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DECODING PUBLIC LIFE IN URBAN SOUNDSCAPE:
The Case of Weimar

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...to my family

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ABBREVIATIONS

2D	: Two Dimensional
3D	: Three Dimesional
ADC	: Analog to Digital Converter
C	: Celsius
CD	: Compact Disc
Cm	: Centimeter
Cresson	: Centre de Recherche sur l'espace sonore et l'environnement urbain
DAC	: Digital to Analog Converter
DB	: Decibel
FFT	: Fast Fourier Transformation
Fpm	: Frames per minute
Hz	: Hertz
IID	: Interaural Intensity Difference
ILD	: Interaural Level Difference
IPD	: Interaural Phase Difference and
ITD	: Interaural Time Difference
K	: 1000(number), replacement of the last three zeros
KHz	: Kilohertz (1000 Hertz)
Loc	: Location
Miking	: Microphone Recording
Mm	: Millimeter
Mov	: Movement, used in music
Ms	: Millisecond
No	: Number (Numero)
ORTF	: Office de Radiodiffusion Télévision Française
OSC	: Open Sound Control

OSS	**:** Optimum Stereo Signal
SEAM	**:** Studio für elektroakustische Musik
Sec	**:** Second
SPL	**:** Sound Sressure Levels
UDP	**:** User Datagram Protocol
WFAE	**:** The World Forum of Acoustic Ecology
XLR	**:** External Line Return

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INTRODUCTION

The research field of sound landscape and public life, initially drew my attention during the master class of ‘Media of the Urban’, originally ‘Medien des Urbanen’, which was given by Prof. Dr. Gabriele Schabacher in the 2015 summer semester. For the relevant class, I conducted an conceptual case study in Istanbul, Beyoglu District, with the intention of analysing the perception of the space by urban sound. During the summer 2015 I recorded various sounds of different spatial settings and developed the analysis by comparing the situations. By that time, I realized the inherent property of the sound as a medium for our perception in urban context.

In the 2015-2016 winter semester, I participated in the master class of the architectural project, named ‘Build Allegory’, which was given by Prof. Dipl.-Ing. Heike Büttner. The project was situated in Berlin Westkreuz, AVUS north curve, on the highway and was originally a race track from 1921. In this context, the aim of my project was to answer various questions, main of which was, how does the architectural form shape the sound of the place? And, how does the sound of the place shape the architectural from? Since the place is still serving mainly to the vehicles, although the function has differed, the sound objects and the context have remained. Through the existence of contextual references, I started with creating a computational tool for analysing the acoustic characteristics of this urban setting, which is fundamentally providing results as the sound cloud, driven from the sound ray tracing method. Regarding to this soundscape analysis method, which I developed, this computational tool assisted me to find an optimum reciprocal relation between architecture and sound.

Since I have been working on soundscape in the context of architecture, urban situations, public life and public space, I was determined to produce a comprehensive research in this field and propound the hypothesis; the existence of the reciprocity between the social behaviours in public space and the sound landscape. In which extent does this reciprocity exist? What are the effects of the public life on the sonic configurations of the space and the other way around?

State of the Art

In the process of understanding this relation, I started researching on the literature and the previous works, which have been operated in this field; soundscape.

In the centre of my research, the work of Swedish architect, researcher and acoustic designer Björn Hellström 'Noise design : architectural modelling and the aesthetics of urban acoustic space' forms the core. This work had great value in helping me to design the framework of my thesis and as well being a profound contribution to the field of sound landscape and sonic configurations. Most of the researches, that I came across or benefited from, belong to French literature. Although nowadays one could find the translations of these works, some of them are not yet decoded. In that extent, Hellström produced an incredible work by translating and decoding these works.

One of the most important research organizations in this field is the WFAE, World Forum of Acoustic Ecology, founded in 1993. Fundamental contributions are made by the Canadian researcher and the composer R. Murray Schafer. The other important research organization is the Cresson Institute, Centre de Recherche sur l'espace sonore et l'environnement urbain, founded in 1979. The WFAE and Cresson have a lot in common. Yet there are several differences between them. One fundamental aspect concerns the concept of the soundcape idiom, which according to Jean-François Augoyard at Cresson does not treat with sufficient precision complex sonic environments in urban space. [1]

On the research of acousmatic configurations of the space, Trevor Wishart in his work 'On Sonic Art', depicted the aural images and the interpretations of the operation of hearing. His investigation has a lot of value in this field. Again in the field of operations of hearing, the Canadian composer and researcher Barry Truax has contributions to granural synthesis and the soundscape.

On the other hand, since this thesis is questioning the dynamics of the public space and the public life, the fundamental research methods have been provided by Jan Gehl and Brigitte Svarre in their

1 Hellström, 2003, pp. 20-21

work ‘How to Study Public Life’, published in 2013. The work is constituted by the experiences of them in the field of analysing public life and space, over more than fifty years. Through their work one can gain a methodological approach to everyday life. The everyday life, in this thesis, will be explored in direction of the French philosopher and sociologist Henry Lefebvre, by his work ‘Rhythmanalysis: Space, Time and Everyday Life’ published in 1992.

When one studies public space and everyday life, one must as well consider the social behaviour in their dynamics. Therefore, in the relevant field, one of the pioneering Canadian-American sociologist is Erving Goffman. He introduced the framing methodology in the context of social experiences and social interaction. This methodology assisted this thesis, to build the contextual structure and the know-how of the analysis.

Throughout all these background researches, I started forming my statements and as well as the questions, regarding to my hypothesis. Consequently, the missing juxtaposition of the research fields; urban sociology in terms of public life, and sound landscape in terms of acoustic code of the space, had led me to build up a new hybrid, interdisciplinary methodology for the analysis of sound and public behaviour. Eventually, this approach motivated me to initialize an architectural and urban design tool, and as well as a tool for sound and acoustic designers. This research can be developed in the direction of pedagogy in terms of teaching people how to listen to the spaces or could be investigated as a new representation to sound compositions.

Thesis Structure

The research on public space and public life in the context of sound landscape was structured in three main parts. Considering the methodologies which had been introduced in the literature and the previous researches about the relevant subjects, the outlines of this study will be introduced as followed.

In the first part, it begins with the description of the dialectic presence of social frameworks, which are the reciprocal entities of the meaning and activities. One cannot conceive the social frameworks, without concerning the social situations which are occurring in public space and in our everyday life. Since it will be argued in the overall thesis study, the frames will be described in terms of codes in order to interpret from everyday situations. This interpretation of public life, regarding sound landscape will be named as 'translations'.

The reason of defining the frames, is to start with a systematic approach for the research and analysis. Therefore the frames are essentially constituted of nine properties, which are thoroughly explained in part one. Referring to the third part, which is the case study conducted in Weimar, the frames can be restructured as;

1. The frames are axial mappings, demonstrating the perceptual localization of the sound objects.
2. The frames are the structurized moments, which were represented as certain patterns of the sound objects' distributions. They consist of metaframes, subdivided frames, illustrating the sonic events in the whole pattern.
3. The patterns of the frames are shaped by not only the sound events, but as well by the physical surroundings, social contexts, etc.
4. Different patterns of different urban settings are complementary to each other. Meaning, the deductions can be made for or to another.
5. Translation of the frames can be made by using inductions.
6. As designers are involved profoundly in the decision making process, it effects the framing and the inferences of social decoding.
7. The axis of the frames, which are represented as mappings in the third part, does not include the time domain.
8. These mappings demonstrate social realities.
9. The frames are the codes which can be used for reasoning and consequences of the sonic and social events.

This structure of frames helps the researcher to avoid semiosis and connotations, which are implicitly negative and out-of-frame. In order to stay in-frames, one should know as well how to investigate the dynamics of public life. Regarding to that, observation is the most efficient tool for measuring the characteristics of urban settings, in extent to everyday life. Thus, the main questions and observational tools are defined broadly for the systematic evaluation.

The evaluation is fundamental to understand the metabolism of the certain urban settings and the rhythm of everyday life. In this context, the observer is the agent to conceive the spatial features and sensuous events. One should take into consideration that the agent makes himself/herself more sensitive to time than space. However spatial features, as well the frames, are not restricted with the time domain, in spite the fact that rhythm cannot be isolated from time. Therefore the results of the case study are represented without an explicit time domain, instead the interval occurrences are shown in the video.

The time dimension is thoroughly explained in extent to being present and being presence in part one. Considering the frames of this study, the whole moment form of the social and sonic events is presence in a time period, so is the frame as well. The individual events are present in their individual moments, in another word interval, as the rhythm of everyday life is strictly related to being present. Therefore analyzing the intervals of the events is as crucial as isolating the time domain and analyzing the whole moment.

Sound is an entity which can evoke the stream of consciousness, therefore sound images. It has been investigated in part one, that the sound and the sense of hearing are related to the local identity. Within this situational characteristics, analyzing the configuration of the sound objects helps to unfold the space syntax. Sound as well conveys inherent information which defines the acoustic code of the space and its relation with the sound objects. Broadly the sound object is disregarded from the sound's contextual cue, and the source which the sound is originally emitted from. Although it is profoundly described in part one from different point of views, sound objects are fundamental to conceive the acoustic of the space, in a quantitative manner. In this context, the intrinsic features of the sound which are concerned by this study, in other words morphology of the sound which can be subdivided as textures and gestures.

Sound morphology is described as the inherent motion of the sound grains, which is not related to the spatial trajectory of the sound in space. These features will provide us a profound understanding of the sound effects between the objects and the receiver. Therefore the receiver, in another word the listener, should apply a special attention and listening technique, which is called reduced listening. However even trained listeners, as well as the others, perform coordinately also the ordinary listening. The distinction between two competences is; while ordinary listening is to perceive the context of the sound, reduced listening is to perceive the sound itself. These operations of listening and hearing are distinguished and thoroughly described in part one.

The modes of perceptions, which were broadly described previously are the milestones for understanding the sound landscape and its sonic configurations. When we speak about the sound landscape, according to the research, it consists of three main parameters; space, location and source. Relation of the space is conceived as the acoustic properties of the place, the location demonstrates the sound as a frame of references and the motions of it, and last the source is for the recognition process of its contextual cue and the transition. In that context, the most significant effects to investigate, in regard to my thesis and the case study, are the 'metamorphosis' (metabolic) effect and the 'ubiquity' effect.

The spatio-temporal parameters are defining the sonic metabolism. In a certain setting, if the contextual cues of sound objects have unstable perception, however it is yet clear to understand the locational information of the constituent parts by time, then this demonstrates the metamorphosis (metabolic) effect. In a variant of this effect, if one perceives the contextual cues, in other words location of the sound sources, simultaneously from a singular source and also from many sources, then this demonstrates the ubiquity effect, which primarily causes the loss of orientation.In either of these effects, the moments are unfolding the spatio-temporal effects, however in this case study, as it was described above, the time domain is considered as non-linear entity as well. This will shape the spine of the analysis and will be called as the 'moment form'.

Disregarding time as a horizontal entity and decoding the constellation of the sound objects vertically is fundamental for the moment form of the settings. As a result, in the mapping, it has been represented as overlapping individual moments without the time domain. After all this can be operated as a new compositional notation system of public life and space. In a defined sound landscape, these new notation system for the sonic configurations of the acoustic space convey the sound effects, which are essentially the matters of facts. The concept of the sound effects is the interaction between the physical sound environment, the sound milieu of a socio-cultural community, and the internal soundscape of every individual. The majority of the sound effects can be investigated under five statements, which are [2] [Augoyard et. al.: 2006];

1. Support of acoustic measurement
2. Multidisciplinary instrument for the analysis of complex situations
3. Support for representative tools
4. Tool for architectural and urban intervention
5. Pedagogic tool serving a general listening experience

Following the first part, methods and techniques are described in part two, which were used in the case study conducted by me. Initially I was introduced with the sound by the studio for electroacoustic music Weimar (SEAM) and took lectures and tutorials on the time period 2015-2016, which helped me to develop some complementary skills and understanding in my research.

In part two, starting with explaining the microphone techniques and recording, the information will be provided about the types of microphones, microphone recording techniques, recorders and microphone equipments, which were used during the case study. When describing broadly the methods, which have been used, at first I should mention about the microphone techniques and the recording process.

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2 Hellström, 2003, pp. 104-105

After testing different methods, I found ORTF and Jecklin Disc microphone recording techniques most efficient in the sense of gaining spacial data from sound environment. Therefore I combined those two methods into one, in order to get maximum performance. For that hybrid technique, I needed two cardioid microphones (Neumann KM184) to have stereo recording, one recording device (Tascam DR-680), and the self made Jecklin Disc built by 10mm EUROKUSTIK acoustic foam with 30cm diameter to isolate both channels. While I was recording the sound, I was using a camera (Canon EOS 600D) to capture the social behaviour as well, so I can freeze the moment for analysing later. In order to listen to the raw materials and to edit, I was using REAPER Digital Audio Workstation. After preparing the material for frequency-amplitude analyse, to collect the values from each frequency samples, I used an open source programming language, Processing. In the end, the results from Processing (amplitude values of each frequencies, approx. every 0.12 ms) were being sent to Rhinoceros (plug-in Grasshopper) to compute the localization of the samples and to create 2D mapping. Each one minute recording from 6 different recording points in Weimar, had about 500.000 sample data for the frequencies between 1k and 5k (which is the most sensitive range for the human ear). In order to compute that data, reduction must be done. The process of visualizing the data and the design rules of perceptual localization will be thoroughly illustrated in part two. Another crucial information, which is provided in part two, is Fast Fourier Analysis and the data extraction.

In the final part, part three, the case study is elaborated and represented with the visuals, related to each analysis, of six different recording points and four different urban settings. One can clearly read the results by framing methodology, in terms of sound effects and sonic metabolism. The new representation must be investigated as a new notation system for the acoustic code of the public life and space.

The recordings and the analysis of these urban settings can be collaboratively examined with the video I prepared, which the reader can find in the CD of this thesis. In this video, there are additional analysis of each location, in extend to loudness and percentages of the sound objects distribution. The analysis of the loudness and the distribution will allow the designer to have inferences from the results and will help in the decision-making process.

PART 1

“What is society, whatever its form? The product of human reciprocal action.”
- Karl Marx

1.1. SOCIAL FRAMEWORKS AND PUBLIC SPACE

Social frameworks are the constitution of human activities, which is apt to represent the manifold existence of society. As denoted in the works of Comte, Marx, Durkheim, Parsons and the Frankfurt School [1], society is viewed as overlapping networks of meaning and activity. This game-like reciprocity between meaning and activity is the representation of dialectic frameworks.

In ‘The Presentation of Self in Everyday Life’, Erving Goffman suggests that when we enter a social setting; we need to know something about the situation and the other participants. We need to know whether the situation is formal or informal, happy or sad. We need to know the various roles of other people, whom we should speak to and whom to avoid, and whether or not we are welcome. Conversely, people in this situation need to know something about us. What is our reason for being there? What role will we play in this situation?

In short, to know the behavior in any interaction, we need to know ‘what is going on here?’ [2] Goffman calls this the ‘definition of the situation’.

1.1.1. INFRASTRUCTURE OF A FRAMEWORK

A framework, which is, in this case, formed within the public space, provides the rules and principles to gain an organized perception of the question: ‘what is going on here?’ Frames are keyed, or

1 Encyclopaedia Britannica
Frankfurt School; group of researchers associated with the Institute for Social Research in Frankfurt am Main, Ger., who applied Marxism to a radical interdisciplinary social theory. The members of the Frankfurt School tried to develop a theory of society that was based on Marxism and Hegelian philosophy but which also utilized the insights of psychoanalysis, sociology, existential philosophy, and other disciplines.

2 Thomas, 1925, p. 42

indicated by cues or signs which stand in a part-whole relationship to the matter(s) framed. About concept key Goffman writes, '... a set of conventions by which a given activity, already meaningful in terms of some primary framework, is transformed into something patterned on this activity but seen by the participants to be something quite else'. [3] The exercise of gathering, assessing and interpolating facts is a kind of framing operation, a creative process maintaining the cultural authority of the law as well as refining its inner cognitive structure. Once a matter, event, person, or conflict is framed, the frame can be used as an analogue for mapping other activities. The frame, then, is something like a code, which shapes, typifies, informs and even confirms the nature of the choice. Nevertheless, the frames are obtained data by process analysis which are yet to be interpreted. It will be termed 'translation'.

Translations of the frameworks are embodied in a structuralist method as Goffman connoted in his work 'Frame Analysis' , rather than using semiotics. Therefore before getting started to analyse a certain moment-form [4], one should provide the infrastructure to gather the information from a behavior pattern. The following infrastructure is emerged from the work of Peter K. Manning and Keith Hawkins about legal decision making which was reproduced from Goffman's ideas on framing. These statements are to provide insight for features of framing in public space.

1) Frames are the axial decodings of social settings, in which the materials are situated by behavioral acts, agencies, aims of existential factors. In this case study they are being examined as the factors of public space, which is organized data of what Goffman calls 'guided doings' [5].

2) Frames are the structurized moments, which can be subdivided into entities to identify different clusters under one totality. Those clusters consist of resemblances in context of public space.

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3 Goffman, 1974, p. 43-44

4 *Moment-Form;* is a new music term originated by famous German composer Karlheinz Stockhausen in 1958-60. The notion was initiated to find a new method to compose a piece by creating a new notation system and focusing on the musical events of the piece, which create the whole moment. Concept of the Moment-Form will be elaborately explained in one of the following chapters.

5 Riggins, 1990, p. 210

3) Frames can be cued or indicated by a number of cues. These cues may be social, psychological, or even physical matters. [6]

4) Frames are complimentary to each other or with in themselves, in extend to draw consensus in related urban setting. The translations refer to reliable outcomes which can be applied deductively to the frames of certain situation of the each moment-forms.

5) Discourse involves metaframing, or providing an analytic frame for discussing frames and framing. [7] Analysing frames, in other word translating, induces analytic frames in order to conceive the rules of the moment-forms and to contextualise the existing frames and metaframes. In this extent, framing might be consolidated by reframing to attain the ultimate translation.

6) Frames vary in kind and content, and they are conducted by the decision-making *process* [8] with the extent to convey certain information to the decision-maker.

7) Frames are the moments which cannot be confined by boundaries of time. Each frame is of equal importance, thus there is no longer beginning or ending. Frames might be consisting item(s) from other moments, the items which are insert to or exserted from another.

8) Frames are reflexive insofar as they as they both constitute 'reality' and they selectively identify the facts that sustain a social reality. [9]

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6 Ibid., p 210

7 Ibid., p. 211

8 Decision-Making - Wikipedia
Decision-making process; in psychology, is regarded as the cognitive process resulting in the selection of a belief or a course of action among several alternative possibilities. Every decision-making process produces a final choice; it may or may not prompt action. Decision-making is the process of identifying and choosing alternatives based on the values and preferences of the decision-maker.

9 Riggins, 1990, p. 213

9) A frame is used, often retrospectively, to define the meaning of events and to link facts, criteria and actions to outcomes and consequences. [10] Frames provide those links to infer within themselves and to the totality of each momentary entities.

With these outlines of the framing, one can conceive its essential dynamics. Infrastructure of framing is consisting the core of the features, thus the moment-form in a public space can be decoded by the decision-maker in order to obtain translations. As it was described before, the analysis of frames is restricted to semiotics. However his work would be strengthened by connotations and semiosis, which were considered by him negative and out-of-frame.

Framing in public space leads us to understand the human activities, and the social interactions which are constituted by interrelated individual behaviors like account, request, and response. In order to analyse those moment-forms of public space, it is essential that 'the matter' should be studied under the social circumstances.

