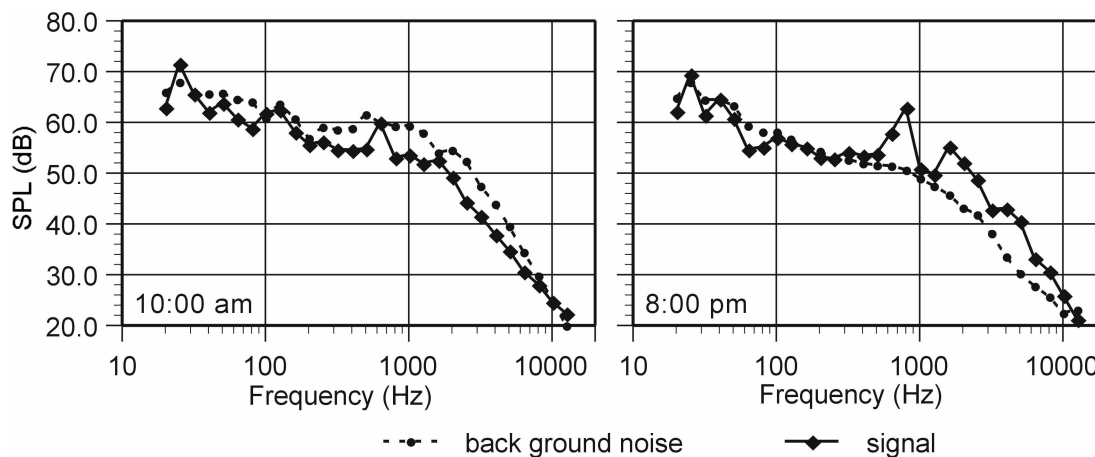


Figure 2: Frequency component of a signal sound at 20 m point.

and the planned signal should be controlled. The results also show that sound information affects five types of human's behavior. Sounds that lead a person to realize it or to look at it seem not to be so important. On the other hand, sounds that lead him to try to understand the content, to avoid danger, and to find out which way to go have meanings that are more significant. It is necessary that the latter type of sound information is controlled to be clearly heard, and the former type is managed so as not to disturb the latter type.

Considering the results of investigations and a measurement totally, it is suggested that sound environment should be controlled for planned and temporary information to be clearly heard, and the planned information should be designed for the public to be aware of easily, in spite of the place and the time. It is necessary that back ground noise, building acoustics, and sound source are simultaneously controlled with much care of spatial and time character, so that a person can clearly hear important sound information that attracts his attention and affects his behavior concerned with the significant activity to understand the contents, to avoid danger, and to find out which way to go.

REFERENCES

1. **Watanabe, A. and Mori, K.**, The relation between signage and way-finding behavior, *Journal of Archit. Plann. Environ. Engng, AIJ (in Japan)*, Vol. 437, pp. 77-86, 1992