DiMMI

Dictionary for Multidisciplinary Music Integration: Interaction

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Silvia Sacchetti, Nicola Conci (eds.)

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The Dictionary for Multidisciplinary Music Integration (DiMMI) is a proceedings series about the event organized by the University of Trento and the Conservatory "F. A. Bonporti" of Trento and Riva del Garda, in which musicians and representatives of the academic world are called to reflect together on a word of common interest, each from the perspective of their own discipline.

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Table of Content

Is Landscape Sound? A Multidisciplinary Approach to the Soundscape of Trento (Italy)

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Abstract

This multidisciplinary—landscape architecture, urban planning, electronic music, composition, and field recording—research project investigates the relationships and interferences between landscape and sound (i.e., soundscape) in Trento (Italy) through environmental sound sampling and mapping. Interaction between disciplines—and between sight and hearing, in the landscape perception—has a key role throughout the research. This contribution aims to report the stages of the activities carried out in the summer 2021 by the research team and to illustrate the first results, the most substantial of which is the sound map, a catalog of urban sounds; a conceptual sound section has also been drawn, to illustrate additional information and reflections that the map does not highlight.

1 Introduction

In the framework of the research project "Oi Dialogoi" (2021-ongoing), promoted by the Conservatory F.A. Bonporti, Trento / Riva del Garda (Italy), the multidisciplinary—landscape architecture, urban planning, electronic music, composition and field recording—research team started an investigation about the soundscape concept (the acoustic analogy to landscape), its digital registration and fruition, and its subsequent potential application in the urban and landscape planning policies of the historic center of Trento.

1.1 Theoretical framework: the soundscape

The title of the research, intentionally provocative, paraphrases the title of the essay "Is landscape...?" [Doherty and Waldheim, 2016], which highlighted the multiple identities of landscape, exploring the relationships between landscape and other disciplines, but among them the relationship between landscape and sound is not explored.
Nevertheless, the use of the term "soundscape" is spread among various disciplines, ranging from urban design to wildlife ecology to computer science. The term firstly appeared in "The Sonic Environment of Cities" [Southworth, 1969], originally coined by Michael Southworth, a city planner, former student of Kevin Lynch; only later it was popularized by the composer Raymond Murray Schafer, thanks to his "The Tuning of the World" [Schafer, 1977].
An important distinction has to be made between "soundscape" and acoustic environment: this latter is the combination of all the acoustic resources, natural and artificial, within a given area as modified by the environment; a "soundscape" is the acoustic environment as perceived by humans, in context. This recalls the definition of "landscape" according to the European Landscape Convention [Council of Europe, 2000]: "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors".
The International Organization for Standardization (ISO) standardized the definition of "soundscape" [International Organization for Standardization, 2014]—the "acoustic environment as perceived or

experienced and/or understood by a person or people, in context"—contributing to the 3rd (Good Health and Well-being) and 11th (Sustainable Cities and Communities) Sustainable Development Goals (SDGs) adopted by the United Nations.

1.2 Operative framework: the urban landscape of Trento (Italy)

Nowadays soundscape approaches—embedding "sound" into the framework of urban and landscape planning and design—focus on human-centered and context-based solutions that consider people's perceptions, needs, socio-cultural background, and expectations in relation to their acoustic environment. Since this latter is one of the critical environmental factors in judging the quality of life, soundscape analysis and mapping (i.e., "soundmaps") can be considered emerging tools to describe urban acoustic states and trends.
Publicly-shared recordings can be used for specific objectives, such as the study of noise pollution [Anderson, 2016] or the preservation of sound heritage (e.g., historical Venice lagoon's sound traces in Venice Soundmap[1]; Portobeseno's environmental sounds, voices and stories in AlpSound[2]), but also for practical applications (e.g., in the Hush City Map app[3] [Radicchi, 2021] anyone can map, evaluate and discover both quantitative and qualitative data about public quiet areas).
In the context of the Municipality of Trento, the main landscape planning tool is the Landscape Chart (lit. *Carta del Paesaggio*), which identifies the so-called landscape units, the territorial structure of identities and invariants. Here, visual perception is the only one taken into consideration, with no mention of the acoustic perception (and of the soundscape). The Municipality is only provided with an acoustic classification (or zoning) of its territory, differentiating it into six acoustically homogeneous classes, based on the main urban uses allowed and each responsible for specific acoustic limits.

2 Methodology

During three days between June and July 2021, the research team recorded, cataloged, and mapped the urban sounds of the city of Trento, inspired by the practice of "soundwalk", a "method that implies a walk in an area with a focus on listening to the acoustic environment" [International Organization for Standardization, 2018].
The spatial conformation of the historic center of Trento suggested the choice of some sample locations, paradigmatic for their geomorphological characteristics, in which to make the first sound recordings. By reducing the city to its essential geometric forms, generators of space—points, lines, and surfaces [Kandinskij, 2017]—the following were identified:

- The three bumps (lit. *Doss*) Trento, Sant'Agata and San Rocco, as points (in elevation).
- The current and former courses of the Adige River, as lines.
- Open public spaces (i.e., squares, parks) as surfaces.