1.1.2. DECONSTRUCTING PUBLIC SPACE

" Design and structure got serious attention, but public life and space was neglected."
- Jahn Gehl

Public life and space have been changing, transforming and adapting to the new or perhaps reprioritized consequences. The prediction of what is going to happen next in a certain time, has been avoided by the time that urbanism and architecture are drawing the majority of attention. However, is it really possible to think of them without considering the dynamics of public life?

The answer might be conceived by addressing the meaning of public life and space and their interplays. Drawing on Jahn Gehl's and Brigitte Svarre's work 'How to Study Public Life', would help us to understand the coexistence of public life and the built environment.

10 Ibid., p. 214

In this context, Gehl and Svarre denote, public space is understood as streets, alleys, buildings, squares, bollards: everything that can be considered part of the built environment. Public life should also be understood in the broadest sense as everything that takes place between buildings, to and from school, on balconies, seated, standing, walking, biking, etc. It is everything we can go out and observe happening – far more than just street theatre and café life. However, we do not mean city life to be understood as the city's psychological well-being. Rather it is the complex and versatile life that unfolds in public space. [11]

After industrialization and modernization, within swiftly build-up and expanded urban structure, the interplay of public life and space between the buildings was dispersed. The change happened by time in complexity, through society, culture, materials and through many other notions. The problems are consisting of needs and activities, therefore in order to solve the problems designers have to consider the interactions between life and space. The solution is not to rebuild what is lost, but to reconsider what is missing instead. Designers need new tools for the new urban or architectural settings to reconnect life and space.

In the 19th century the designer used machines to magnify his physical capacity. Again, as then, our innocence is lost. And again, of course, the innocence once lost, cannot be regained. The loss demands attention, not denial. [12]

11 Gehl, Svarre, 2013, p. 2
12 Alexander, 1964, p. 11

“... Please look closely at real cities. While you are looking, you might as well also listen, linger and think about what you see.”
- Jane Jacobs

1.2. OBSERVATION

Public place, in some extent, is an objective entity with its static elements and environment. It can be defined by its physical boundaries, as well as by personal experiences and activities. Therefore to analyze a certain setting, a most practical tool is to observe. It is as well a situationist [13] behavior that one tries to create ‘genius loci’ or ‘sense of place’ by physically and psychologically remapping the city. Hence, drawing on Lefebvre’s work ‘Rhythmanalysis’, one can be named as ‘the agent’[Lefebvre: 1992], the rhythmanalyst of the space, time and everyday life. The agent is the one who is looking into the public life attentively, conversely the others who are not so proficient to see the details. As it may need a particular reflection to decode an urban setting, however one can also train his/her senses to do so.

Studying people’s behavior in public space can be compared to studying and structuring other forms of living organisms [14]. Organisms have their own inner dynamics, which can be measurable with certain methods. They coexist in their own system, therefore they are in reciprocal interaction. A trained eye, with the right tools, can count their amount, metabolic speed or locations. While the examination occurs, the collected data can demonstrate the knowledge about their inner dynamics. Social behavior in public space is as well measurable by selection of the right tools. According to observational studies, if any organism is going to learn something from a model, the most important factor is attention. Then it comes retention, reproduction and motivation.

13 Coverley, 2010, p. 93
Situationist; as it has been defined under the editorship of Guy Debord by Internationale Situationniste, is having to do with the theory or practical activity of constructing situations. A member of the Situationist International.
14 Gehl, Svarre, 2013, p. 5

The observer is involved with collecting data, most of the time, interpretively. Hence s/he cannot reach the optimal objectivity with manual tools. For example, data registry of counting how many bicycles passed in a certain time period, can be imprecise since humans have selective perception. Although human senses are crucial in an exquisite observation. Whence to advantage digital tools, such as video and sound recording, can be beneficial to freeze the moment and continue the observation later on. It is fundamental to combine various type of tools for more efficient investigation.

First of all, observation of human behavior in public space requires some ethical measurements within the scope of digital documentation. In general, the rules are to prevent invading one's individual privacy. Therefore any digital tool for registering visual or auditory sample from human activity, must not be hidden. They should be exposed in clarity to those who are being recorded, otherwise the observer should get their consent. On the other hand, if the place is private property, the observer must get permission to be able to do the recording.

"Once we begin observing city life and its interaction with physical surroundings, even the most ordinary street corner can provide interesting knowledge about the interplay of city life and form - anywhere in the world. We can systematize our observations by asking basic question like who, what and where."
- Jahn Gehl, Birgitte Svarre

1.2.1. STRUCTURE OF OBSERVATION

Among the many projects and research on observation of public life which have been proceeded in Gehl and Svarre's works for the last 50 years, their methodology has been developed very efficiently. According to them, it is crucial to ask the right questions, in order to have a systematic evaluation since the questions might be limitless. Although it is not possible to draw up a list of fixed questions that can be investigated in all areas or cities. Every city is unique, and observers must use their eyes, other senses and good common sense. Most important is that the context and the site determine the methods and tools, and on the whole, how and when the study should be conducted. [15] Nonetheless the study between public life and space is too convoluted, so that it is nearly impossible to examine without asking some key questions. Drawing on Gehl and Svarre's work, these questions are;

- How many?

It is to obtain qualitative assessment of the public space and life by counting measurable entities, such as head counts of people. Although the number of an entity itself cannot convey the meaning alone, therefore it must be compared with other numbers. The study has to be proceeded to collect more data by keeping some factual inputs stable, like weather conditions, registry time and features. Thus the obtained data is comparable.

- Who?

Since the users of public space and the inherence of public are people, it is relevant to know who is participating in a certain setting. Observation can be conducted by registering individual information or rather more practically, it can be categorized by group information, such as age or gender. Categorization can only be done in extent to observable information, although, as Gehl and Svarre denoted, it is naturally allowing for a certain degree of inaccuracy in making a subjective evaluation of age group [16].

- Where?

When urban designers and architects begin with their design tasks, they should beforehand think the whereabouts of the inputs, such as activities, users' standing locations or walking directions, public / semi-public / private zones, built environments or recreational areas. It is to understand the tendencies of, for example, people in settings or expected behavior and activities. On the city level

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15 Ibid., p. 11
16 Ibid., p. 14

this can mean registering or localizing numerous functions, activities, direction of pedestrian flow and preferred places to stay [17].

- What?

In a certain public space to understand the social context, one should conceive the feature of activities, such as necessary or optional activities. It may be called necessary activity, for instance, if people are walking through a space for going to work or coming from shopping. Optional activities could be, for instance, sitting on the benches, reading or jogging. According to researches, public spaces have been shaped and emerged by more likely necessities.

One can as well look into the social behavior to see what kind of interactions occur. Analyzing interaction categories can aid to understand social context, such as encounters with acquaintances or strangers. William H. Whyte uses the term triangulation to define the scenario where two people who don't know each other start talking due to an external event. The catalyst could be a street artist or physical object like a sculpture. Or it could be an unusual condition such as hail in summer, power failure, fire in a neighboring building or anything else that spurs people who do not know each other to start talking. [18]

- How long?

In extent to duration of certain activities in a public space, Gehl and Svarre denotes that, walking speed and the amount of time spent staying, can provide information about the quality of physical frameworks. It is often the case that people walk slower and stay longer in places relative to the qualities and pleasures offered. [19]

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17 Ibid., p. 15
18 Whyte, 1980, p. 94-97
19 Gehl, Svarre, 2013, p. 19

The time factor is crucial for urban and/or social studies. Delving into the public life demands analysis of the duration, which means the question of “how long?” is fundamental. Hence the planners can provide solutions to the quality of a public space.

Once we have defined the structure with the outlines of the questions above,one can start systematic observation in an urban setting. These questions will provide us the optimum knowledge to analyze and conceive the social life in public space. However the system needs the appropriate tools and methods for registry of information. Purpose, budget, time and local conditions determine the tools selected for a study [20]. Choosing tools, day and weather for the case study will be elaborately explained in part two, however we can in short provide the guidelines for the tools which are the fundamentals of the human behavioral studies in public space. The list described below is structured by Gehl and Svarre after their various researches [Gehl, Svarre: 2013].

Counting;
is a comprehensive tool which has been used by researches in public studies. It can provide numeric information to compare different urban settings or different timelines.

Mapping / Behavioral mapping;
is a transcription of activities, people, zones in the public space to a new notation system with certain symbols to illustrate the moment. It is often shown on the plan of an area, localizing the activities' whereabouts with a symbolic or/and numeric system.

Tracing;
is illustrating the movement patterns of activities on the plan of an area with drawn lines or continuous points. The movement can be of an individual or a group of people as well.

Tracking / Shadowing;
is to understand the public behavior, one can as well select one individual for a certain activity and

20 Ibid., p. 22

follow his or her movement in a certain time period.

Looking for traces;
can be operated by other tools like counting, photographing or mapping [21]. Users of a certain setting leave traces like trashes or footprints on the ground. It can be a collaborative tool for tracing or mapping. Through that, one can understand the use of the urban setting, such as walking paths or gathering zones.

Photographing;
or in general digital registry, is an important tool for documentation of public studies. During the inference process, it is helpful to use flashbacks of the registry moment to analyze it in detail and to enliven the obtained data. Although the observation is an activity which requires full attention, it is not possible for a researcher to notice everything with the naked eye. Herein the observer will need documentation through digital registry tools for a comprehensive analysis.

Keeping a dairy;
can be used as a complementary tool to the others above. It is to provide the fine points hidden in the details, which could be used later in the further understandings of public life. The method is often used as a qualitative supplement to a more quantitative material in order to explain and elucidate hard data [22].

Test walks;
means the observer takes a walk on the selected routes, meanwhile more or less systematically minding the time, activities, people’s behavior or small narratives on the way.

21 Ibid., p. 24
22 Ibid., p. 32

1.3. RHYTHM OF PUBLIC SPACE

By using or adopting the tools which had been described in the previous chapter, one can systematically start on the analysis of an urban setting and investigate the rhythm of daily life in public space. This methodology will provide results to conceive the existing metabolism of the public space. As it was elaborately analyzed by situationists like Guy Debord or Henri Lefebvre, it is essential to understand metabolism in order to see the relation with public behavior.

The conception of situationist is propounding the notion of the urban wanderer, in other word flâner [23], and psychogeography, which became an instrument by the help of Guy Debord in mid-20th century. Understanding of mental traveling has been the medium to perceive the surroundings and helps to forge the 'genius loci', sense of place, to the urban wanderer. The question then arises, which factors do help to sensuously construct the world in the context of everyday life and urban setting? Through the senses, the urban wanderer, or as Lefebvre called 'the agent', is creating the stream of consciousness for spatial perception of the urban environment. Perception of the place is supported by sound as well as the other four main senses, however sound plays a very important role in identifying the place, in which the agent remaps the space objectively and subjectively.

Our sensations and perceptions, in full and continuous appearances, contain repetitive figures, concealing them. Thus sounds, lights, colors, and objects. We contain ourselves by concealing the diversity of our rhythms: to ourselves, body and flesh, we are 'almost objects'. Not completely, however. But what does a midge perceive, whose body has almost nothing in common with ours, and whose wings beat to the rhythm of thousand times per second? This insect makes us hear a high-pitched sound, we perceive a threatening, little winged cloud that seeks our blood. In short, rhythms escape logic, and nevertheless contain a logic, a possible calculus of numbers and numerical relations. [24] What do we understand from a concept of rhythm? Is there a general acceptance of rhythm?

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23 Tester, 1994, p. 138

24 Lefebvre, 1992/2014, p. 20

Flâner; is a verb has been defined as, wandering without aim, stopping once in a while to look around.

Drawing on Lefebvre, he notes in his ‘Rhythmanalysis: The Critique of the Thing’ that we easily confuse rhythm with movement [mouvement], speed, a sequence of movements [gestes] or objects(machines, for example). [25] Essentially one cannot think rhythm apart from time. Hence we can denote rhythm as regulated time, something we can measure, something we can analyze.

Analyzing the rhythm of public space and life brings with it to consider the spatial awareness. Without doubt, one must look on the environment related with its objects to receive the sensible and insensible messages they are obliged to transmit. In a number of places, Lefebvre indicates the idea of perception and conception of the world, of time and of the environment as the agent, borrows and receives from one’s whole body and senses, so one receives data [donnèes] from all the sciences: psychology, sociology, ethnology, biology; and even physics and mathematics. The agent must recognize the ‘representations’ by their curves, phases, periods, and recurrences. In relation to the instruments with which specialists supply to the agent who pursues an interdisciplinary approach. With omitting the special features and the places, of course, the agent makes himself more sensitive to times than to spaces. He or she will come to ‘listen’ to a house, a street, a town, as an audience listens to a symphony. The agent will give and account of the relation between the present and presence: between their rhythms. A dialectical relation: neither incompatibility, nor identity – neither exclusion nor inclusion. One calls the other, substitutes itself for this other [emphasize added]. [26] By these indications, this study tends to enlighten how the metamorphosis of being presence and being present operates and how the things, the objects, make themselves present but not presence.

From any given object, from a simple thing (Van Gogh’s shoes), a great artist creates a strong presence, and he does so on a canvas, a simple surface. The metamorphosis does not prevent the restitution of the thing as it is. Both enigmatic and simple, filling a simple surface, the act [geste] of the artist has the power to evoke a time (the wearing away of the pair of shoes), and the presence of a long period of destitution. Therefore a series of presents. The presence of the scene brings forth all its presents, and is also the presence of Van Gogh, of his life that was poor but dominated by

25 Ibid., p. 15
26 Ibid., p. 32-33

creative act [geste]. [27]

- Henri Lefebvre, Rhythmanalysis: Space, Time and Everyday Life

The things like Van Gogh's shoes which are present in urban places, in our everyday life, try to expose their presence, the presence which has not yet occurred. Hence the agent is apt to externalize the inherent essence; 'genius loci'.

27 Ibid., p. 33-34

1.4. MUTENESS OF THE OBJECTS

The city is place. Though we might take the city for granted as an objective entity, it is a product of individual perception, “People live in the same city, even in the same part of the city, and yet perceive different worlds” [28]. Although cities are well known, there are several downsides that make them harder to separate from similar settlements. The lack of visible identity [29] is one of them. It refers to the sense of seeing – think about famous skylines, buildings, or the shape of the terrain. If the visual image is hard to identify, it is hard(er) to experience the unique sense of place of a city. Tuan argues that the place is whatever stable objects catch our attention, he also indicates, this theoretical description suits various places, not only cities but also the neighborhood, house, or bed, the county, country, or the entire planet [Tuan: 1977]. Experience binds the individual who is perceiving place to the very same. [30]

Sensuous Geographies does not deal with the social issues of individual geographies, but does explore some of the dimensions of individual perceptions. [31]

- Paul Rodaway, Sensuous Geographies: Body Sense and Place

This quote from Rodaway shows that the physical senses of a human being are important when it comes to one’s sense of place. One of them is the sense of hearing, which can be investigated from various perspectives, e.g., the consideration of blind and deaf people. From them, dominant sense of seeing is contrasted with the loss or accentuation of hearing. [32] In this context Rodaway points out that the “‘quite ear’ may be silent but the body ‘resonates’, so that it can give at least a partial sense of the auditory world because sound is first and foremost vibration” [33].

28 Tuan, 1974, p. 248
29 Banerjee and Southworth, 1990, p. 90
30 Wissmann, 2014, p. 32
31 Rodaway, 1994, ix
32 Wissmann, 2014, p. 32
33 Rodaway, 1994, p. 97

Sound studies are also related with examining the local identity. Boland indicates the sense of place in the context of how "distinctive accent and/or dialect affects the construction of local identity" [34]. The context of this study looks at Scouse dialect from the people who were born in Liverpool, England. However the language wouldn't be considered with the city boundaries. There might be a part of urban population that does not speak Scouse and so would be falsely labelled Scousers [35].

Can we accept a territorial, place-bound definition of Scouse identity? Is a sonic conceptualization equally or more appropriate? Put another way, is Scouse identity determined by where a person is born or how they sound? [36]

- Philip Boland, Sonic Geography, Place and Race in the Formation of Local Identity: Liverpool and Scousers

Most studies about sound until now, are written in a sociological and psychological context. There is a wide variety of sound studies especially within the discipline of sociology. For instance, the impact of sounds on humans, how the world is heard individually, sound design, the effects of environmental noise, and motion in relation to perception. [37] In philosophy, it has been many times indicated, how we perceive the environment and/or the objects around us. Ihde reflects on the history of philosophy with recollections of pages and pages devoted to the discussion of 'material objects' with their various qualities and on the 'world' tables, desks, and chairs that inhabit so many philosophers' attention: the realm of mute objects [38].

In the following chapter, sound of the urban settings context will be introduced, in extend to how we perceive the urban setting with its physical elements, influence of the place experience, does acoustic quality affects the public space and life? Do we have any images based on sound or in another

34 Boland, 2010, p. 1
35 Wissmann, 2014, p. 32
36 Boland, 2010, p. 6
37 Wissmann, 2014, p. 37
38 Ihde, 2007, p. 50

word ‘sound images’ which exist for the place? Answers for these questions will be provided when one takes a close look into how actually sound occurs in a certain environment. However one can certainly say sound images do exist as individual or social context in our everyday life, like simple door slam, hearing a national anthem, or a church bell. Places can be imagined through acoustic stimuli, thus sound operates within place to shape it and evoke a certain image and understanding [39]. For example, interpreting walking sounds can be important for social interaction [40]. Rate memory of a friend’s walk, in case, is useful for predicting estimated arrival time [41]. As illustrated above hearing a sound evokes an image, which is described by Husserl as a stream of consciousness.

39 Wissmann, 2014, p. 44

40 Visell et al., 2009, p. 947

41 Boltz, 2010, p. 178

“ Wherever we are, what we hear is mostly noise. When we ignore it, it disturbs us. When we listen to it, we find it fascinating. The sound of a truck at fifty miles per hour. Static between the stations. Rain. We want to capture and control these sounds, to use them not as sound effects but as musical instruments... If this word ‘music’ is sacred and reserved for eighteenth- and nineteenth- century instruments, we can substitute a more meaningful term: organization of sound. “
- John Cage

1.5. CONFIGURATIONS OF THE OBJECTS

Architecture has been most often thought as the discipline of static and material artefacts. Although it deals as much with immateriality. After the industrial revolution, designer’s task gained new perspectives, as Christopher Alexander manifested, maybe even lost its innocence. The definition of design space as well evolved, transformed and varied.

In contemporary architectural discourse, there is some discussion of the idea of a transparent and fluid space, made up by information that is distributed by sounds, light and pictures, as well as of electronic media. We are therefore dealing with other categories of space sometimes identified as a ‘place-less space’, ‘phenomenological space’, ‘rhizomatic space’, ‘cyberspace’, ‘electronic space’, etc. So architecture is redefining its boundaries, involving a type of ephemeral space-time-accelerating architecture that dissolves the traditional concept of place into a place of phenomena. [42] As the configurations of the space have been gaining serious attention by urban planners, architects, sound designers and sociologists, unfolding its syntax became more important. While the space syntax [43] dissolves itself, one can realize the interconnection between society and space. Configurations of the space are profoundly intrinsic with human activity. On the other hand, in design process activity

42 Hellstörm, 2003, p. 12
43 Paliou, Lieberwirth & Polla, 2014, loc. 533
Space syntax; is a set of techniques for analysing spatial configuration, and a set of theories linking space and society. For the most part, it has been developed on the basis of here-and-now data which is, or can be, pretty complete. You can relate spatial configuration to where people are, how they move, how they adapt and decorate space, and how they talk about it.

between object and receiver is reciprocal, although through the perceptual imagination of the receiver, design and aesthetic ideologies are involved with abstract and subjective expressions. One important configuration to be discussed within the deign discourse, thus, is the one of sound, which due to its transient nature is a natural key for unfolding such expressions [44]. In this extent, sound of a certain space can convey inherent information which defines the characteristic of acoustic space and its relation with the sound objects.

