

SOUND CHARACTERIZATION OF URBAN ENVIRONMENT

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1. INTRODUCTION

The perceptive and acoustical characterization of sound environments constitutes an important topic in research concerning the quality of life. The traditional approach, based on sociological surveys, aims at developing indices correlated with annoyance. Such indices are usually linked with sound level [1], but more recently, other indices linked to the quality of sound have been proposed [2]. However the general methods developed for defining new indices remain sociological in essence, since only general trends are explained and individual differences remain unexplained.

On the opposite, the method presented in this paper is essentially psychological since it aims at explaining the individual differences by correlating them with differences in the mental representation of sound by the subjects.

This work has two objectives : first to identify and select environments that can allow us to establish a corpus of meaningful sounds that we can physically describe and manipulate and second to find out how psychological properties correlate with the physical parameters. Only the first objective is presented in this paper.

2. METHODOLOGY

Sociology studies have used, such as Amphoux [3], for example, query techniques in order to identify the representations of a priori selected soundscapes in different groups of users of a city. Our investigation is in some ways upstream from such a research, inasmuch as it questions what is a relevant soundscape among all the large variety of acoustic stimulations that a citizen encounters.

Inasmuch as the mental representations we want to get at are not observable, we had to elaborate adequate methodologies, borrowed from cognitive psychology and linguistics, in order to have access to them. We selected two modalities of access, a graphic and a verbal one, in close connection with cognitive research concerning the relations between mental representations and linguistic [4] or iconic representations.

Graphic and verbal representations are well known to allow access to different properties of the mental representations for visual objects [5]. We will explore here the fruitfulness of such an approach within the sound modality.

2.1 Description

The subjects were first asked to give a graphical representation (that is visual) of their acoustic representations (sounds). In a second time, they had to verbally describe their sound experiences (that is, memorized).

In order to establish a representative corpus of locations which would be of particular acoustic relevance for subjects, we carried out an exploratory enquiry in Paris. The instructions required the subjects :

1 - to establish a graphical representation of the sound space in Paris by drawing : "Qu'est-ce que le Paris sonore pour vous ?" ("What is the sound Paris according to you?") and then to verbally comment the resulting drawing,

2 - "citer des lieux ou itinéraires ayant des qualités acoustiques particulières" (enumerate locations or routes having particular acoustic features).

30 persons (17 men and 13 women, ranging from 20 to 58 years old) users of Paris have been interviewed. The interviews lasted about 30 minutes.

2.2 Data processing

The locations and activities most often mentioned were : the traffic of the ring road (24%), of Rivoli street (16%), of Place de la Bastille (24%) and the Seine banks (27%), the birds and children of the Jardin des Plantes (16%), of the Buttes Chaumont (20%) and of the Bois de Vincennes (16%), the street markets of Aligre (16%) and of Mouffetard street (20%), the bustles in the streets of Montmartre (16%), Les Halles (30%), the St-Michel district (30%) and the Parvis de Beaubourg (20%), the walks in the Marais (16%) and in Père Lachaise cemetery (24%). These locations display soundscapes that can be considered as typical of Paris and which will therefore be further involved in physical analysis, as one aim of the present research.

In order to fulfill the second aim, i.e. how the sound Paris is mentally represented, it is required to further develop a linguistic and psychological analysis of the data collected.

The verbal descriptions as well as the drawing have been analyzed according to different criteria. For the drawings, the main criteria considered were :

- the setting of the drawing within the page,
- the represented point of view,
- the type of object represented.

For the verbal description, the main criteria considered were :

- the identification of the answer,
- the list of the properties attached to each of them (among which acoustical properties, evaluations, types of "objects", time, etc.).

3. RESULTS

3.1 Graphical representation

Four classes of sound space representations were obtained (Figure 1) : cartographies of Paris (20%), specific locations with generic or proper names (23%), unorganized sources in a place (50%) and abstract schemata (13%), some drawings involving several of these strategies. We can conclude that the mental representations of the sounds of a city can be heterogeneous, presenting different levels of abstraction, and different types of structural properties, that can not be reduced to the three identified by Amphoux. However the cartographical representation, elected by Amphoux as the most representative one, is given by only 20% of our subjects, whereas the unorganized sources in a location represent half of the answers. Among the sources, 76% are represented by discrete objects, 14% by people and 9% by animals (birds exclusively). Among sources and activities reported, more than 66% refer to traffic.

The drawings mainly focus on objects. Neither time nor qualitative appreciations could be observed, but the graphical representations allow us to identify the spatial properties of noise for the subjects.