The methodological steps of the work are described in the following paragraphs.

2.1 Data collection and elaboration

Since people experience space and sound in 360°, the translation at the recording level (made with the recorder Zoom F8n, 48000 Hz of sampling rate at 24-bit) and subsequent reproduction of these essential geometric shapes from spatial to sound was solved as follows, using relatively expeditious and inexpensive means:

- For points, the so-called "XY" technique was adopted by crossing two microphones (Neumann KM184) with "cardioid" polar pattern and making a stereo recording (left and right channel).
- For lines, movement of points in one direction, a microphone called "shotgun" (Sennheiser MKH 416, "super-cardioid" polar pattern) was used, which records in the direction in which it is oriented so that the movement can be rendered. This technique differs from the others because it is performed in motion.
- For surfaces (the most complex), sets of points/line movements, were used four microphones (Neumann KM184) with "cardioids" polar pattern, to define a circumscribed area of about 5x5 m, and a microphone with "omnidirectional" polar pattern (AKG C414), placed in the center of that area.

[1] Available at: www.venicesoundmap.eu/home/.
[2] Available at: www.portobeseno.it/alpsound/?page_id=2133.
[3] Available at: map.opensourcesoundscapes.org/view-area.

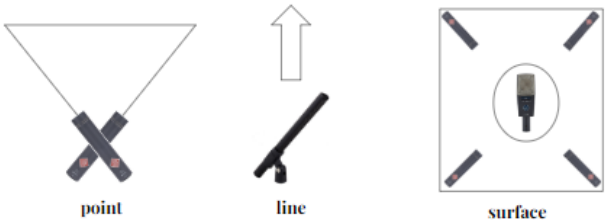

Figure 1: *Points, lines, and surfaces in audio domain*

After a first test of these procedures in Piazza Dante (the train station square), the main change made was in the size of the surface to record (from 12x12 feet to about 5x5 m).
For the data elaboration, the surface recordings were adapted to stereo listening because of the difficulty in reproducing the "surface effect" without a quadraphonic audio setup. Subsequently the audio files were cleaned with a Digital Audio Workstation (Pro Tools) using an equalizer to remove unwanted low frequencies picked up by microphones (caused in most cases by the wind). Rare adjustments were also made on the other portions of the audio spectrum, but only in case of annoying frequencies. After that, they were normalized at -3,0 dB for a correct listening, to resolve the differences of dynamic range in the various recorded soundscapes. Finally, all the audio files were collected, cutted to exactly one minute, and uploaded to a digital platform for listening.

2.2 Data visualization

To visualize these data and make them shareable and usable, a digital sound map has been developed. Specifically, the collected recordings have been cataloged in a geo-referenced sound map using Google My Maps, a platform to publish data, making them shareable and accessible.
The geometry of the various elements—points, lines, and surfaces—had already been approximately drawn directly in the map while recording, using the app on the mobile phone and thanks to the GPS. These traces have been used as landmarks when later the map has been improved and equipped with data. The geometries are clustered according to date and place of recording and accompanied by a brief description of the context.
To complete the map, also representing the sound depth [Feld, 2021], a conceptual section was developed, perpendicularly to the Adige River (from Doss Trento to Doss Sant'Agata): thus, places and their relations (e.g., the relative height) are shown in a different way.

3 Results

The main result of this work is the geo-referenced sound map[4]: points, lines and surfaces are described with soundtracks, photos taken during the recordings and, in some cases, videos. These elements are easily accessible to users clicking on the associated element in the map. In addition, each typology of geometrical elements is characterized by a different color: points in purple, lines in orange, and surfaces in blue; some points are in orange (lines' starting and ending points) and in blue (surfaces' vertices and center).
The framework of the research project "Oi Dialogoi" gave the possibility to present the research project and its first results in different phases, having feedback that enriched the entire process. An interesting experience was the use of the Kahoot app, during a meeting on 24th September 2021, with the audience involved. After listening to a track registered along the Adige River, people were asked to imagine some physical elements of that place, relying only on the sound perception. The results highlighted the little attention usually people pay on soundscape: having sound as the only information tends to confuse our perception of space (for example, someone did not recognize that the recording was in movement or along a river). The results of this experience are even more interesting if related to the history of the Adige River in Trento: in the proximity of the city center, nowadays this no longer follows its original watercourse; in the XIX century, it was deviated to build the railway [Consoli, 2012] and now on its original riverbed there is a street.