Sound object, a term coined by Pierre Schaeffer, corresponds to the concepts of acousmatics and reduced listening, which imply reducing the associative meanings of sound and focusing on the intrinsic qualities. Sound object is considered to be a perceptual object and the best way to analyse it is simply by listening. Above all, the sound object may be analysed by its temporal shaping i.e. its morphology that involves spatial, spectral and structural configurations. A sound object is finite in time and its temporal shaping is also discussed in terms of its envelope, the characteristics of which are attack, body and decay. R. Murray Schafer denotes another perspective in terms of sound event, which when not connected to acousmatics and reduced listening, sound object can be viewed from a contextual angle, treating the object as an event. This contextual approach implies that it is the symbolic, semantic and referential qualities of sound that matter.[45] Among the various definitions of sound objects, the perspective in this research will be more similar to the definition by Pierre Schaeffer, although context will be more quantitative. Thus the term of sound object resembles the sound sources or events in the context of their deployed fragmentations. Each sound object consists of a fragment from the relevant sound event and conveys its core characteristic. In a certain spatial and temporal configuration, sound object is a perceptual representation which illustrates behavior of the sound fragments, in other words its gesture and texture. In context of fragmentation of sound, composer and architect Iannis Xenakis refers to them as “prefabricated material” and states:

All sound is an integration of grains, of elementary sonic particles, of sonic quanta. Each of these elementary grains has a threefold nature: duration, frequency, and intensity. All sound, even all

44 Hellstörm, 2003, p. 29
45 Ibid., p. 211

continuous sonic variation, is conceived as an assemblage of a large number of elementary grains adequately disposed in time.

- Iannis Xenakis, Formalised Music - Thoughts and Mathematics in Music

However a sound object should not be confused with the object which emits the sound. For instance, in Schaeffer's piece Étude aux chemins de fer, which was composed in 1948, the locomotive is the object -le corps sonore [Schaeffer: 1966]- that creates the sound. But the concept of sound object concerns the intrinsic properties of the 'locomotive-sound' and, accordingly, in spite of its name the concept is not to be connected to an identifiable physical shape[46].

Besides the notion of sound object, one must grasp two other correlated notions which were defined by Schaeffer, to find out its operation; acousmatics and reduced listening.

In one of the essays of Björn Hellstörm about sound design through the works of Pierre Schaeffer, it was denoted that the concept of acousmatics concerns the relation between the perceived sound and its origin. According to the French Larousse Dictionary, the adjective acousmatic derives from Greek and refers to the condition when the sound is apprehended, but when the association to the source is detached. Acousmatics was used in Ancient Greece when a lecturer hid behind the curtain to put the focus on the speech itself. [47]

Operation of the sound objects can be conceived most efficiently by listening process, in which we deploy and decode the acousmatic space. Reduced listening implies a type of listening perspective that can be regarded as an objective listening process; when listening, the focus is on the sound objects and not on the sources that emitted the sounds, nor their environmental context [48]. In the context of acousmatic, the sound objects may seem easy to depict in terms of abstraction of the source

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46 Ibid., p. 44
47 Ibid., p. 44
48 Ibid., p. 45

from the sound, even though the listening process is very complex. According to music theorist Denis Smalley, the heart of acousmatic perception concerns the everyday identification process; when one is prevented from visually verifying a sound source one automatically seeks to associate the sound by comparing it with past experiences, using the memory as a “reference-bank of correlation between sound and experience” [Smalley: 1991] [49].

Since listener’s space has been reduced to the context of sound objects regarding to acousmatic perception, sound objects become quantitative entities. Although Smalley denotes the relations of the sound objects with the reference-bank, in other word experiences. If one only investigates the intrinsic features, the data can be obtained objectively which may be called as the morphology of the sound. In this extent, one can seek the gestures and textures of sound objects. The concepts of gesture and texture have been well defined in the work of Hellström Noise Design. Gesture is the work of a spectral motion concerning the horizontal behavior of sounds. In comparison with texture, this type of horizontal motion is more easily apprehended since its features concern the outward shape of sound e.g. intervention, growth and progress (though it has nothing to do with the actual motion of sound in space). Gesture can be described in terms of spatial trajectories or as sculptural evolution of sound over time. Current semantic definitions of gesture often contain an idea of its spatial and temporal features e.g. rotation, expansion, density and implosion. [50] Texture is the internal behavior of spectral motion created by the patterning of small sonic units such as the interaction of the spectra of overtones. In comparison to the horizontal motion of gesture, textural motion concerns the inherent vertical movement. This type of motion is subjected to the inward shape of sound, and it requires active attention when focusing on textural qualities. Texture may be described in terms of the spatial distribution of sonic units. [51] In the following chapters, the motions of the sound will be thoroughly described under minor and major sound effects, which are the fundamentals of this study.

Accordingly, an acousmatic configuration is only conceived in terms of inherent features of its each

49 Ibid., p.45
50 Ibid., p. 209
51 Ibid., p. 212

sonic grains. Therefore one can acquire a collection of various information about the acoustic code of the space and life. Although obtained information will be qualitative as well as quantitative. However by following certain steps of listening process, it is possible to have objective inferences, instead of subjective. It is also crucial to gain certain listening skills, which will provide the listener the competence of staying within the acousmatic configuration, while the lack of competence will cause to be lost in contextual disconnections.

1.6. SOUND LANDSCAPE OR SOUNDSCAPE

Analyzing acousmatic configuration in a certain urban setting, led the researchers to build a new vocabulary and terminology, which is mostly applied by electro acoustic sound designers, composers, and music theorists. However later on it was also being used in terms of architecture, urban planning, sociology and psychoacoustics. In this auditory field, there have been two different terms and definitions used to describe the audible space; sound landscape and soundscape.

The term soundscape was coined by R. Murray Schafer. The concept implies an interdisciplinary approach to the acoustic environment with the listener as the focal point. The concept not only concerns studies of the acoustic environment; soundscape is also a musical genre consisting of composers who involve environmental sounds in their music e.g. by tape-montage. Today the soundscape-movement is an established field of research and belongs under the international association of The World Forum for Acoustic Ecology (WFAE), an umbrella organization, which engages a wide spectra of members who ‘share a common concern with the state of the world’s soundscape as an ecologically balanced entity’. On the other hand, the term sound landscape was denoted by Trevor Wishart, and implies the musical (electro acoustic) context of sound. The sound landscape is constituted of three categories [52]:

1) Space - the nature of the perceived acoustic space
2) Location - the disposition of sound objects within the space
3) Source - the recognition of individual sound objects

52 Ibid., p. 211-212

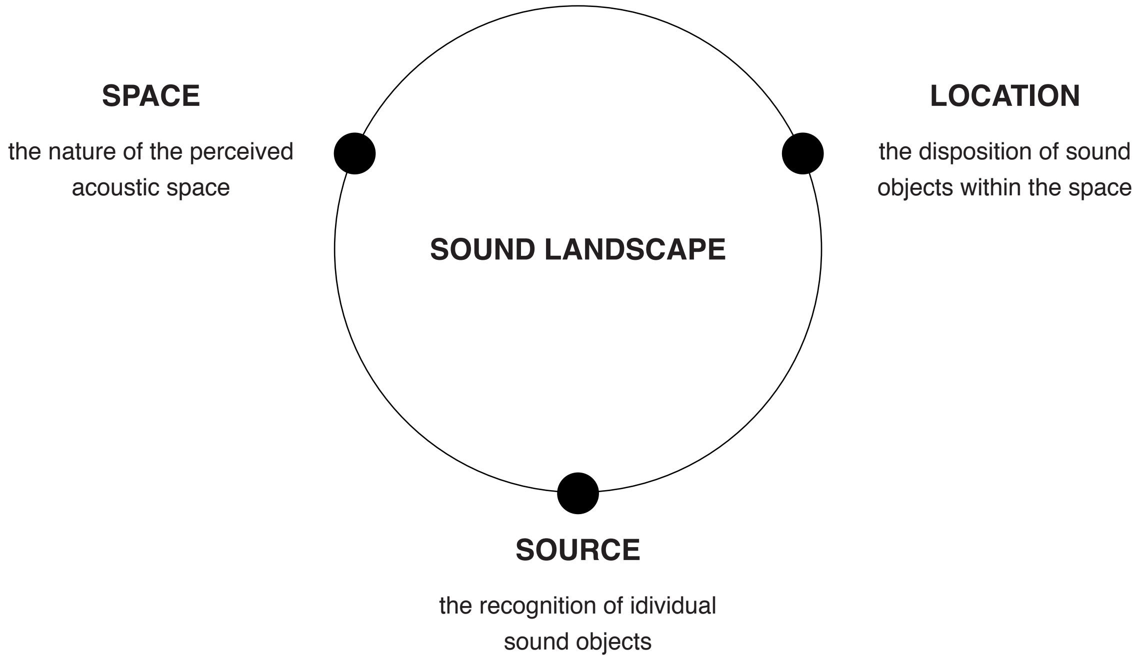

Fig. 1.1: Model of Sound Landscape

According to Wishart, acoustic space and sound object cannot be independent from each other. Sound objects convey the information about the space by their transformation in an interval. By the following definitions, Wishart denoted the characteristics of sound landscape, which are as well outlined in Hellstörm's work as followed.

1.6.1. LANDSCAPE - SPACE: The Nature of the Perceived Acoustic Space

The space and the sound objects cannot be conceived independently, as previously denoted in Wishart's description of properties of sound landscape. Every certain place or urban setting simulates certain acoustic characteristics – the acoustic code, which is measurable by using specific tools and techniques. Acoustic characteristics denote the sonic intrinsic significance of certain sound (e.g. its spectral characteristics) or of a certain place (e.g. its resonance and reverberation time) [53].

The acoustic properties of a certain place have been playing crucial role in design and social disciplines. In this extent, Wishart as well indicates the distinction between real acoustic space and formalized acoustic space for further characterizations of sound landscape. He denotes;

There is, of course, not a clear dividing line between these two categories because, as broadcast sound becomes an ever more present part of our real sonic space, it becomes possible to question, for example, whether we hear orchestral music, the sound of a radio (playing orchestral music). (...) And in fact some sounds which have been modified by the technological means of reproduction might almost be accepted into the category of real acoustic space, for example, the sound of a voice heard over a telephone or the sound of a voice heard over a distant distorting channel as with the sound of voices transmitted from space. [54]

- Trevor Wishart, On Sonic Art

Since the formalized acoustic space becomes more and more common in everyday life – muzak in elevators, signals or jingles in metros and buses, amplified street music etc. – it is important to investigate the interaction between built form and acoustic space, and to examine what effects this mix of different acoustic entities have on people's behavior when acting in urban space [55].

1.6.2. LANDSCAPE - LOCATION: The Disposition of Sound Objects within Space

This context constitutes the location of sound objects and sources in space. It is one of the main concerns when examining properties of sound landscape, which as Wishart would discuss, is essentially a complexity of motion and location in space, in other words a frame of reference [Wishart: 1996].

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53 Ibid., p. 298
54 Wishart, 1996, pp. 142-144
55 Hellström, 2003, p. 67

The conception of sound as a frame of reference refers, thus, to the function of a sound source as a focus or sonic center for orientation in space. As it is described previously in chapter 1.5, (Configurations of the Objects), the motion of sound objects has vertical and as well horizontal effects, which can be called as texture or gesture of the sound. For instance, if the frequency of a sound object increasing from low to high, it could be perceived as a vertical motion that the sound object is rising.

The context of the disposition of sound object in space, involves the perceptual changes in a three dimensional plane. Thus, the intercommunications between real objects and the real space becomes fundamental for sound landscape and its properties.

1.6.3. LANDSCAPE - SOURCE: The Recognition of Individual Sound Objects

In everyday life we count mainly on our visual perceptions to accommodate our recognition of the objects and events around us. By decontextualizing sounds from their source, the recognition of the sound objects are no longer related with the event or the source. Therefore to auralize [56] the space, in another words the aural experience, becomes the only clue that we should rely on as a result of the sound losing its function.

Contextual clues may not only change the recognition of an aural image but also the interpretation of the events we hear. [57]

- Trevor Wishart – On Sonic Art

Now imagine that you are driving your car to work and turned on the radio. There is a piece playing by an orchestra. The utterance of the radio play in your car will be different than the orchestra itself playing in a concert hall. The Listener will perceive the piece as it is recontextualized but more importantly the listener will focus more on the internal characteristics of the piece rather than its context.

56 Kleilein et. al., 2008, p. 110
57 Wishart, 1996, p. 152

This contextual transition is called schizophonia which was introduced by R. Murray Schafer. It concerns the effect when isolating the sound from its original context and reproducing it into another [58] (emphasis added). To be more explicit, schizophonia is an interlacing action of multiple environments through a medium.

The recognition of individual sound objects also was discussed by Wishart in terms of intrinsic recognition and contextual recognition. In extent of intrinsic recognition, it concerns the sound itself, broadly about its properties like frequency, spectra, duration etc. However in everyday life the recognition of sound is mostly related with its contextual relation with its source, therefore environment. The recognition is as well related with juxtaposition of different sounds. In this concern, one of the essential indications is the masking effect. The main masking factor is the volume, but factors such as timbre, articulation and duration also affect the possibility of identifying sounds [59]. In this context of masking, the listener has no visual cues regarding to the sound which has been perceived through its contextual environment. Wishart denotes in his work 'On Sonic Art' that, masking is, however, not a totally passive phenomenon. As experiments in both visual, and aural perception have demonstrated, our brain has the ability to reconstruct certain kinds of images and messages, even where these are heavily masked (see Figure 1.2) [60].

Interplay of different type of sounds, in other words masking effect, is essential in extent to composing virtual acoustic space of a music and as well to conceive the basis of natural sound objects in their contexts. Thus, the listener can have a better reconstruction of the user's space in terms of soundscape cognition.

58 Hellström, 2003, p. 210
59 Ibid., p. 70
60 Wishart, 1996, p. 152

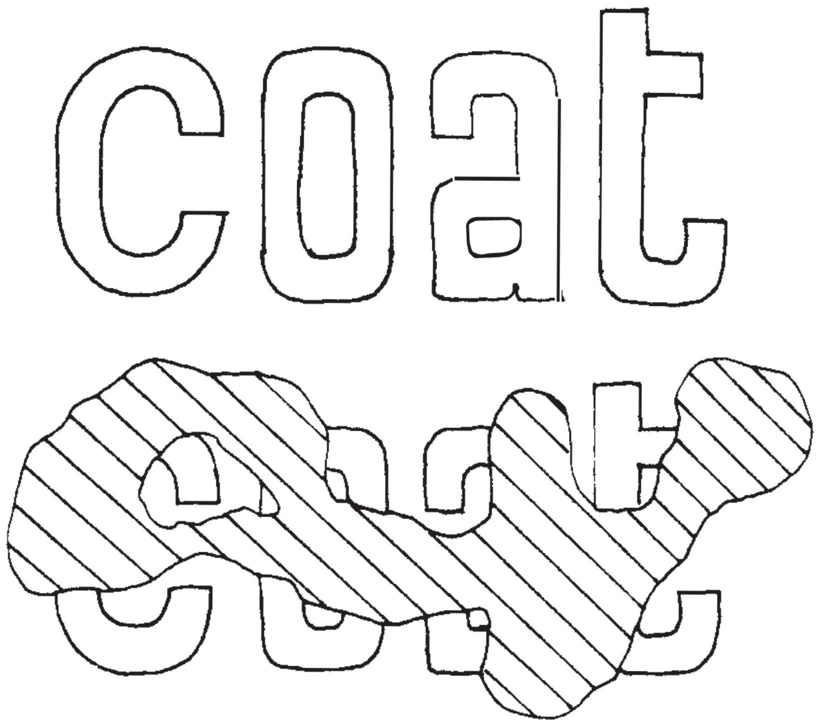


Fig. 1.2: Visual Masking [61]

As the acousmatic configurations have been explained regarding to Wishart work ‘On Sonic Art’, it was categorized under three correlated parts; space (the nature of the acoustic space), location (the disposition of sound objects in space), and source (the recognition of sources). Although Wishart widely discusses about uses of sound images and objects in composition of electroacoustic music, as well as methodologies and techniques. However he does not mention so explicitly about the operations of sound in public life, even though his contributions to understanding of interaction between various sonic entities have provided extensive insights regarding this context.

61 Wishart, 1996, p. 153

“After I went blind, I could never make a motion without starting an avalanche of noise. ...Whenever I took a step, the floor cried or sang – I could hear it making both these sounds –and its song was passed along from one board to the next, all way to the window, to give me the measure of the room. ... As I walked along a country road bordered by trees, I could point to each one of the trees by the road, even if they were not spaced at regular intervals. I knew whether the trees were straight and tall, carrying their branches as a body carries its head, or gathered into thickets and partly covering the ground around them.”
- Jacques Lusseyran

1.7. COGNITIVE PROCESSING OF SOUND

As it is previously denoted, the significance of listening is indisputable in order to observe a certain sonic environment. Considering our very first listening experience goes back to the fetus in which our ears were exposed to human sounds, cognitive process of acknowledging an external sound source and as well communication start. In the work of Barry Truax ‘Acoustic Communication’, listening was indicated as a crucial interface between individual and environment, and examined initially under two main categories; hearing as an elucidation of human sense, and listening as an activity of cognitive processing. It is important to investigate deliberately the inherence of these processes, to be able to observe the sonic environment, especially the complex situations such as public space and everyday life.

1.7.1. OPERATION: HEARING

Hearing is a sensory activity to stimulate perceptual recognition of the environment, and it as well a collaborative medium for reciprocal interaction. Hearing as perception is receptive to certain ranges of frequencies and intensities.

