Habitats Assen Pilot: Testing Methods for Exploring the Correlation between Sound, Morphology and Behavior

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Introduction

The Habitats Assen Pilot was a joint initiative of INCAS[3] and Gemeente Assen that researched the interaction between human activity and the physical environment. During the four month duration of this pilot we used a multidisciplinary approach that used techniques from both human and physical sciences to investigate how professionals, locals and non-locals experience public spaces in Assen and determine the importance of acoustics on their perception of public spaces and on the activities that they state to engage in. In this paper, we aim to offer an overview of the methods we employed in this research; we compiled mental maps, completed interviews with municipality workers and questionnaires with denizens and looked at the sonic environment from both an acoustic and a human perspective to obtain a multilayered account of the urban experience of Assen. Along these lines, we also share some characteristic mental maps, interview results and interpretation of recordings to illustrate the appropriateness of these methods to research the correlation between sound, morphology and patterns of behavior. The overall purposes of this endeavor were to explore the feasibility of using sound as a means for assessing the quality of the urban experience and also to see how this initiative could benefit urban planning initiatives.

Motivation

Humans perceive the surrounding environment in a multisensory way. Perceiving a large variety of stimuli, they construct meaning of events in the world and these meanings become *cues* that may elicit action and interaction. While the impact of the natural and built environment on human behavior has been extensively looked at in human and social sciences, sound has been marginalized and analyzed mostly as *noise* i.e. unwanted sound. The hypothesis that we advance and subjected to preliminary testing during this pilot is that sound has an effect on our day to day activities and that the perception of sound can affect our choice of activities and locations just as much as urban form ([2], [3], [4]). We tested the hypothesis that there was a relationship between the sonic environment of public spaces and the way in which humans use (and experience) their public spaces outside a lab and without reference to "unnatural" acoustic stimuli, as in other studies on attention and behavior ([5], inter alia).

Framing within Literature

In using public spaces, we cannot separate the physical features of the environment from their users and from what type of activities they actually *afford.* Gibson [6] put forward an interactionist view on perception of spaces and coined the concept of *affordance* to express the "possibility for action" i.e. the perceived potential for usage of spaces for any

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user [6]. In ecological perception and subsequently in environmental psychology and urban research affordances have been limited to the tangible elements of the built or natural environment and the influence that *form* exerts over behavior and activities in public spaces ([1], [2], [3]). We put forward a strategy that not only focuses on the perception of *visual* properties of the space as affordances but looks also at sounds as *enablers* of activity. In this sense, we build on soundscape research, where the emphasis is shifted towards the perception of sounds and their *meanings*, as perceived by humans. "The sonic environment is seen […] as a mediator between humans, their activities and the environment" ([7]). Nonetheless, although there has been notable research on the importance of urban sound quality as an indicator of the quality of urban environments ([8] inter alia) and on how sound quality affects the overall experience of public spaces ([9], [10], [11]), to our knowledge, very little has been written on the interaction between sound and patterns of human activity per se in public spaces, most of the research on perception of sounds still being performed in a laboratory, rather than in situ.

Methods for Data Collection and Analysis

During the 4-month pilot we worked with 71 respondents that drew mental maps, participated in in-depth interviews and completed questionnaires on how they experience Assen and on how they would describe the sonic environment of different public spaces they use. An overview of the methods employed follows:

1. Methods from human sciences:
    a. Mental maps.

A mental map is the graphic representation of a user's knowledge of a space. The use of this method was pioneered by Lynch ([3]) as a an alternative way of collective data on subjective assessments of spaces and practical uses of geography on a day to day basis (for example, way-finding). By asking the respondents to draw a map of Assen "as well as they can", we completed over 45 mental maps that were analyzed (and compared) according to form and content. An example of a mental map drawn by a local follows:

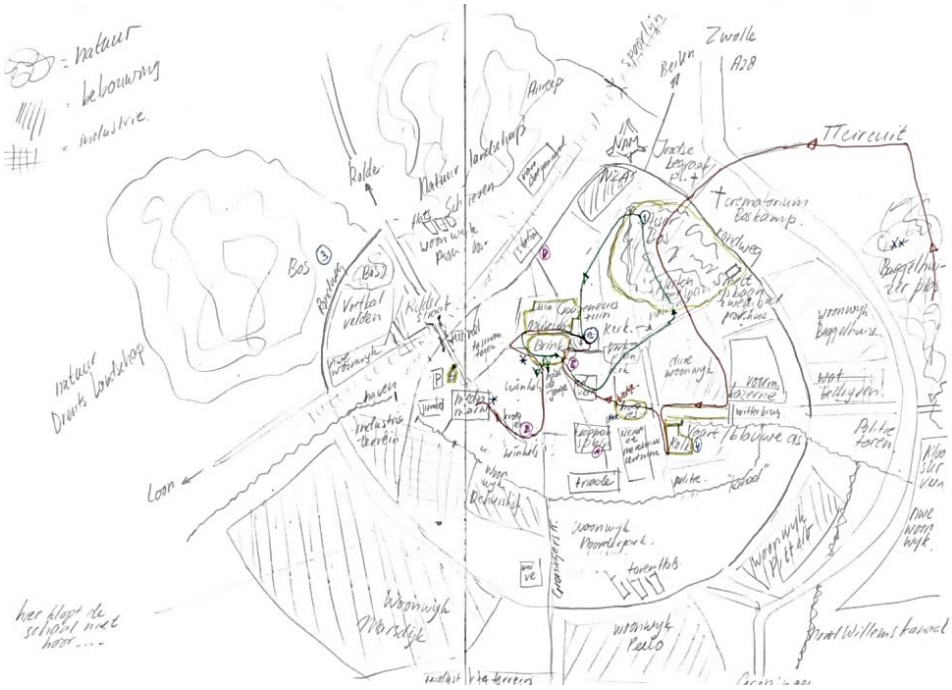

Figure 1. Mental map of Assen, drawn by a local

b. Interviewing.