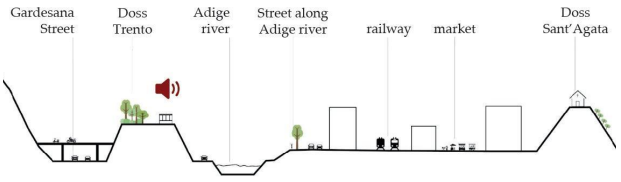

Figure 2: *"Soundscape section"*

Similar considerations emerged during the recording: the soundscape was sometimes very different from the landscape as "visually" perceived; and the "depth" of sound was not

[4] Available at: www.google.com/maps/d/viewer?mid=1cxqHKCpbTI5zDtjZK6iF50Vlvq1i1Tl2&ll=46.072360725662364%2C11.11010809384096&z=14.

always realistically captured (i.e., sometimes the sound source seems closer or more distant than it really is). This latter can be better understood referring to the "soundscape section"[5]: a track registered in Doss Trento (corresponding to the red symbol in Figure 2) is listenable. Some sounds (e.g., motorcycles and trains) do not match with the landscape—the Doss surrounded by trees that prevent the spectator from seeing the city.

4 Conclusions and outlook

Although the literature and multidisciplinary research on soundscape have been growing, especially in the last two decades, there is still a strong need to provide a holistic perspective for designing sustainable urban soundscapes.
This research could move towards the integration between urban planning and policy to noise pollution control and mitigation in the city of Trento. Indeed, considering that maps and sections are different ways to represent relations between spatial elements, and that in this case they are enriched with multimedia files, this research could be the starting point for a qualitative and quantitative data catalog towards a Trento's soundscape description to be used in urban planning. In particular, the in-progress "soundscape section", as conceptual representation, shows potentialities to be explored, beyond its current limits (e.g., it is not geometrically accurate; it is linked to only one soundtrack; it has to be accompanied with other parallel and perpendicular sections).
The considerations about perception during the recordings, as well as following the collective experience with the Kahoot app, suggested open questions: what changes did the modification of the course of the Adige River cause in the soundscape of the city of Trento? Is it possible to find some traces of the ancient Adige course's soundscape into its modern one, and vice versa?
From the point of view of sound sampling, this work can contribute to a better organization of procedures and audio recording equipment, specifically associated with geometrical entities of space (as points, lines, and surfaces). New forms of representation for a better interaction between senses could also be studied and experimented.
Even if the quality of tracks uploaded would not be guaranteed, further development could include citizen participation in constructing the map and the section(s); additionally, this could increase the number of recordings, enriching the data and making them more objective.

[5] Available at: soundcloud.com/sebastiano-beozzo/punto2-dosstrento-cut/s-EgfxJfp5600?si=29d6ef264fe74e8fabdcaba60fd22b0d&utm_source=clipboard&utm_medium=text&utm_campaign=social_sharing.

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References

Anderson, I. [2016]. Soundmapping Beyond The Grid: alternative cartographies of sound. *Journal of Sonic Studies*, *11*.

Consoli, M. [2012, January 6]. Quando l'Adige seguiva il corso dell'Adigetto. *L'Adigetto*. Retrieved from www.ladigetto.it/permalink/16339.html.

Council of Europe. [2000]. *European Landscape Convention*.

Doherty, G., and Waldheim, C. (Eds.). [2016]. *Is landscape...? essays on the identity of landscape*. London New York: Routledge, Taylor & Francis Group.

Feld, S. [2021]. L'estetica come iconicità dello stile. In *Il mondo sonoro dei Bosavi. Espressioni musicali, legami sociali e natura nella foresta pluviale della Papua Nuova Guinea*. Palermo: Edizioni Museo Pasqualino.

International Organization for Standardization. [2014]. *ISO 12913-1:2014 Acoustics — Soundscape — Part 1: Definition and conceptual framework*.

International Organization for Standardization. [2018]. *ISO/TS 12913-2:2018 Acoustics — Soundscape — Part 2: Data collection and reporting requirements*.

Kandinskij, V. [2017]. *Punto, linea, superficie: contributo all'analisi degli elementi pittorici* (34. ed). Milano: Adelphi.

[6] For more information: www.conservatorio.tn.it/oi-dialogoi.

Radicchi, A. [2021]. Chapter 6. Citizen science mobile apps for soundscape research and public spaces studies: lessons from the Hush City project. In A. Skarlatidou and M. Haklay (Eds.), *Geographic Citizen Science Design. No one left behind* (pp. 130–148).

Schafer, R. M. [1977]. *The tuning of the world: a pioneering exploration into the past history and present state of the most neglected aspect of our environment: the soundscape*. Toronto: McClelland and Stewart.

Southworth, M. [1969]. The Sonic Environment of Cities. *Environment and Behavior*, *1*(1), 49–70. doi: 10.1177/001391656900100104.

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