In human case, this range extends from the threshold of hearing, which is the slightest intensity level that excites the auditory system, to the threshold of pain, which is the intensity level that causes acute discomfort. The difference in intensity between the two levels is on the order of magnitude of trillion to one, a range that is so large that a logarithmic scale has been devised to reduce it to a difference of 120 on the decibel (dB) scale. The corresponding range of frequency sensitivity of the auditory system is also large, though it is well known that many animals have an extended high frequency range. The usual description of the audio range, or range of audible frequencies, extends from 20 to 20,000 Hz, where the unit of Hertz is one cycle per second. In practice, the upper range is seldom above 18 kHz (i.e., 18,000 Hz) for the young adult, and with noise exposure and age, it drops dramatically. [62]

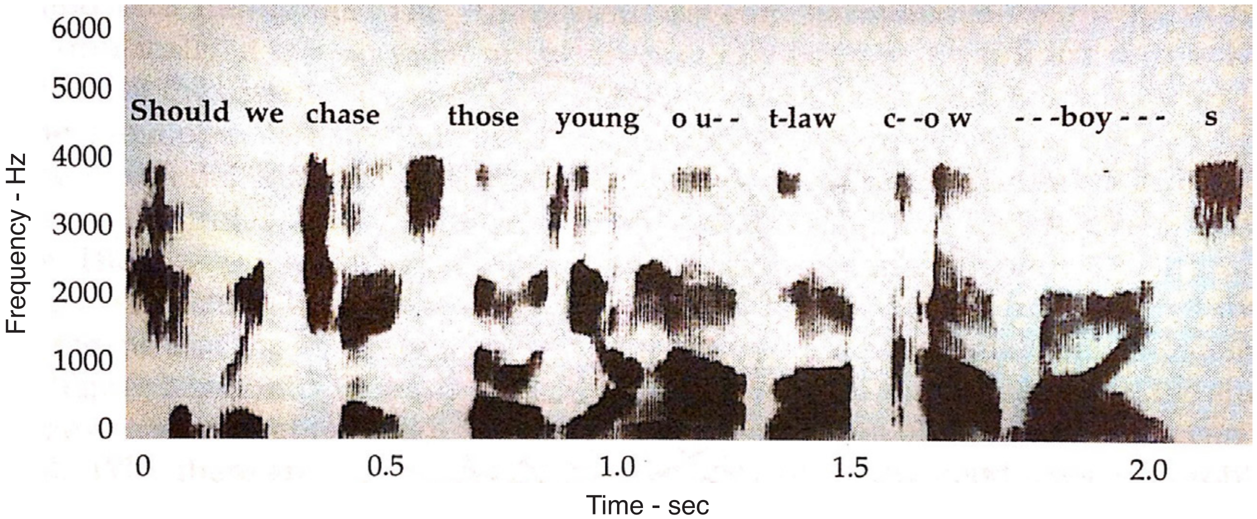


Fig. 1.3: Sound Spectrograph of Human Speech [63]

Humans are most sensitive to the frequency range from 2 kHz to 5 kHz. However, there are significant directional effects for the 1,4 kHz – to 2 kHz band, which contains important speech frequencies (emphasis added). Notice in the Fig. 1.3 that there is little speech energy above 4 kHz. Although it is

62 Truax, 2001, pp. 15-16

63 Everest & Pohlmann, 2015, p. 75

not shown by the spectrograph, there is also relatively little speech energy below 1000 Hz. It is understandable, presence filters peak in the 2 - to 3 kHz region; that is where human speech sounds resonate. [64]

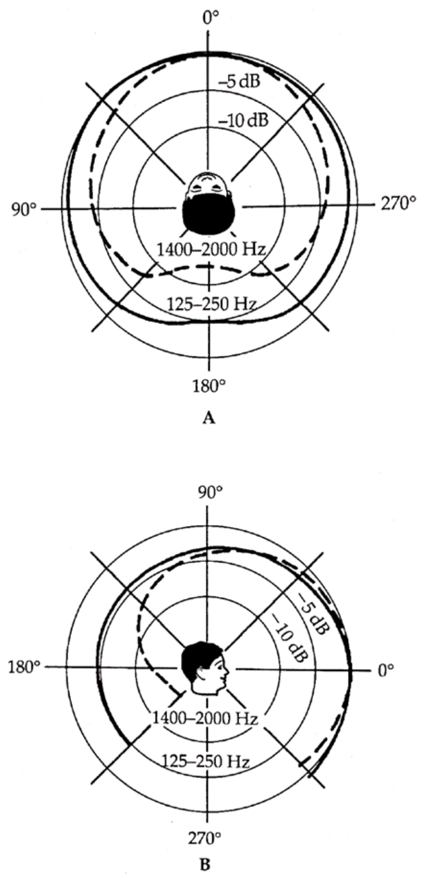


Fig. 1.4: Directionality of Human Voice [65]

The human voice is directional. (A) Front-to-back directional effects of about 12 dB are found for critical speech frequencies. (B) In the vertical plane, the front-to-back directional effects for the 1400 to 2000 Hz band are about the same as for the horizontal plane.

64 Ibid., pp. 75-76

65 Ibid., p. 76

Drawing on Everest and Pohlmann's work 'Master Handbook of Acoustics', it was profoundly described that human auditory perception is an impressive system, which can distinguish different sound sources and as well address our attention to a specific sound. This ability of the human auditory system is called 'the cocktail-party effect' or 'auditory scene analysis' which means in a sonic environment of various sounds, humans are able to detect a single sound source and perceptually exclude the others. To be more precise with the example, one can focus on a single conversation in a crowded and loud party or can even detect if someone says his name among the other diverse sound events. The ability of differentiating the sounds, is mainly operated by the localization ability. However as Everest and Pohlmann denote, language, gender and pitch of the talkers also play a role. It is also known in the area of electronic signal processing as 'source separation' or 'blind source separation'.

The perception of localization starts with the external ear, called pinna. By different type of conversion and transmission process, the sound reaches to the auditory canal, thus it is encoded with directional information. Following with the results of inner ear process, the brain interprets the sound signals. In this directional encoding process, sound wavefront conveys the information which makes the listener understand vertical-horizontal and front-back differentiation. However perception of vertical localization of the ear is inadequate, comparing to horizontal localization.

Humans are involving binaural hearing with two ears in cognitive process of localization, which consists of fundamentally two methods; ITD (Interaural Time Difference), also called IPD (Interaural Phase Difference) and IID (Interaural Intensity Difference), also called ILD (Interaural Level Difference). Because of the difference in distance from the source, the nearer ear receives sound somewhat earlier than the far ear. Below 1 kHz, the phase (time) effect dominates while above 1 kHz the intensity effect dominates. [66] This domination of two methods for low or high-frequencies has been well denoted in Alan R. Palmer's work 'Neural Signal Processing'. It was described that, the pinna effects and the head shadowing are minimal for low-frequency sounds for which the wavelength is longer than the head (or pinna) width. For such (i.e below 1 kHz) low-frequency tones the time differ-

66 Ibid., p. 59

ence is manifested as an interaural phase (time) difference (IPD). For tones of wavelength shorter than the head width, the IPD presents an ambiguous cue, but interaural level differences (ILDs) may be as much as 20 dB. [67]

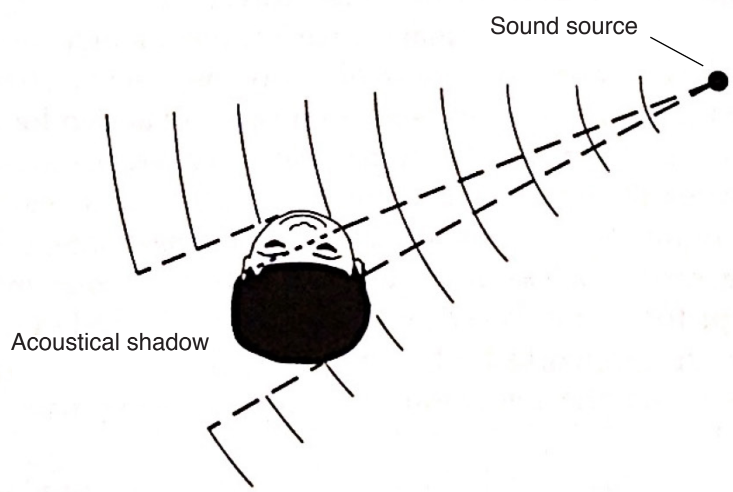


Fig. 1.5: Binaural Hearing [68]
Our binaural directinal sense depends in part on the difference in intensity and time of arrival of the sound falling on two ears.

Since the human sensitivity range of the sound is proportionally much bigger than the range of the light because essentially it is constrained by the elimination of the light through earth's atmosphere. Therefore it is certainly interesting to understand the inherent operations of hearing. The visual and audial perceptions are both allowing us to obtain details from the environment, however hearing conveys less detailed information than vision, but more comprehensive.

67 Moore, 1995, p. 105
68 Everest & Pohlmann, 2015, p. 59

1.7.2. OPERATION: LISTENING

Drawing on the work of Pierre Schaffer 'Treatise on Musical Objects', two forms of listening were stated; reduced listening which is what we argued on the previous chapter 'Configuration of the Objects' and ordinary listening.

Reduced listening was examined under the concept of acousmatics, as the listener focused on the sound objects apart from its source or contextual entities. Together with reduced listening, Schaffer as well defines four particular modes of perception; listening, hearing, attending and understanding. Those acts are categorized under the context of ordinary listening.

In this extent, Hellström had structured ordinary listening by giving brief descriptions for those four acts of perception of sound in terms of:

- **Listening** deals with the relationship between a sound and the event that caused it; the sound is treated as an indicia of the source.
- **Hearing** concerns the most elementary order of auditory perception; one hears passively without specifically searching for a certain sound and/or explicitly understanding the sonic information.
- **Attending** is when the perceiving subject operates on a selective level; s/he searches for specific qualities of certain sounds.
- **Understanding** concerns a semantic mode of perception; sound is treated as a sign or code, consisting of certain values. [69]

Furthermore, Schaffer has brought those acts into a systematics and outlined their dualistic relations under abstract and concrete, objective and subjective examinations.

The abstract order concerns the qualities of sound that circumscribe a perceptual and/or semantic level (the intention of understanding a message). Concrete refers to the casual references of the

69 Hellström, 2003, p. 72

given sound (the intention of understanding a messenger). Moreover, objective refers to a condition when one confronts the sound itself, and subjective refers to a situation when one confronts an activity in regard to the perceived sound, which schematically is outlined as follows: [70]

4 UNDERSTANDING - inside level : signs - outside level: values Emergence of the contents of sound, and reference and confrıntation of the notion of the sound from the outside	**1** LISTENING - inside level: indications - outside level: exterior events Emission of sound	subjective
3 ATTENDING - inside level: perceptual qualification - outside level: sound quality Selection of certain aspects of sound	**2** HEARING - inside level: rough perception, outline of the sound object - outside level: rough sound object Reception of sound	objective
abstract	concrete	

fig. 1.6: Table of Listening Functions

Those two listening perspectives, ordinary and reduced listening, are distinct in regard to auditory experience. While ordinary listening is leading the listener to the context of sound, reduced listening is providing information about the perception of sound itself. As in the work of Chion Michel, Guide to Sound Objects, reduced listening as well operates two different procedures on sound objects of

70 Ibid., p. 73

perception; identification and description. Drawing on Chion, the identification consists of isolating and identifying an object, or a sound criterion, in the diversity of a context or a structure e.g. to identify a certain sound object in a sound ‘chain’, a ‘grain’ in an isolated sound object; and the description consists in describing and characterising the object or the selected criterion, from its internal qualities. Therefore one can operate the identification by reference to the higher level of context which includes the identified object, as an object in a structure, ‘its form’; and the description can be operated as describing and characterising the object or the selected criterion, from its internal qualities, ‘its values’. [71]

Environmental counterparts of ordinary listening’s modes were described by Pascal Amphoux in the work ‘Sonic Identity of European Cities’, in terms of sonic signals, sonic background and a sonic ambience. Amphoux as well indicates the dual relation of figure-ground, conveys the operations of environmental characteristics. This dual relation emanates from gestalt theory. When acting in the acoustic space, perception operates on a selective level; the listener searches for specifically qualitative sound information. Auditory perception can perceive multiple of sounds as a single entity, but also distinguish certain sounds from each other. ‘Figure’ is the sound that catches the attention, while the rest of the sounds constitutes the ‘ground’.

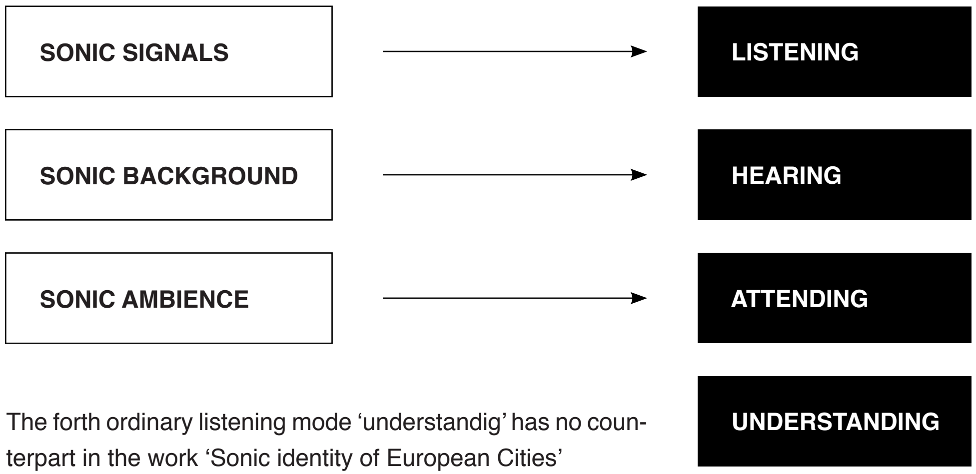


Fig. 1.7: Counterparts of Ordinary Listening

71 Chion, 2009, p. 61

Sonic Signals (Listening); concerns the emission of sounds that one, in principle, envisages from an acoustic viewpoint (e.g., difference in intensity) or from a psycho-sociological viewpoint (e.g., an uncommon noise). Literally speaking, the sonic signal grabs our attention; the signal makes us become conscious of an ongoing activity. From a temporal viewpoint, the sound signal can be described in terms of discontinuity in that it is triggered off by an event that makes us listen.

Sonic Background (Hearing); refers to an order to which one does not pay attention; it is a passive relation between the receiver (subject) and the environment (emitter). Yet, the paradox is that the background is clearly audible from the moment one starts to listen actively, implying that 'sonic environmental characteristics' no longer belong to the order of 'background'. From a temporal viewpoint the sonic background can be described in terms of continuity, imagined as an ongoing stream - a continuum - of sounds.

Sonic Ambience (Attending); concerns the composition of the present sounds within the acoustic space; the sounds bring a distinct character – a sonic code – to a place. From a temporal viewpoint the sonic ambience can be described in terms of dynamics in that it is the mobility, the movement, the rhythm and the alteration of the sonic units that constitute the sonic ambience of a place. [72]

Each certain sonic setting can trigger different modes of auditory perception. In specific, while some places activate the passive mode, 'hearing', the sonic environmental characteristic of the space is focused more on the 'sonic background'. On the contrary, another sonic setting can trigger an active mode, 'listening or attending', therefore one can be focused on 'sonic signals' or 'sonic ambience'. The modes of perception shift consciously or unconsciously according to the varying sonic characteristics.

On the other hand, the same sonic setting can trigger different modes of perception, according to the intention of the listener or the design of the setting. Imagine a situation in a bar, which has a

72 Hellström, 2003, pp. 75-76

considerably loud music playing. The costumers on one table, may have chosen the place because they don't want to be heard by the others, so they use the sound inside the place as a masking tool. Therefore the sonic background of the music and the sound of the other costumers inside the bar, trigger their inactive mode of perception, 'hearing'. However in the same bar, on another table, some costumers might have been there intentionally to listen the music playing in the bar. Therefore sonic signals of the music grab their attention and trigger active mode of perception, 'listening'. It is as well possible to describe a third situation, which a costumer might have just entered the bar on occasion and the music is constant. Therefore sonic ambience of the place triggers his or her dynamic mode of perception, 'attending'.

The example is to illustrate how mode of perception can shift in different circumstances and as well to describe the possibilities of utilizing the sound source in order to create a certain sonic climate, which ordinarily occurs in our everyday lives.

Regarding to the manifestation of figure-ground there are two other fundamental aspects which are metamorphosis (metabolic) effect and ubiquity effect, defined at the French Institute Cresson, in Grenoble.

Metamorphosis (metabolic), a perceptive effect describing the unstable and changing relations between elements of a sound ensemble. A classic figure of rhetoric, metamorphosis characterizes the instability present in structural relations that link parts of an ensemble and the resulting possibility to switch elementary components of a totality, so it is perceived as being in perpetual transition. The ancient Greek word metabolos (in French "métabole") means that which is variable - something that is in metamorphosis. Our considered modification here involves the relation between elements that compose the sound environment, defined as addition and superimposition of multiple sources heard simultaneously. The metamorphosis effect has two fundamental criteria:

- The instability of the structure perceived in time.

- The distinctiveness of the parts or ensemble in a given sound composition. [73]

Meaning, when one acts in a sonic setting, s/he perceives the sound not like a single entity, but as a totality instead. However one can as well distinguish its constituent parts, sound objects, in time.

An effect linked to spatio-temporal conditions expresses the difficulty or impossibility of locating a sound source. In the major variant of this effect, the sound seems to come from everywhere and from nowhere at the same time. In a minor variant, sound seems to come simultaneously from a singular source and from many sources. Beyond the simple phenomenon of sound reflections that limit localization, the ubiquity effect opens the way to the metaphysical dimension of sound.

Diffused, unstable, omnidirectional sound presents an intrinsic tendency toward ubiquity - in fact it is impossible to delimit or materialize the 'location' of a sound. Inversely, the notion of ubiquity, immaterial in principle, could not be better evoked than by sound - it cannot be seen, it does not 'manifest' itself, and it uses other sensorial channels to be revealed, among which hearing seems to predominate. [74]

Meaning, when one acts in a sonic setting, s/he perceives ambiguity of the environment, since the locational cue of the sound objects are constantly changing. Thus, the listener cannot even distinguish constituent parts, sound objects, of the sonic setting, which causes the loss of spatial orientation.

The metamorphosis effect is related to the ubiquity effect in the sense that it prevents the listener from fixing his or her attention on a particular sound source. But it differs from the ubiquity effect in that each sound is well localized. In a way, metamorphosis is to time as presence is to space: the former is characterized by permanent instability of referents in time (incessant inversion of the relation between sound figure and background); the latter is characterized by an instability of referents in space (incessant questioning of the position of sound sources). From a semantic point of view, in the

73 Augoyard et. al., 2006, pp. 73-74
74 Ibid., pp. 130-131

metamorphosis effect sounds are impersonal (hence the feeling of euphoria), while in the ubiquity effect, they are anonymous (hence a feeling of discomfort). [75]

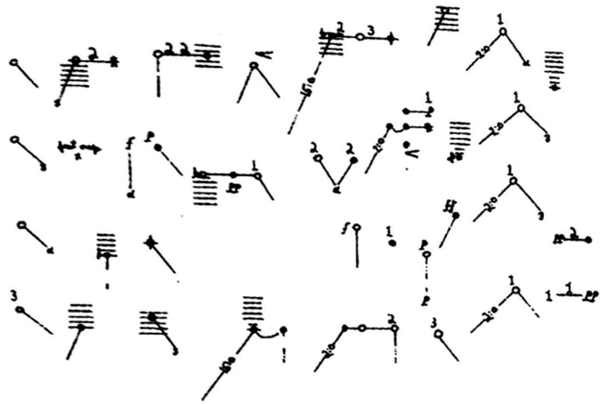
In the mid twentieth century the famous German composer Karlheinz Stockhausen invented a phenomena called moment-form, concerning as well the dual relation of figure-ground in extent to metamorphosis effect and ubiquity effect. He considers a composition as a whole, disregarding the time as a horizontal entity. In context of moment-form, each moment has equal importance and time dimension is no longer linear. Stockhausen describes the moment-form in his lecture of 'Moment-Forming and Integration, 1972' in Institute of Contemporary Arts London;

When certain characteristics remain constant for a while, a moment is going on. ... When sounds occur in a certain region of certain dynamics then these characteristics determine the moment. ...When these characteristic changes all of a sudden, a new moment begins. When they change very slowly, a new moment is going to begin and the present moment is still going on. If we are in this room tonight, the measures of this room, the number of participants and this meeting, to certain extent the quality of the people, all these components determine this moment. When you leave this hall one by one starting right now and the last one would leave this hall after about two hours, when I am going to leave approximately, then the change from this moment to the next moment, which is the moment of going home or going somewhere else, will be very slow. Where is when all of a sudden, this floor breaks or there will be an explosion, then the moment changes to the next moment very quickly, abruptly. The degree of change is something that can become the quality which is consider during the active composing rather then what is changed. [76]

According to Stockhausen, each moment has influences on other moments. Thus, it can be examined as one whole integration. Since one can identify the changes and certain dynamics of the moment-form, metabolic effect might be more active than ubiquity effect. However they can still simultaneously or consecutively coexist. More importantly, in this context, the layers of sound objects

75 Ibid., p.75
76 Stockhausen, 1972

and events have a vertical constellation. That means, occurrence of sonic events forms the whole integration, which brings the necessity of a new notation system rather than occidental representations.