We completed seven semi-structured interviews with municipality workers (urban planners and designers) on where they place potential users and their activities in the urban planning process as well as on their professional view on the public spaces in Assen and their sonic environment.

c. Questionnaires.

A group of 71 respondents (among which the seven municipality workers and the respondents willing to complete a mental map) was asked to reply to a questionnaire focused on their perception of public spaces in Assen, on places they considered tranquil (or not) and on urban issues they encounter in their day to day endeavors.

2. Method from physical sciences: sound recording and signal analysis.

We made recordings in two locations that had been indicated by respondents in their questionnaires as being both tranquil and noisy. These recordings were used as a data source for the hybrid method described in (3).

3. Hybrid method: Time-component Matrix Chart.

A Time-component Matrix Chart (TM-chart) is a graphic representation of the temporal distribution and loudness of the dominant sounds (as identified and labelled by a human listener) captured in a recording made in a public space ([12], [13]). We compiled TM charts based on the recordings mentioned previously. The TM charts were compared based on their composition (perceived and annotated sound categories) as well as the relative sound pressure levels of the categories of sounds. An example of two of our resulting TM-charts follows. Observe that the relative sound pressure level values of the two recordings are very similar but that the difference in acoustic environments is readily available with reference to the TM charts i.e. it can be seen in the percentage of time in which certain sound categories are dominant for each case. For Koopmansplein, which is a largely pedestrian shopping square, "human sounds" are dominant for more than 70% of the recorded time and also have a relative sound pressure level lower than that of the dominant sound in the Havenkwartier (a business park by a busy highway) – "traffic noise" – for over 95% of the time.

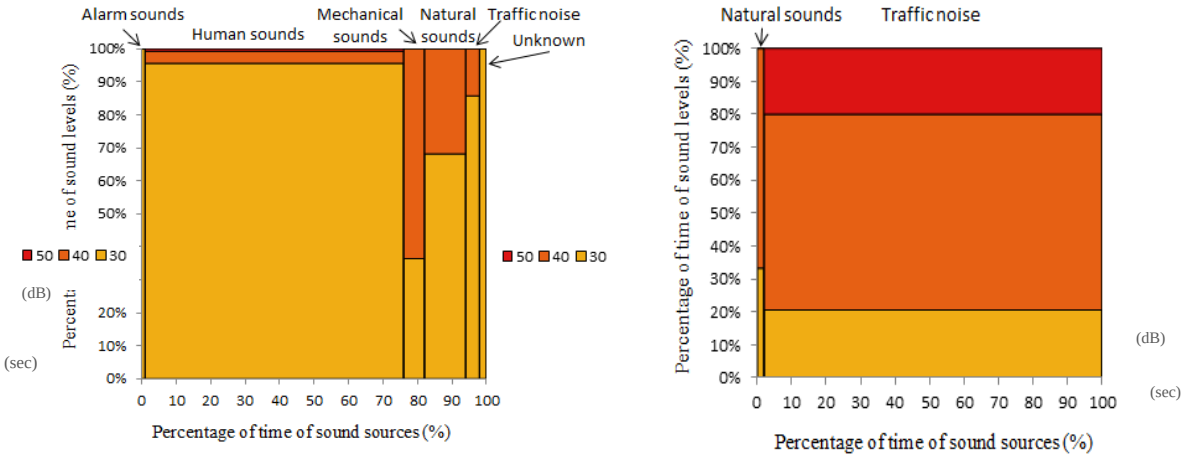

Figure 2. Time-component matrix chart for Koopmansplein (left) and Havenkwartier (right)

Findings

We mainly focused on methods to explore patterns of activity and public space usage. The results of the data collection and analysis are derived from a research strategy that can yield a meaningful variety of human data: verbal data on user-centered needs and potential solutions for urban planning and design gathered through interviews, data on usage and perception of public spaces through questionnaires and data on individual spatial knowledge obtained through mental mapping. Both the TM charts and the mental mapping technique make the progress towards bridging the gap between the physical and the human sciences by combining acoustic and geographical data with human perception of spaces and thus offering a more complete image of the urban experience.

Given the complex nature of our research, this pilot has employed a mixed method approach (including, along the more classic interviewing and surveying techniques, mental mapping and TM chart compilation) to explore the potential of sound as a and how urban research can benefit from adding the acoustic dimension to a traditionally vision-oriented approach to the city.

Future research

The preliminary results of the pilot indicate a contribution that could be made to urban planning practices by adding the dimension of sound to a largely vision-oriented tradition of designing and assessing public spaces. Nonetheless, a series of questions arise:

- What are other research strategies/instruments that could contribute to a more accurate depiction of this interaction between users' perception of spaces, their patterns of activity and their sonic environment in public spaces?
- How can these methodologies be automated to improve efficiency of data collection and analysis?

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