3.2 Verbal representation

The main results show 80% locations, as requested by the question, but all of them are outdoors ones (no indoor soundscape). Among the remaining 20%, we mainly get sound sources. Furthermore, in contrast with the graphic description, the verbal description allows us to identify sounds as temporally situated (not that sound is displayed in time, but that sounds are identified through their precise location in time : morning markets, rush-hour time traffic, early in the morning) [6].

These 80% sites are more precisely described through the sound sources (22%), the physical properties of sound (16%) (mainly intensity -50%- then globality and continuity -30%- and the qualitative appreciations (11%). The data reveal that half of these 11% of evaluative properties are positive : surprisingly half of the reported sounds is considered as a positive quality of the city.

Such a quantitative description of the data must not hide that subjects' answers are either global or complex wording, such as "motorbikes noises in Bastille on Friday evening", "someone disturbed by the noise of the lift" and "quiet inside in the afternoon", displaying mostly soundscapes as aggregating specific locations, time and type of activities.

4. CONCLUSION

Our first aim of selecting a corpus of soundscapes has allowed us to obtain information from verbal and graphical representations of the sound environment. From the analysis of verbal descriptions we could identify locations and activities as the most often mentioned criteria for soundscapes. It can be further shown that it is important to take into account the constraints of each modality, graphical or verbal, in order to extract information on the structure of the mental representation of sound environment. When a particular attention is given to the specificities and differences of the modes of enquiry, it allows us to identify non-trivial characteristics of the sound representation. The

graphic mode allows us to stress the diversity of levels of abstraction for sound representations in human memory, whereas the verbal mode stressed the temporal and evaluative properties and the position the subject is giving to him/herself with regard to noise.

5. REFERENCES

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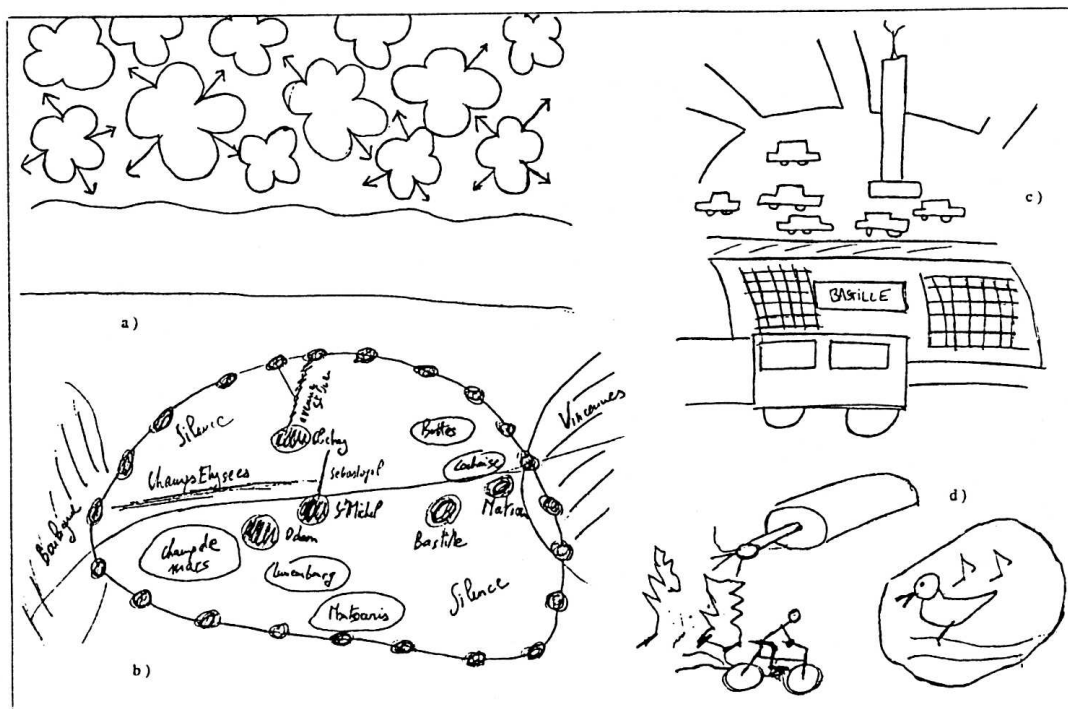


Figure 1 : 4 types of sound representations : a) abstract schemata, b) cartography, c) specific locations and d) unorganized sources in a location