On the left, ‘traditional notation’ Richard Wagner - Tristan und Isolde (1865) . On the right, ‘graphical notation’ Christian Wolff - For 1, 2 or 3 people (1964)

Fig. 1.8: Traditional and Graphical Notation [77]

The outcomes are not a consequence of what they represent, but what they mediate [78]. As Deluze and Guttari explains in ‘A Thousand Plateaus: Capitalism and Schizophrenia’, the diagrammatic representations are not for something real, but rather they form something which hasn’t yet occurred. It is a reality to happen. Therefore the representations of this case study are interpretable outcomes and they function to put into concepts in extent to production of architectural and musical expressions.

77 Hellström, 2003, pp. 85-91

78 Ibid., p. 98

“Let us listen to our cities. Is it not the very nature of the urban environment to make us hear, whether we like it or not, this mixing of sounds? Dull murmurs, machine noise, the shifting and familiar acoustic racket created by people - every urban moment has a sound signature, usually composed of many sounds together. Beyond classification, “the city rings” (or as Schopenhauer said, “Die Welt klingt”).”
-J.F. Augoyard et. al.

1.8. THE CITY RINGS

The Cresson Institute in Grenoble, France, since 1980s, has been researching about developing methodologies for understanding sonic environment and its constituent elements. Although the concept of the sonic environment was including various arbitrary interpretations, it was aimed to progress the research beyond aesthetic purposes. Jean-Francois Augoyard et. al., provided a swift improvement in the field of acoustic space and its relation to built environment and human dimensions. However human dimensions require certain degree of accuracy, which was not possible to achieve with the existing quantitative tools. Thus, it was suggested by them to develop accompanying qualitative tools, since the quantitative tools are not efficient to analyze measurable entities of sonic environment.

The researchers at Cresson have wondered about this deficiency in tools to fulfil three criteria: interdisciplinarity; suitability to the scale of the urban situations to be observed; and capacity to integrate dimensions beyond aesthetic design. The notion that has finally been adopted and placed at the heart of the process is that of the ‘sonic effect’, which is becoming more and more necessary in the three fields in which it is particularly effective: social sciences, urban studies, and applied acoustics.[79] Sonic, or sound, effects are the results of the surveys conducted and analyzed by the engineers, architects, town-planners, sociologists, philosophers, geographers and musicologists at Cresson. Accordingly, they outlined the acoustic space, in extent to effects, into three different process, regarding to local sonic configurations. Those processes were restructured in the work of Björn Hell-

79 Augoyard et. al., 2006, p. 7

ström ‘Noise Design’ as;

1- Regarding sounds as a reservoir of possibilities - like instrumentarium, which materializes and gives form to daily human relations and to the management of the urban acoustic space.

2- Sonic phenomena in regard to the city itself, which is constituted through the development of this ‘sonic instrumentarium’. This viewpoint deals with the knowledge fields of architecture and town planning, since the built space works directly together with many of the sound effects. Even though not all of the identified sound effects are dependent on a spatial propagation, most of them are to some extent dependent on a spatial context.

3- In regard to applied acoustics, a pure physical signal can be regarded as a laboratory abstraction. In built space, however, the sound will be formed by morphological properties, its form and structure, and also by the physical circumstances affecting location and mobility. Therefore such acoustic measurements indicate only quantitative values. Yet such knowledge is very precise and provides substantial support when making surveys in urban space. It helps, among other things, the architect and the town planner to forecast certain acoustic configurations of planned architectural form. [80]

To sum up, the sonic effect, sometimes measurable and generally linked to the physical characteristics of a specific context, was not reducible either objectively or subjectively. The concept of the sonic effect seemed to describe this interaction between the physical sound environment, the sound milieu of a socio-cultural community, and the ‘internal soundscape’ [81] of every individual. What is the nature of this operative concept? [82]

80 Hellström, 2003, p. 102

81 Augoyard et. al., 2006, p. 154
Internal soundscape; the concept, particularly affecting pschological and physiological approaches, was produced by Manuel Perianez in ‘Testologie du paysage sonore interne’.

82 Ibid., p. 9

1.8.1. MECHANISM OF SOUND EFFECTS

In its broadest sense, the sound effect does not only stand for the effect itself, nor for the event/source which causes the sound. It is the outcome on the listener resulted by the event and its cause. For instance, Noise or sound do not physically 'change' in the Doppler Effect; it is the relation between the observer and the emitting object that is modified, when the former or the latter is moving at sufficient speed. The physics of 'effects' is not only born of relativity; it also opens the way to a phenomenonal thinking banned from the exact sciences for many centuries. [83]

Hellström analyses sound effects under three aspects, by concerning the sound effect not as the effect itself as a result of a physical cause. Instead he states that it refers to factual description, interpretation and expression.

- Factual description of the total appearances of the effect; i.e. it derives from the cause through the event and its environmental and perceptual influences. The effect very precisely depicts the spatial and temporal progress of the sonic elements in the environment.
- Interpretation of sound; when listening we never attend to the sound itself, but we attend its context e.g. its spatial, cultural and aesthetic dimensions.
- Expression of sound; in daily life we are to some extent always aware of sounds in that the given sonic information works as a guide to inform us how to act in the environment. Consequently, this aspect concerns social interaction and people's practice. [84]

The sound (sonic) effect should not be understood as a full "concept" in its strict sense. The example of the 'soundscape', prematurely presented in the 1980s as a miraculous, qualitative, and hedonistic concept by urban planners, architects, and landscape designers, is an important warning. This eagerness to approach sound like any other object and to use a key word, which in fact masks a deficiency in our knowledge about sound, is largely responsible for the loss of focus and unlikely

83 Ibid., p. 10
84 Hellström, 2003, p. 103

relevance of a term endowed with a particular and precise meaning. The effect may not be a concept. The survey of objects it refers to remains open. The notion is only partly understood; the sound (sonic) effect is paradigmatic. [85]

Acoustic situations are convoluted for analysis in situ, therefore paradigmatic notion of sound effect might need to be well framed both theoretically and practically in order to provide a comprehensive understanding to the listener. Thus, according to Augoyard et. al., the majority of the examples can be investigated under five statements, which are denoted as well by Hellström [86][Augoyard et. al.: 2006].

1. Support of acoustic measurement;
can be helpful for micro scale examinations about configuration of the acoustic space, i.e. frequency and intensity. The sound effects tool can be useful for estimating elaborately and assessing certain values in situ.

2. Multidisciplinary instrument for the analysis of complex situations;
can be helpful for evaluating complexity of sonic phenomena, which evolves in interactive dimension of the certain components. The sound effects tool can be useful for analyzing acoustic quality of built space, noise problem, acoustic identity and the comfort of the urban setting, acoustic planning of highways.

3. Support for representative tools;
can be helpful for being more indicative to create certain representations of sonic settings, in which it is fundamental to provide relevant information, such as the type of source, acoustic qualities, sonic events etc. In this context, sound effects tool can work as a representative tool for qualitative and as well quantitative information of the relevant urban setting.

85 Augoyard et. al., 2006, p. 9
86 Hellström, 2003, pp. 104-105

4. Tool for architectural and urban intervention;

The sound effects, which have accurate and multidisciplinary spatial definitions, are predictable in certain situations. For instance ubiquity effect is predictable within the configuration of urban space (acoustical characteristics of urban landscape, type of sources in relation to use of urban space). In this extent, the sound effects tool can be useful for defining the identity of a planned space, as well it can be a collaborative tool for urban planning and decision-making process. Augoyard indicates that, at the level of architectural conception and urban design some effects participate fully in the conception of the space and contribute to shaping its identity (i.e. the clear reverberation of tiled Mediterranean houses, the cut out effect in artistic or cultural exhibitions, sound masks in industrial installations or open-plan offices, and the confused sound metabolism of new shopping centers). The sound (sonic) effect is probably one of the most subtle tools of architectural and design projects. The lack of awareness of designers concerning this notion is probably due to a mental block caused by visual culture and education. [87]

5.Pedagogic tool serving a general listening experience;

Conceiving an acoustic setting is related with the listener's competence on sonic cognition. The daily listening situations are very complex, however it is similar to learning a new language. One should attend in comparison between naïve experience of every day listening and specialized or expert practice. In extent to musical composition, the sound effects provide a wide range of variety. Considering the composers are mostly influenced by the environment, they are to explore musical domains through the sound effects (i.e. Doppler Effect in Gustav Mahler – Symphonie No. 2 Mov. 1 or Symphonie No. 6 Mov. 1, distance and closeness in Claudio Monteverdi - Madrigali)

A listening practice that starts with a return to the consciousness of early listening concerns sound specialists as much as urban environment planners and educators. Listening to sound (sonic) effects and developing the capacity to identify them are part of a rehabilitation of general auditory sensitivity. In this thesis, this sensitivity will assist us to understand the dynamics of sound objects and its relation to sound events and social behavior in public space.

87 Augoyard et. al., 2006, pp. 11-12

1.8.2. CLASSIFICATION OF SOUND EFFECTS

The repertoire of eighty-two sound effects was defined by Augoyard under three categories. First one consists of major and minor effects; second consists of different fields of knowledge; third is a less explicit category which is classified according to relations between the environment and the listener (see the Fig. 1.9).

CLASSIFICATION OF SOUND EFFECT

First Classification	Second Classification	Third Classification
• major effects (16) • minor effects (66)	• physical and applied acoustics • architecture and town-planning • psychology and physiological perception • sociology and the culture of everyday life • musical aesthetics and electroacoustic music • media	1. elementary effects 2. sonic composition effects 3. effects connected to the perceptive organisation 4. psycho-motricity effects 5. semantic effects

Fig. 1.9: Classification of Sound Effect [88]

Each effect is sub categorized according to the third category, the majors and minors are highlighted and in their descriptions have been thoroughly defined under the second category, considering different fields of knowledge [Augoyard et. al, 2006].

88 Hellström, 2003, p. 105

LIST OF MAJOR AND MINOR SOUND EFFECTS

(the effects with extra bold type are major effects)w

1. ELEMENTARY EFFECTS

Coloring
Delay
Distortion
Dullness
Echo
Filtering
Flutter echo
Haas
Resonance
Reverberation

2. SONIC COMPOSITION EFFECTS

Accelerando
Blurring
Bourdon
Coupling
Crescendo
Cutting
Decrescendo
Doppler
Emergence
Fade-in / Fade-out
Hauling
Masking
Mixing
Phone
Rallentando
Re-entry
Wave

3. EFFECTS, CONNECTED TO PERCEPTIVE ORGANISATION, MEMORY OR CULTURE

Anamnesis
Anticipation
Asyndeton
Cocktail-party
Delocalisation
Erasing
Hyperlocalisation
Immersion
Metamorphosis (Metabolic)
Phonomnesis
Remanence
Synecdoche
Ubiquity
Wall

4. EFFECTS OF PSYCHO-MOTRICITY

Attraction
Crenel
Deburau
Desynchronisation
Chaining
Instrusion
Irruption
Lombard
Paranthesis
Phonotonic
Repulsion
Synchronisation

5. SEMANTIC EFFECTS

Decontextualisation
Dilation
Envelope
Imitation
In distress
Narrowing
Quotation
Repetition
Sharawadji
Suspension

Fig. 1.10: List of Major and Minor Effects [89]

89 Ibid., p. 108

PART 2

2.1. METHODS AND TECHNIQUES

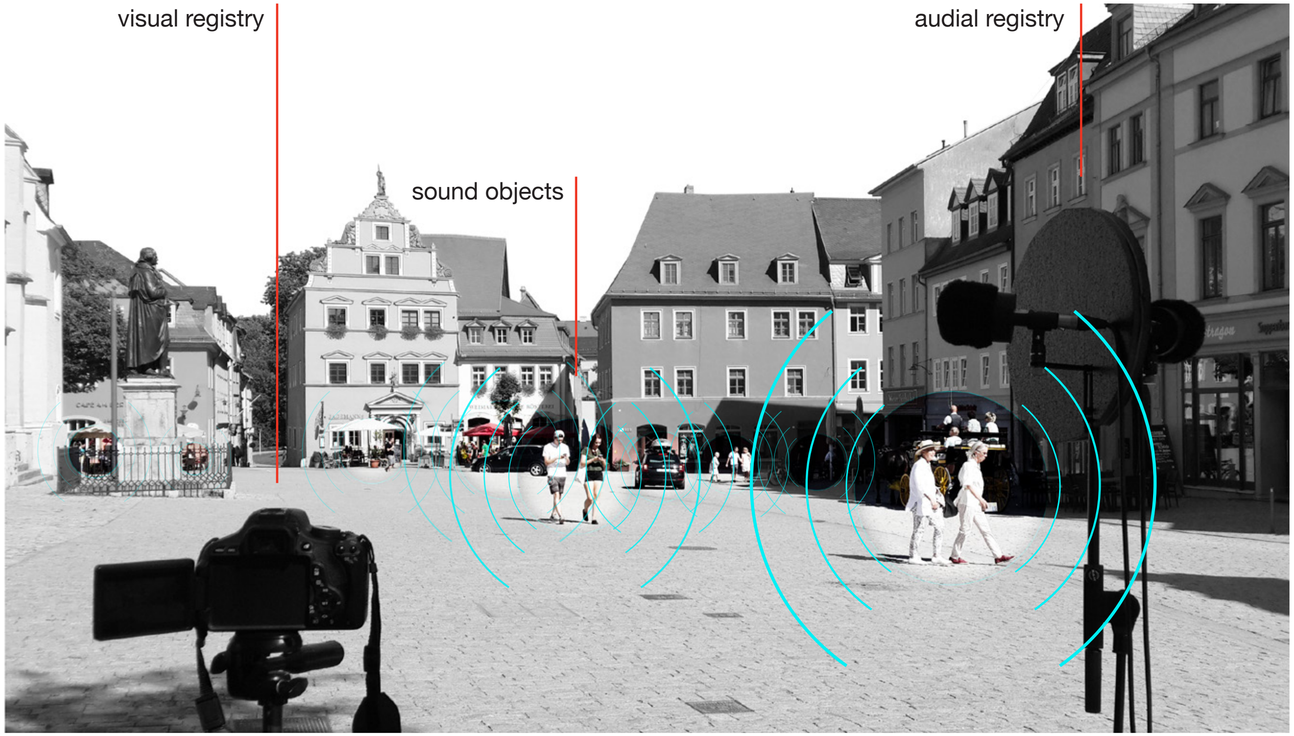


Fig. 2.1: Observing Public Space (Herderplatz, Weimar - Germany I 07.08.2016)

The methodology of observing the public life in public space has been thoroughly explained in part 1, according to the researches made by Gehl and Svarre since 1960s. If I may connote shortly, it consists of five main questions; how many?, who?, where?, what?, how long?, and besides eight methods; counting, mapping/behavioral mapping, tracing, tracking/shadowing, looking for traces, photographing (digital registry), keeping a dairy, test walks. Among the observation methods of public life, digital registry was the most crucial in order to begin the case study which was conducted by me.

One of the main reasons behind the importance of digital process of data storing is breaking the time constraint, which is essentially a process that objectifies the sound. Barry Truax describes this process explicitly in 'Acoustic Communication' as an objectification and commodity, in which we transform something that occurs in time to a physical medium – an object in fact – that exists in space. By transforming time into space we make it accessible to visual and tactile inspection. [90] Breaking the time constrain is as well important to analyze the stored data of public life and sonic setting, because observation in public space is not fully efficient with the naked eye and ear. It is certainly necessary to fast freeze the time constrain and analyze the instantaneous situations, in another word moments.

Besides digital registry, the other contributing methods were as well crucial, for instance keeping dairy, behavioral mapping etc. Considering this case study was conducted as an individual project, some of the tools had to be disregarded while recording. Those tools (such as counting, tracing, tracking etc.) were taken into consideration while analyzing the recordings.

In the following chapters, I will broadly elucidate the process of methods and techniques, which were applied in the study, from collecting the visual and audial data to the representation of the outcomes.

90 Truax, 2001, p. 131

2.2. MICROPHONE TECHNIQUES AND RECORDING

The microphone turns acoustic energy into electric energy through a process called transduction. Microphones include a diaphragm that moves in response to changes in air pressure. The diaphragm then converts this movement into an electric signal that travels through a cable. [91]

Among various types of microphones, such as dynamic, ribbon, carbon etc., for this case study the condenser microphones were the most suitable and accurate ones but at the cost of being more fragile. Condenser diaphragms usually cannot handle the stress of high-volume sounds for long periods of time. However, in a controlled environment, they can offer a truer reproduction of the original sound. Condenser is the most widely used type of microphone for sound effects recording. [92]

2.2.1. POLAR PATTERNS

Microphones as well defined by their polar patterns, which are called sometimes pickup patterns of directional settings. These patterns are calculated by sending signals which have same sound pressure levels (SPL). There are mainly four categories according to their polar patterns;

1. Omnidirectional (non-directional) microphones

2. Unidirectional microphones
    - Cardioid
    - Hypercardioid
    - Supercardioid
    - Subcardioid

3. Bidirectional (figure of 8) microphones

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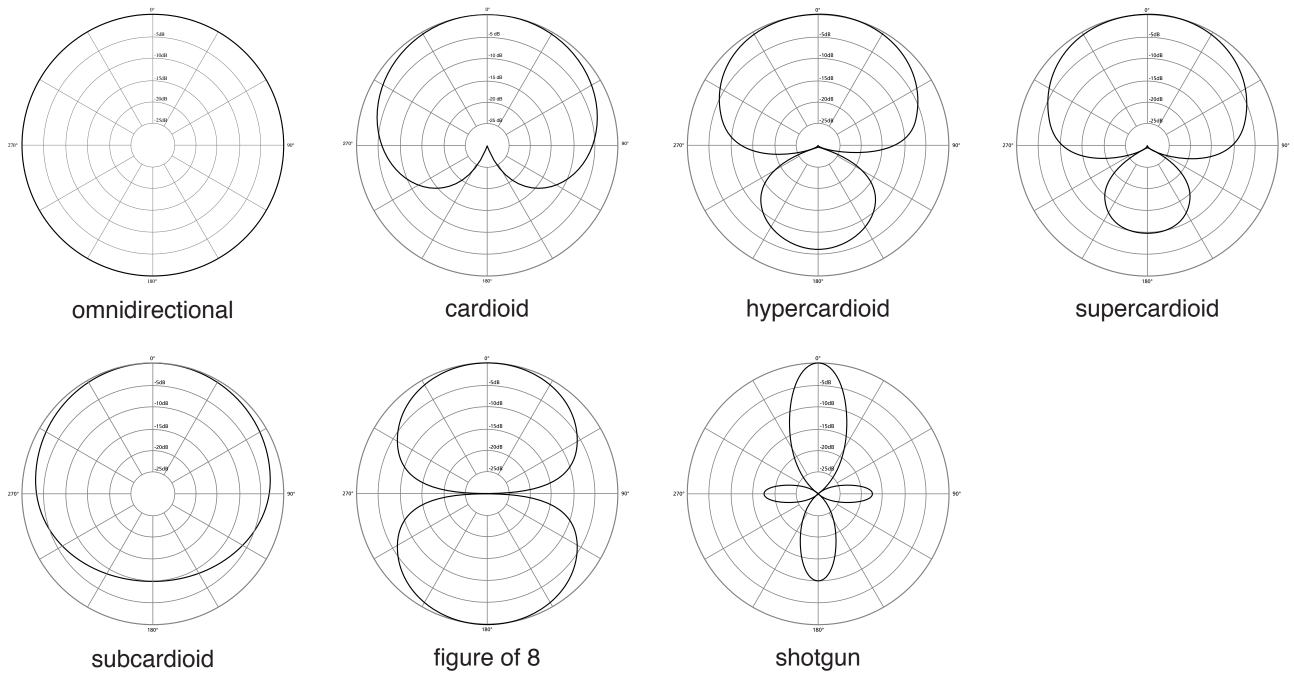
91 Viers, 2008, p. 16
92 Ibid., pp. 16-17

4. Shotgun and Parabolic microphones



(Microphone facing top of the page in diagram, paralel to the page)

Fig. 2.2: Microphone Polar Patterns [93]

Considering cardioid microphones are mostly rejecting the sounds coming from the behind, for the method which was applied in this case study, it was precisely providing the necessary sound informations.

2.2.2. MICROPHONE RECORDING TECHNIQUES

Choosing a miking (microphone recording) technique, depends on many criterions, such as;

93 Microphone - Wikipedia

- The environment where the recording takes place
- Intention of the recording
- Signal type; mono, stereo or multi-channel
- Sound source properties
- The use of microphone equipments; shock mounts, windscreens, microphone stands, cables etc.

These criteria form the whole miking setting, which we eventually want to have in order to do the recording adequately. Since the method of the case study requires stereo recording, I would therefore like to provide some basic information.

Stereo microphones are microphones or systems used for coincident, XY, AB, ORTF, OSS, M/S, SASS, binaural in-the-head, and binaural in-the-ear (ITE) recording. These systems have the microphones close together (in proximity to a point source or ear-to-ear distance) and produce the stereophonic effect by intensity stereo, time based stereo or a combination of both. (emphasis added) [94]

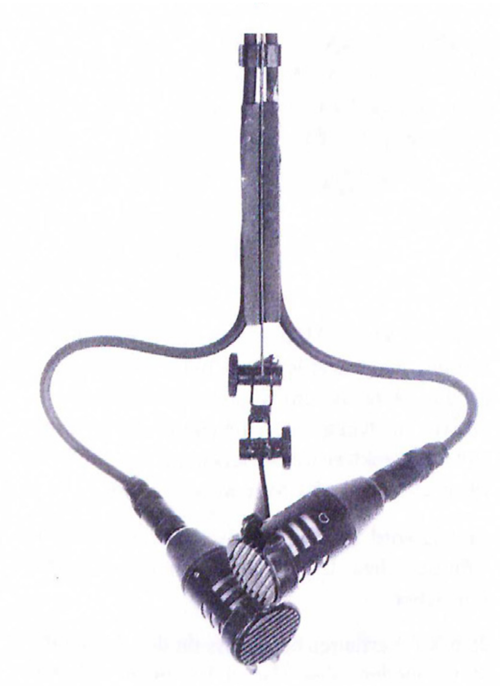
In everyday life, one experiences the combination of both time and intensity based stereo effect, since the design of human ear has binaural setting properties (it was broadly explained in the chapter 7, *Cognitive Processing of Sound*). Therefore, after trying many settings, I came up with a combination of two settings according to the results of stereophonic effect; ORTF and OSS (Jecklin Disk) miking techniques. The reasons behind these decisions will be thoroughly explained in the following chapter.

2.2.2.1. ORTF TECHNIQUE

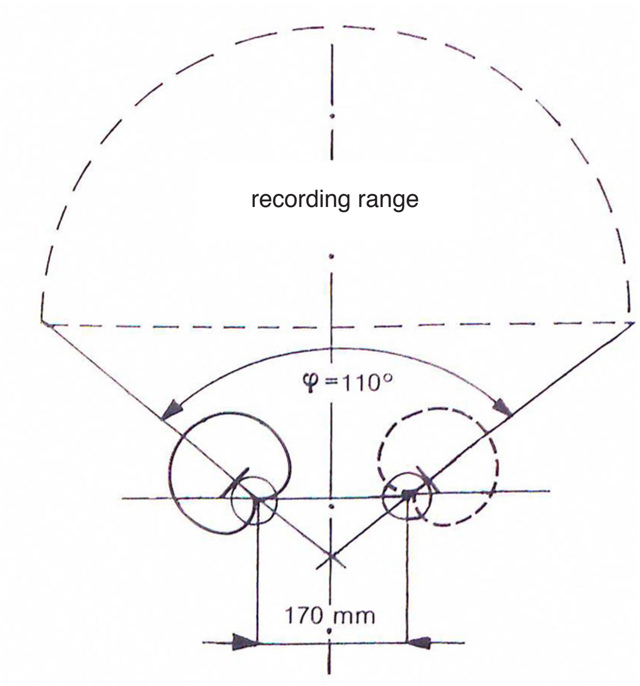
The initials ORTF stand for 'Office de Radiodiffusion Television Francais', the French government radio network that developed this technique. The ORTF method uses two cardioid microphones spaced 7 inches (17 cm) apart and facing outward with an angle of 110° between them (see Fig. 2.3). Because of spacing between the transducers, in another word microphones, the ORTF method does

94 Ballou, 2008, p. 542

not have time-coherence properties of M/S or XY miking. [95]



XY Technique



ORTF Technique

Fig. 2.3: XY and ORTF Microphone Techniques [96]

ORTF miking technique is often used especially for a large body of sound [97], spatial sense.

2.2.2.2. OSS TECHNIQUE

The initials OSS stand for ‘Optimal Stereo Signal’. This miking technique is suggested by Swiss

95 Ibid., p. 544
96 Pawera, 1993, p. 40
97 (my translation) Ibid., p. 41

Broadcaster, Jürg Jecklin. It is also known as the 'Jecklin Disk Technique'.

Two omnidirectional small diaphragm transducers stand slightly angled outward, in distance of 16 cm from each other, and on the middle axis there is a separator disc which has 30 cm diameter. The disc consists of absorbent material (such as acoustic foam, felt). It has around 3cm to 5cm thickness. [98] (see Fig. 2.4)

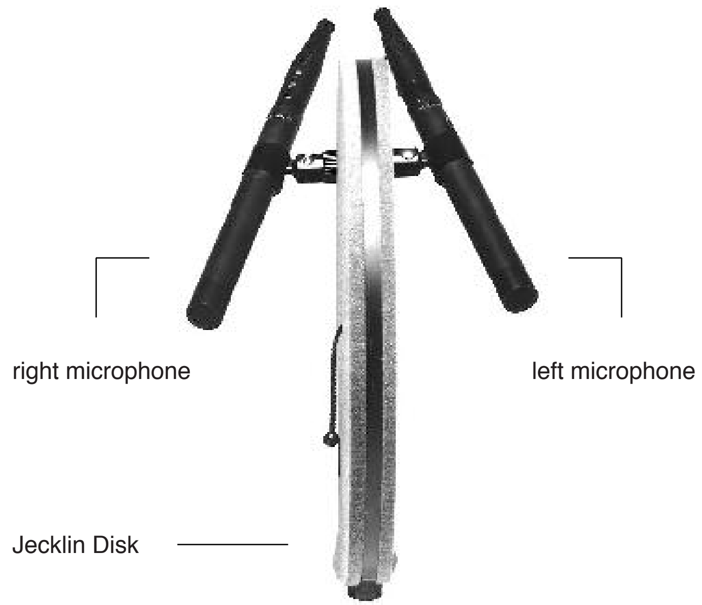


Fig. 2.4: Jecklin Disk Technique [99]

2.2.2.3. APPLIED HYBRID TECHNIQUE

After testing the variations of different miking settings results, I used the ORTF technique as basis and for larger separation of intensity difference between two channels I came to the conclusion to

98 Ibid., p. 42

99 Core Sound - Jecklin Disk and Schneider Disk microphone mount

attach a self-made Jecklin Disk on the middle axis.

This hybrid setting consists of two cardioid microphones, in this case Neumann KM184, which stand in distance of 17cm, facing outward with 110º angle. The Microphone stand was adjusted on an average height of the ear, around 170cm, considering someone standing. The separator disc is made of 10mm EUROKUSTIK acoustic foam in diameter of 30cm. (see Fig. 2.5)

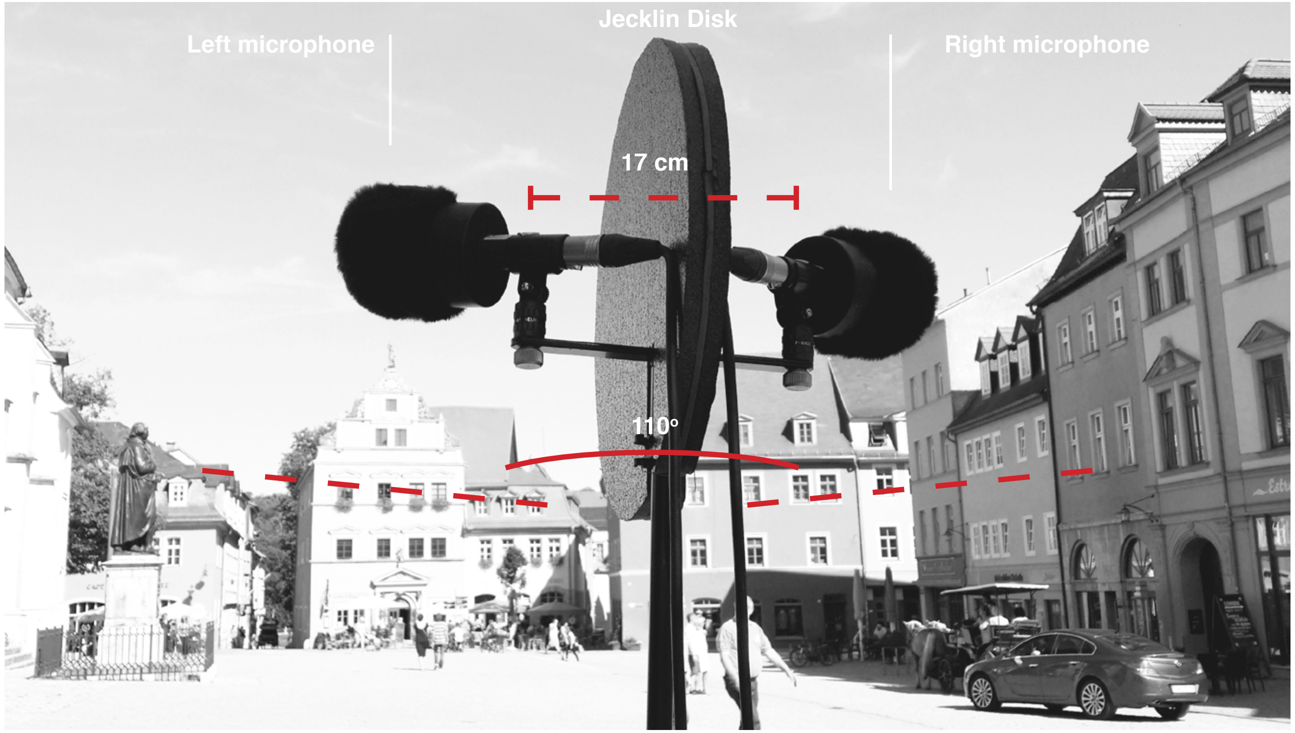


Fig. 2.5: Hybrid Technique (Herderplatz, Weimar - Germany I 07.08.2016)

As a result, I obtained the large body of sound of ORTF technique and additionally a significant intensity difference between left and right channels. Thus the necessary data was provided for the further signal processing of the recorded sound.

2.2.3. RECORDERS AND MICROPHONE EQUIPMENT

In principle, the recorder takes the electrical information transmitted by the microphone and stores it on a medium, such as a hard disk or compact flash card. Through the years, mediums have changed, but the principles remain the same. [100] In the context of this case study, a digital field recorder was needed, therefore the records were made by using TASCAM DR-680 multi-channel portable recording. (see Fig. 2.6)

Fig. 2.6: Digital Field Recorder

However the quality of the recording that a microphone produces greatly depends on the equipment that is used to isolate the microphone from its environment. Microphones are vulnerable to wind noise, vibrations, and high sound-pressure levels. Protective gear should be used to reduce these adverse effects. [101]

100 Viers, 2008, p. 48
101 Ibid., p. 38

The equipment, which was used in this case study;

- Shock Mounts
- Windscreens
- Windjammers
- Microphone Stands
- XLR Cables
- Headphones
- Phone Jack / Adapter

2.3. FOURIER ANALYSIS AND DATA EXTRACTION

In this chapter I would like to illustrate certain concepts regarding to the sound signal in order to convey the main understanding of data extraction process, by referring William M. Hartmann's work 'Signals, Sound, and Sensation'. He was working on physics and acoustics over 50 years, and has since published more than 50 research articles and chapters about acoustics and psychoacoustics.

It was fundamental for this case study to extract information from sound through Fourier analysis, such as the intensity levels (amplitudes) of each frequencies. Thus, one could conceive the spatial information of the sound objects, in another term perceptual localization. This will be later on described thoroughly.

2.3.1. PURE TONE

The pure tone occupies a unique place in acoustics and other signal sciences. It is the most elementary of all signals. Mathematically the pure tone is known as a sine wave, which is a function of time. [102]The pure tone (sine or cosine) wave form is special because it consists of only a single frequency. The significance of this idea becomes clear when one considers Fourier analysis, by which a waveform can be analyzed into its constituent frequencies. All waveforms have at least two constituent frequencies (or components), except for the pure tone which has only one. That is what makes it pure.

102 Hartmann, 1998, p. 1

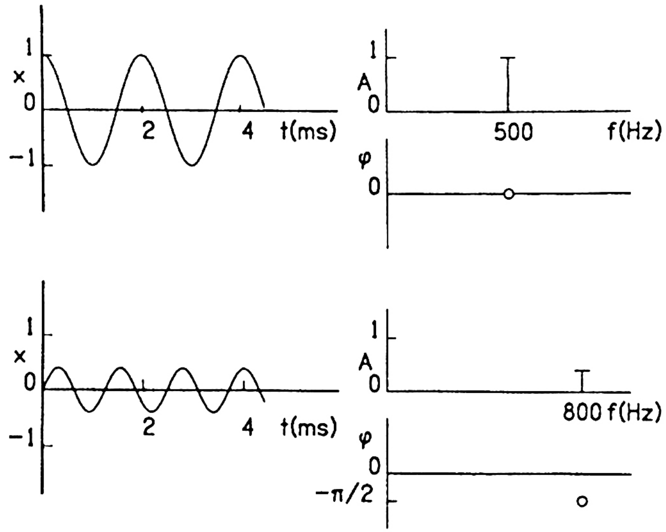


Fig. 2.7: Pure Tone [103]

Pure tone waveforms, with frequencies of 500 Hz and 800 HZ, are shown on the left as function of time. The corresponding amplitude and phase spectra are shown on the right. The phase reference is chosen so that a cosine function has zero starting phase.

2.3.2. THE SPECTRUM

A pure tone has an infinite duration. In fact, a tone with a beginning or an end is not, strictly speaking, a pure tone. As a consequence, a figure showing a sine or cosine function cannot represent a pure tone unless the figure is infinitely long. An alternative representation makes it possible to describe a pure tone exactly. This is the spectral representation. The amplitude spectrum shows the amplitude of the wave plotted against frequency. The phase spectrum shows the starting phase, also plotted against frequency. Several examples are given in Fig. 2.7, where the phase reference has been chosen to be zero for cosine wave. It should be noticed how the heights of the waveforms in the left-hand

103 Ibid., pp. 4-5

figures directly translate into the representations of amplitudes on the right. [104]

2.3.3. FOURIER SERIES

The Fourier transformation is an idea of enormous theoretical importance and practical significance. It says that a waveform, such as an acoustical signal, can be represented as a sum of pure tones, each with its own frequency, amplitude and phase. [105] It is a link between two different representations of an object. If the object is a signal, then the transformation links the time-domain representation. [106]

The operation known as 'Fourier analysis' is a way to make evident the individual frequency components in a tone. The auditory systems of all mammalian animals, and of many non-mammals, perform a Fourier analysis. The fundamental process by which acoustical vibrations are transduced into neural impulses is tuned like a bank of filters. A single sound, such as a vowel sound, is analyzed into different frequency bands because different neural channels are sensitive to different frequencies.

The converse of analysis is synthesis. The operation known as Fourier synthesis creates complex waveforms by adding together pure tones of particular frequencies, amplitudes, and phases. Contemporary digital signal generation techniques allow an experimenter to create a waveform in just that way. [107]

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104 Ibid., pp. 5-6
105 Ibid., p. 81
106 Ibid., p. 161
107 Ibid., pp. 81-82

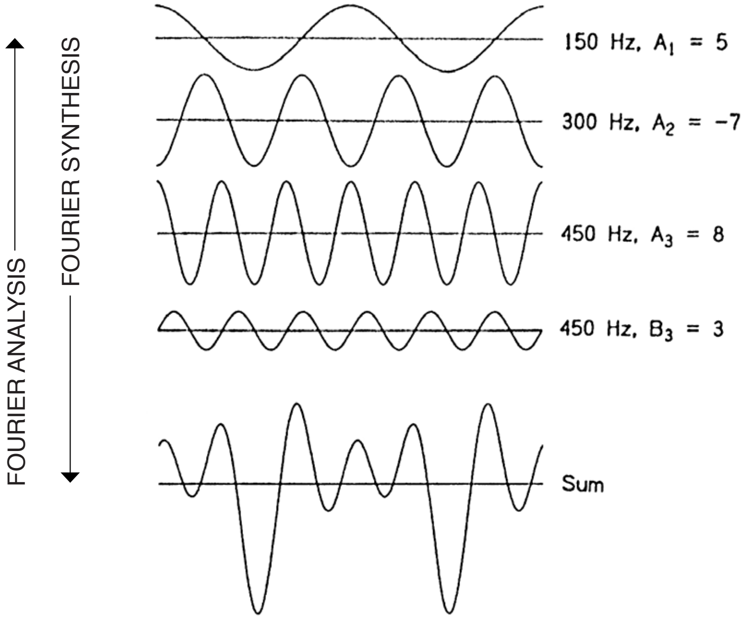


Fig. 2.8: Componential Fourier Analysis / Synthesis [108]

The top four functions show Fourier component waves with frequencies of 150, 300, and 450 Hz, and with amplitudes given 5, -7, and 8. Both cosine and sine components of 450 Hz are requiered. The bottom function shows the sum of the components.

There are two kinds of transformation: the Fourier series and the Fourier integral. The Fourier series gives a representation of a signal that is restricted to cases where the signal is periodic. A periodic signal repeats itself indefinitely, into the infinite future and into the infinite past. The Fourier integral is a more general formulation. Link the Fourier series, Fourier integral is used in acoustics to find both the amplitude spectrum and the phase spectrum. [109]

108 Ibid., p. 91
109 Ibid., p. 161

2.3.4. SAMPLED SIGNALS

There are three basic digital signal applications:

- Digital signal analysis display
- Digital signal recording-processing-reproduction
- Digital signal synthesis

An acoustical signal is mathematically a function of time, as denoted previously. Therefore it can be called as ‘*x(t)*’. In the case of analysis-display, an acoustical signal, called *x(t)*, is transduced by microphone into an electrical signal and then it is converted to a digital format by an analog-to-digital converter (ADC). In what follows, digitized signal will be called *y(t)*. Thorough certain filtering or Fourier transformation, digital signal is displayed. In such applications the signal has no future existence as an analog waveform. The signal goes in, and what comes out is a measurement of some kind.

Digital recording-processing-reproduction begins with a conversion from an analog signal, *x(t)*, to a digital format, *y(t)*, using an ADC. It ends with the conversion from a digital format to an analog signal, *w(t)*, by means of a digital-to-analog converter (DAC). Between these two conversions, the digitized signal may be stored (in computer memory, on digital tape, or on optical disc), or the signal may be processed, for example by digital filters or delay lines.

Digital signal synthesis is the computation of a digital signal, *y(t)*, by means of an algorithm and subsequent conversion to an analog signal, *w(t)*, by a DAC. The algorithm may be written in a high-level language for a general purpose computer or it may be a program on a dedicated signal processor constructed on a single piece of silicon. In this application the output signal *w(t)* has had no previous existence in any analog form prior to conversion by the DAC. [110]

110 Ibid., p. 468

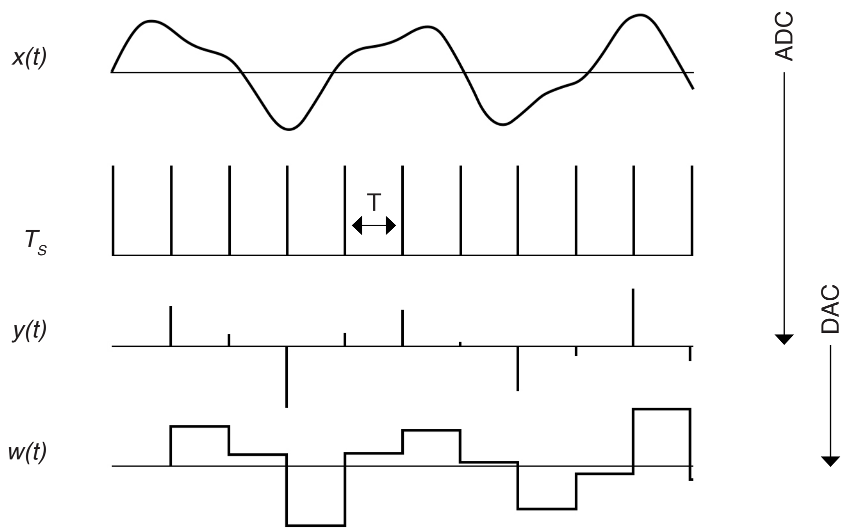


Fig. 2.9: Signal Conversion Process [111]
'*x(t)*' The input signal as a function of time. 'T_s' The sampling train. '*y(t)*' The product of the input signal and the sampling train which is the sampled signal, '*y(t)*' also regarded as a function of a continuous time variable. '*w(t)*' The synthesized product of digital signal as function of time.

In this case study an analog acoustical signal was first digitized in order to display certain features of the acoustical signal, by ADC process. Afterwards the recorded digital signal was reproduced by DAC and as well computed by an algorithm written in Processing language, accordingly it was visually displayed through a code written in Rhinoceros/Grasshopper. Digital signal was as well synthesized in terms of conversion of acoustical data to a visual data.

111 Ibid., p. 471

2.4. TRANSFORMING DATA AND MAPPING

In this chapter I would like to introduce the programming codes which I wrote and developed, in order to sample data from an analog acoustical signal and convert it into visual context. Most importantly, here it will be denoted the significance of perceptual localization, in terms of sound objects in public space.

The conversion process of analog input to a digital output, in terms of sound object analysis, consists of four steps;

- Intelligibility of the sound data and localization (see machine learning)
- Digital audio production
- Acoustic data sampling
- Intercommunication, data structuring and visualization

2.4.1. INTELLIGIBILITY OF THE SOUND DATA AND LOCALIZATION

The system in an acoustic environment is set by the existent behaviors and therefore sonic events and sound objects, which we previously described in part 1. Here we would like to understand this system through certain algorithms and develop an initial intelligence. However to be intelligent, a system that is in a changing environment should have the ability to learn. If the system can learn and adapt such changes, the system designer needs not foresee and provide solutions for all possibilities. [112]

Considering the designed tool should operate each different situations by itself, it must be programmed in a way that certain design rules are followed. Implementation of the design rules as basis for each situation, will allow us to obtain comparable results, therefore classification.

112 Alpaydin, 2014, p.3

The design rules are defined, for this case study, with the aim of identifying sound objects in extent to their perceptual localization. Thus one can find the cues of social behavior in analog acoustical signal. The design rules are to evaluate the obtained data from the process of data extraction from digitalized acoustic signal, in other words sound recordings of public spaces. According to the knowledge, which has been extracted form sound, the system designer's task is to construe it for further inferences.

The extracted knowledge is known as a bandwidth of frequencies and their individual average amplitudes - intensity levels -, which was the outcomes of Fast Fourier Transformation (FFT) analysis in Processing (FFT analysis will be broadly described in the following chapters). Therefore the outcomes are integer values for frequencies from 0 Hz to 22050 Hz, and float numbers for amplitude levels from 0 (minimum intensity level) to 1 (highest intensity level). However the frequency range we are aimed to analyze will be from 1000 Hz to 5000 Hz, which is the most sensitive frequency range of human ears.

At the outset of accepting each frequency as the objects distributed in space, I may outline the design rules for perceptual localization in order to compute the extracted knowledge. There are three main stages to operate;

1- According to the level of amplitude on a certain frequency, distance from recording point will be adjusted. The lower the intensity of the object, the further it will be placed from the recording point, which we can call origin, considering the distribution is on Cartesian plane.

2- On the same frequency and the same sample from left and right channels, if the amplitude levels are equal, the object will be placed on the middle axis, in other words in front of the recording point. Considering the recording is made stereo, there will be two samples collected, out of FFT analysis. Therefore those two samples are simultaneous and comparable.

3- On the same frequency and the same sample, if the amplitude level from one channel is higher than the other one, the object will be placed on the higher one's side. Considering binaural hearing process of humans, ILD (Interaural Level Difference) is the one we are operating in this case study. The explanations were given in part 1.

- Amplitude value of the sample will define the zone, in which the object is situated.
- Amplitude value difference between the right and left channels, on the same frequency and the sample, will define the perpendicular distance from middle axis.

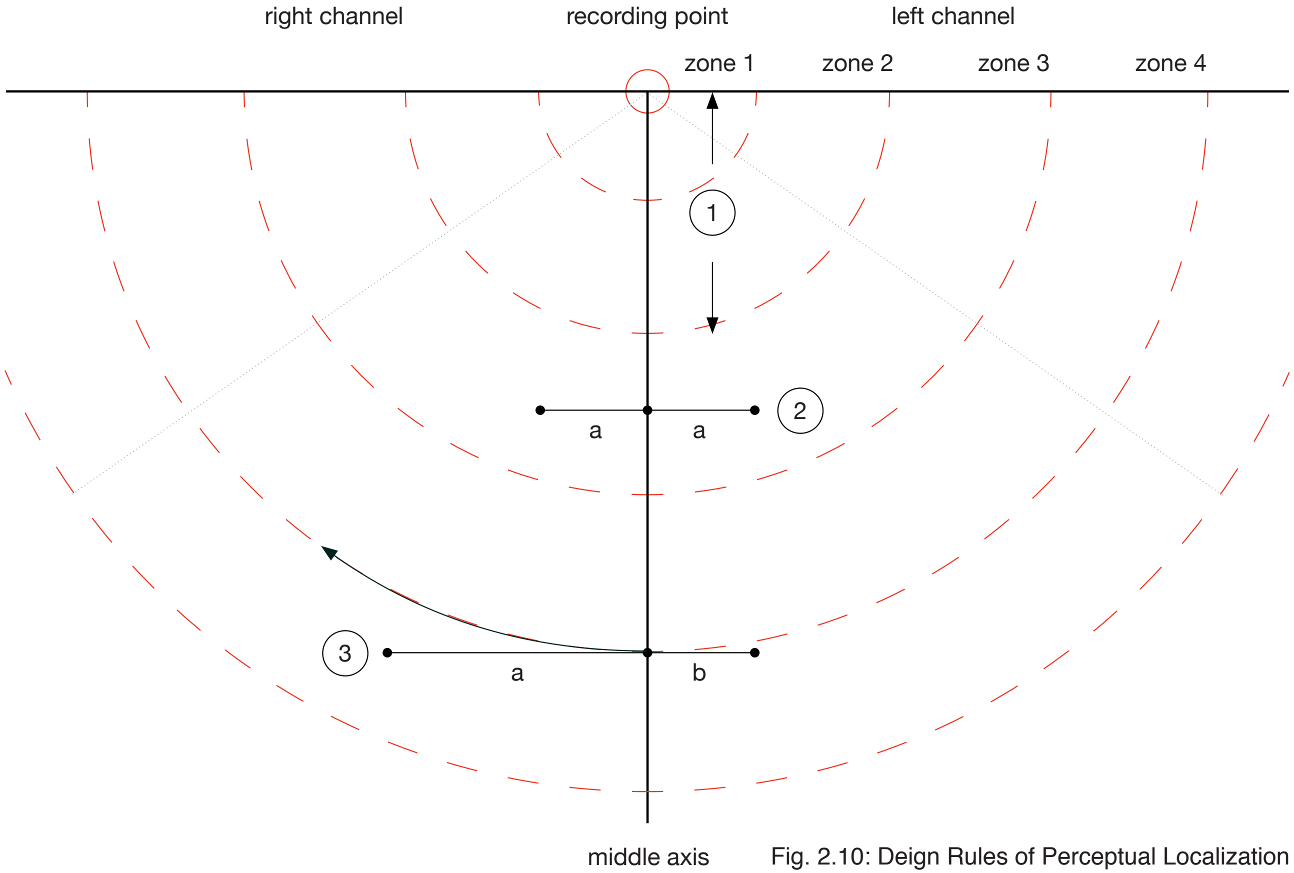


Fig. 2.10: Deign Rules of Perceptual Localization

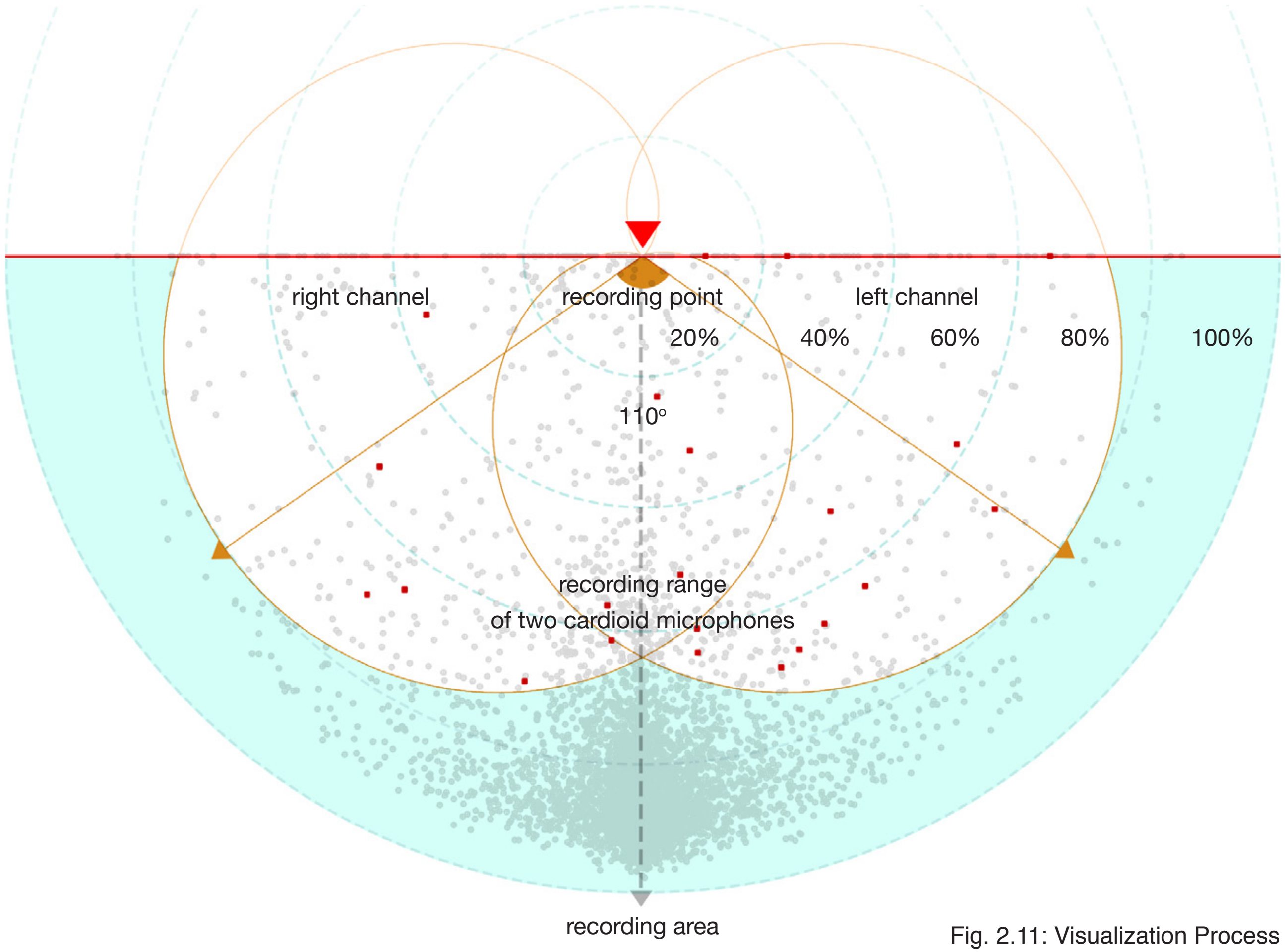


Fig. 2.11: Visualization Process

2.4.2. DIGITAL AUDIO PRODUCTION

The analog acoustical signal, the sound recording of public space, initially has to be digitalized. In order to analyze the sound data, the Fourier Transformation in Processing requires the recordings in mp3 format, therefore, in this case study, the format conversion needed to be done by a software called REAPER. It is a digital audio production software, which allowed me to see the raw data values and check the recording, in terms of quality and feasibility.

In this process stereo sound data was converted into two separated recordings for each left and right channel. It was as well reduced from 10 minutes recording to 1 minute by selecting the part which carries the most valuable sound object information. As a result through the process, I gained from each recordings, two sound files (for left channel sound and right channel sound) in duration of 1 minute. Thus the files are ready to be computed in the acoustic data sampling process.

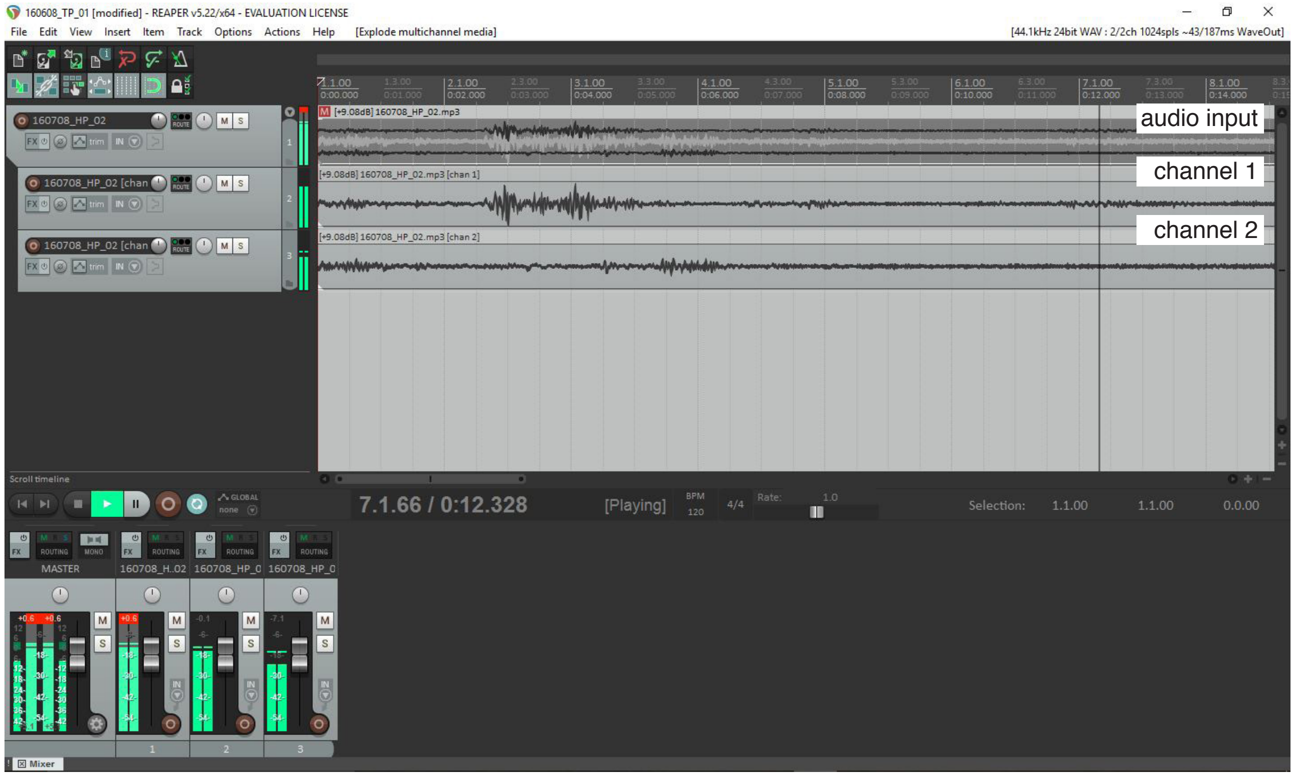


Fig. 2.12: Digital Audio Production
An example of splitting the audio input into two channels (left and right), and creating 1 minute audio file for FFT analysis.

2.4.3. ACOUSTIC DATA SAMPLING

As we described previously, the data sampling process was made by an algorithm called Fourier Transformation. In this chapter, the description about the coding structure of FFT analysis in Processing will be provided.

Processing is a open source programming tool for software prototyping and data visualization, which allows users to work in various language modes, such as JavaScript or Python, but mainly Java. In this case study our aim is to use Processing for sound data analyzing and extraction. Therefore the Minim library is fundamental for my case study.

Minim is an audio library that uses the JavaSound API, a bit of Tritonus, and Javazoom's MP3SPI to provide an easy to use audio library for people developing in the Processing environment. The philosophy behind the API is to make integrating audio into your sketches as simple as possible while still providing a reasonable amount of flexibility for more advanced users.

Here are some of the features of Minim:

- AudioPlayer: Mono and Stereo playback of WAV, AIFF, AU, SND, and MP3 files.
- AudioMetaData: An object filled with metadata about a file, such as ID3 tags.
- AudioRecorder: Mono and Stereo audio recording either buffered or direct to disk.
- AudioInput: Mono and Stereo input monitoring.
- AudioOutput: Mono and Stereo sound synthesis.
- FFT: perform a Fourier Transform on audio data to generate a frequency spectrum.
- BeatDetect: a class for doing beat detection.
- A real-time synthesis framework based around unit generators, which we call UGens. [113]

113 Minim | Compartmental

2.4.3.1. PROCESSING CODE

FFT analysis allows us to split the frequency range into bands with two methods; linear and logarithmic. Accordingly it calculates each division and assigns an average amplitude value to them. Thus, one can utilize the outcomes according to the purpose of the data extraction.

In this process, I started with linear division method of the frequency range, which is from 0 to 22050 Hz. However the results of the linear division were not representing the factual situation. Instead of having the majority of the urban sound recording concentrated in the range of 1 kHz to 5 kHz, the concentration was in the low frequencies. In contrary, the results were more accurately distributed by the logarithmic division method. Therefore the latter method was applied.

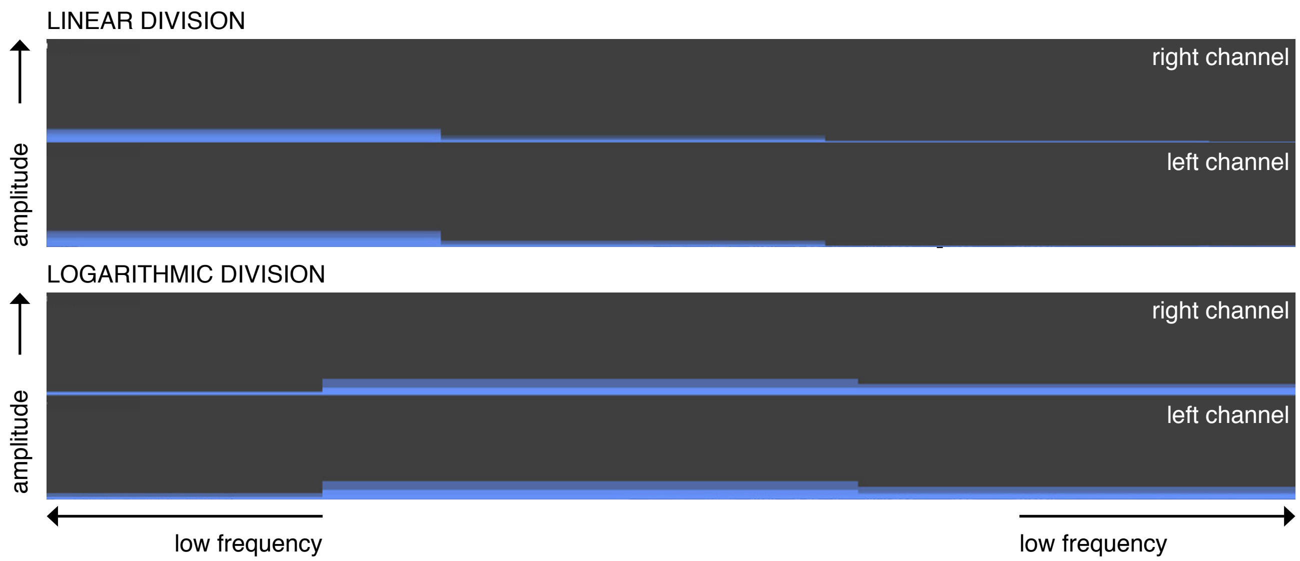


Fig. 2.13: Comparison of Two Methods

Frequency division was made by 50 Hz, starting from 0 to 22050. Therefore, the amount of the results for each interval will be 441. These 441 results were collected in approximately 0.12 sec, and the consequently outcome of each 1 minute audio recording contains about 500.000 data only in the range of 1 kHz to 5 kHz. Considering the computation potential of a regular computer, reduction in collecting data must be done, which will be thoroughly described in intercommunication and data structuring process. In the following diagram, the structure of the script for FFT analysis is illustrated.

Script

```
import ddf.minim.*;
import ddf.minim.analysis.*;

Minim minim;
AudioPlayer input;
FFT fftR, fftL;

PrintWriter outputleft;
PrintWriter outputright;

int x, y;
int grid=441;
int spacing=0;
float yScale = 4;

void setup() {

  size(22050, 400);
  smooth();
  noStroke();

  outputleft = createWriter("dataleft.txt");
  outputright = createWriter("dataright.txt");
```

- importing the libraries which are necesstary for FFT analysis
- Defining the main objects
- Defining the function for writing output values into an external text file
- Defining the variables

  441 is the amount of frequency division to analyze
- Windows size
- For each channel, assigning text files to save the values

```

  minim = new Minim(this);

  input = minim.loadFile(“160608_TP_01.mp3”, 65536);
  input.play();
  input.printControls();

  fftR = new FFT (input.bufferSize (), input.sampleRate ());
  fftL = new FFT (input.bufferSize (), input.sampleRate ());
  fftR.logAverages(50, 441);
  fftL.logAverages(50, 441);
}

void draw() {

  fftR.forward(input.right);
  fftL.forward(input.left);

  for (int i=0; i < fftR.avgSize(); i+=fftR.avgSize()/grid) {

    float x = map(i, 0, fftR.avgSize(), 0, width);
    float y = map(fftR.getAvg(i)*yScale, 0, 100, 0, height/5) ;

    outputright.print(x + “,”);
    outputright.println(y);
  }
```

calling the minim objects

Uploading the audio file and setting the size of sample buffer.

initializing the FFT functions for spectrum analysis of both channels, and logarithmic divisions.

Calculation of the right channel frequency, ‘x’, and its corresponding avarage amplitude value, ‘y’.

Writing x and y values (x_n , y_n) of whole spectrum line by line

```
  for (int i=0; i < fftL.avgSize(); i+=fftL.avgSize()/grid) {

    float x = map(i, 0, fftL.avgSize(), 0, width);
    float y = map(fftL.getAvg(i)*yScale, 0, 100, 0, height/5) ;

    outputleft.print(x + ",");
    outputleft.println(y);
  }
}

void stop()
{
  input.close();

  outputleft.flush();
  outputright.flush();

  outputleft.close();
  outputright.close();

  exit();

  minim.stop();
  super.stop();
}
```

Calculation of the left channel frequency, ‘x’, and its corresponding avarage amplitude value, ‘y’.

Writing x and y values (x_n , y_n) of whole spectrum line by line

Whole void function is to stop all continuing operations, such as respectively;

- close the audio player
- write the remaining data to the files.
- finish writing into files
- stop the program
- stop the minim objects

Fig. 2.14: Processing Definition

2.4.4. INTERCOMMUNICATION, DATA STRUCTURING AND VISUALIZATION

Intercommunication between two softwares is essential to analyze the sound data, because the data is collected in Processing, and it will be structured and visualized in another software, called Rhinoceros and its plug-in Grasshopper. Rhinoceros is a 3D modelling software, which allows users to create, edit, analyze, document, render, animate and translate type of objects. [114] Grasshopper is a visual programming language and a graphical algorithm editor tightly integrated with Rhino's 3D modelling tools. [115]

There are various methods to build this communication system, such as direct communications UDP, OSC, serial read etc. In the beginning, I was focused on the protocols using local network for sending and receiving data, for instance UDP. However the results were not so accurate, because using a network for communication has delays. The problem here is, the sending and receiving data intervals are not matching. Therefore it causes vast amount of irregular data lose. Besides, it was not possible to identify which parts of the data were missing. After testing this protocol, I decided to find a method which is more precise; serial reading.

Serial reading protocol between Processing and Grasshopper is only possible either with an advance programming script or writing the serial data into a text file from Processing and reading the text file in Grasshopper. The latter method as well allows the users to document data, which is the reason this method was applied in this case study.

As it was depicted in the previous chapter, after running the Processing script for each recording, I had two text files of left and right channels, which consist of the frequencies and its corresponding amplitude values.

114 Rhinoceros Feature Overview
115 Grasshopper - algorithmic modelling for Rhino

2.4.4.1. THE STRUCTURE OF TEXT FILE

x: frequency; Hz
y: oscillating variable, which refers to sound pressure level; SPL (or dB)

x_n, y_n

0.0,66.20664
50.0,142.85715
100.0,225.24176
150.0,562.6245
200.0,262.8236
250.00002,276.4597
300.0,378.24396
350.00003,322.36597
400.0,397.28674
450.0,652.48425
.
.
.
21800.0,0.039890364
21850.0,0.038938947
21900.0,0.037515707
21950.0,0.039533023
22000.0,0.04211573
0.0,66.20664
50.0,142.85715
100.0,225.24176
150.0,562.6245
200.0,262.8236
.
.
.

This is an example for the content of saved text file through Processing. First variable before comma represents the frequency value which increases by 50 Hz in each sample, and second variable after comma represents the corresponding amplitude value which is amplified magnitude by processing.

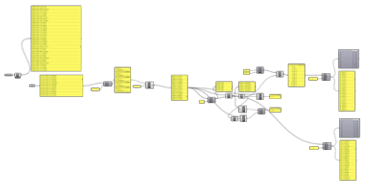
Fig. 2.15: Structure of the Stored Data

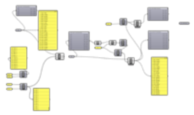
2.4.4.2. GRASSHOPPER CODE

Accordingly the text files are received in Grasshopper and structured as followed;

- Splitting the lines into two values from comma.
- Creating data trees which consist of 441 values on each branch and creating consequently about 1000 branches. Each branch contains the full spectrum values.
- Selecting the frequencies between 1 kHz and 5 kHz for the analysis, which has 81 values.
- Reducing the number of data collected from the recording interval 0.06 sec. to 0.12 sec., in other words from 1000 branches to 500 branches.
- Flipping the data tree to 81 branches which contains 500 data, which gives the opportunity to compare the individual frequencies with each other.
- Remapping the amplitude values to the range of 0 to 1.
- Applying the operational stages of design rules; perceptual localization which was outlined in the previous chapter ‘Intelligibility of the Sound Data and Localization’.
- Defining the recording boundaries of cardioid microphones.
- Coloring the localized frequencies, the objects, in gray scale according to their frequency levels.
- Addressing the instant sound objects with red dots.
- As contribution to the research, constructing graphs by comparing the data for each urban setting, such as; simultaneous data analysis of each channel for frequency distrubution; left and right channel, and overall loudness analysis. Accordingly visualizing the graphs.
- Analysing the obtained data for each urban setting and animating the each situation through a new representation of sound landscape.

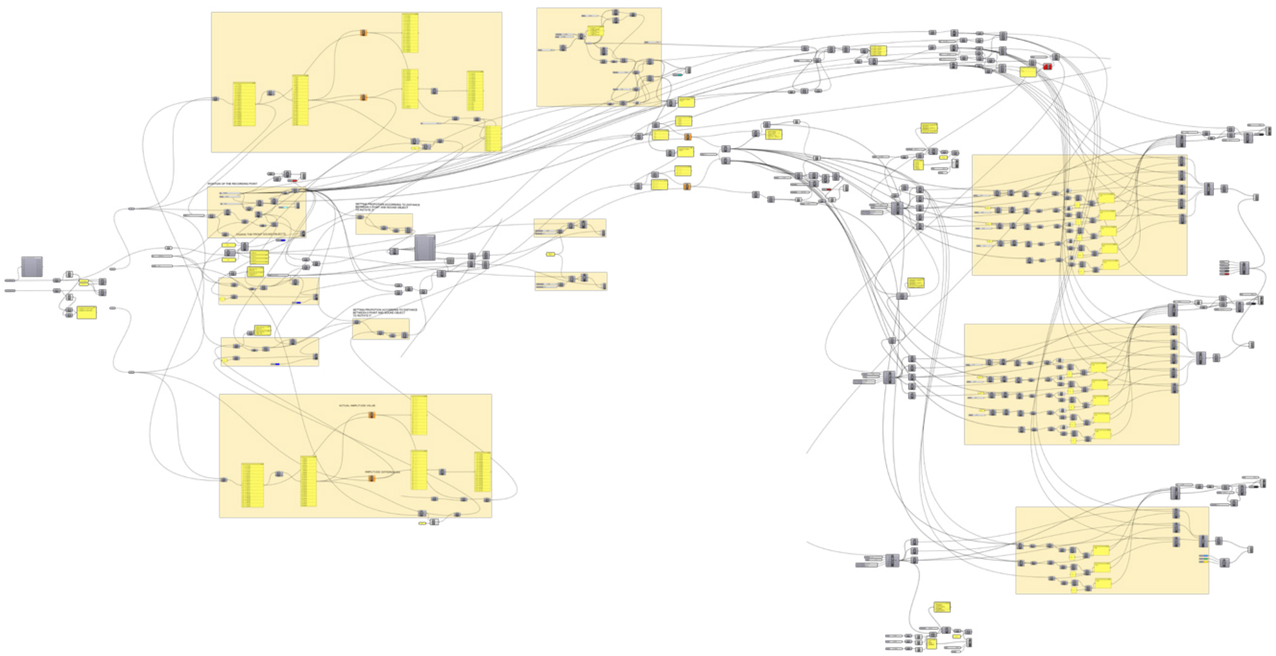
The structure, which was outlined above, demonstrates the process of the consecutive operations defined in Grasshopper. Due to these actions, the new representation model of sound landscape was achieved and brought into visual existence. In the following image (see Fig. 2.16) you can see the Grasshopper definition and its main stages.





stage 1 I reading the sound data

stage 2 I clustering the sound data



stage 3 I localizing / visualizing the sound data

stage 4 I constructing the contributional graphs

Fig. 2.16: Stages of the Grasshopper Definition

(1) Reading the sound data, (2) Clustering the sound data, (3) localizing / visualizing the sound data, (4) constructing the contributional graphs

PART 3

3.1. SOUND LANDSCAPE OF FOUR LOCATIONS

Fig. 3.1: Site Plan I Weimar - Germany
(1) Herderplatz - Location 1, (2) Herderplatz - Location 2, (3) Theaterplatz - Location 1, (4) Theaterplatz - Location 2, (5) Schillerstrasse, (6) Windischenstrasse

The case study had been conducted in Weimar during August and September 2016. The choices of location, time and days have been made considering the weather conditions, rhythm of everyday life and public situations. Essentially, the case study is a medium for complementing the hypothesis, which has been explained in the introduction part. Therefore it was important to gain results through similar as well as contrast situations in the city.

The systematic of the observation in the public life, were formed by the observation questions which were clearly denoted in the first part. These questions; such as how many, who, where, what, how long, will give assistance to obtain the results out of the analysis of the case study.

As you can see in the map (see Fig. 3.1), the study focuses on four locations and six different recording points, which are Herderplatz - square situation -, Theaterplatz - square situation -, Schillerstrasse - pedestrian street situation - and Windishengasse - pedestrian street situation -. The recordings are made on weekeneds, between 15:45 – 16:15. Each recording took place for ten minutes and during the recording with voice recorder and camera, I was simultaneously taking notes and sketches regarding to each urban setting.

In the following chapter, the methodologies, which had been throughly described in part one, are practically applied and each setting is outlined accordingly. The structure of the analysis of each urban setting, had been influenced by the work of Hellström which was conducted in Sweden [Hellström, 2003]. However the way of interpreting the parameters contextually differs from his work. This framework mainly consists of six parameters, which are;

1- Locational Information
2- Sound Sources
3- Composition Effects
4- Sonic Metabolism
5- Description of Effects
6- Description of Sonic Metabolism

The illustrations, regarding to recording points, are provided for each location, which are showing the general distribution of the moment forms of the urban settings. Through these images, one can as well understand the new representation technique for sound landscape, which is thoroughly demonstrated in the video (see CD).

3.1.1. HERDERPLATZ - LOCATION 1

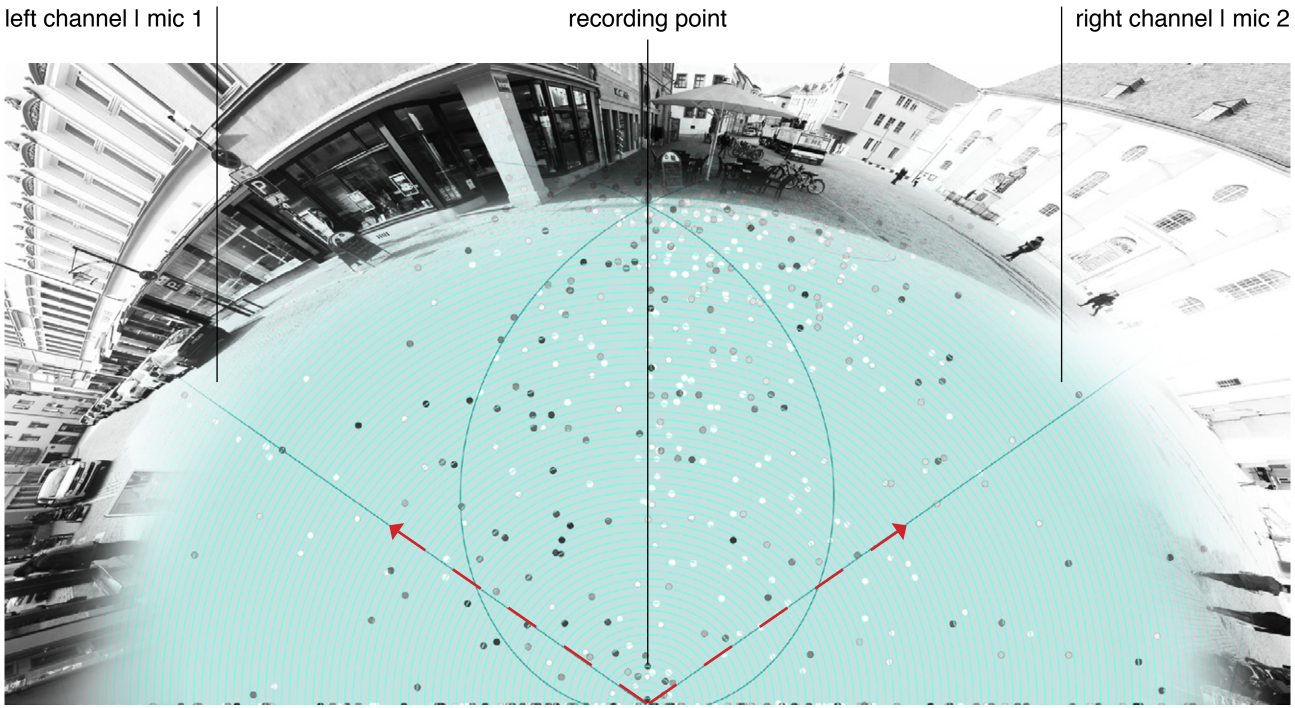


Fig. 3.2: Sound Objects in Herderplatz - Location 1

1

Date: 07.08.2016 I 13.08.2016

Weather condition: 24° C, Sunny

Time: 15:45 - 16:15

Duration of recording: 10 minutes each

Duration of analysis: 1 minute each

Frame count: 100 fpm (frames per minute)

Locational Information: Herderplatz is one of the main squares which is located in the east of Weimar. It is surrounded by 3 - 4 floor buildings and a church named Herderkriche. The functions consist of city council, church, stores, cafes and restaurants. The square connects to two other main squares in Weimar, Marktplatz in the south and Theaterplatz in the southwest. It is as well related to other pedestrian walkways and situated very close to Ilm river.

The acoustic code of the place is mainly composed of the sounds of passers by and their footsteps, people standing or playing with the fountain, murmuring of the people sitting or walking, cars, bicycles, sometimes horse carts, water sound from the fountain, church bell, and some background noise. The dominant sound of this place is pedestrians.

The recording and observation were made at the south east corner of the square, on the connection point with Kaufstrasse.

Sound Sources: Pedestrians (footsteps, voice), fountain, car passing by, baby stroller, bicycle

Composition Effects: Reverberation, emergence, fade-in / out, hauling, masking, mixing, re-entry, wave, attraction, de-contextualisation, repetition.

Sonic Metabolism: Compositional clarity / Hierarchical structure

Description of Effects: The dominant sound effect here is fade-in / out effect, since the observation point and the characteristics of the space trigger mobility. Thus, the sound sources emerge into the moment form of the sound landscape and leave. Considering the mobility property, re-entry, repetition, mixing and even hauling effects are constantly conceived. For instance the effect, which occurs when a car passes by, is a good example of the wave effect and as well as indicates hauling. At that very moment the low frequency distribution of the sound source, also creates a masking effect. There is another sound source which propagates instant low frequency sound is the fountain, which causes attraction. Sometimes one receives private sounds from pedestrians, which utter de-contextualisation. Due to the spatial properties of the space (e.g. hight of the surrounding buildings, dimensions of the square, materials), another distinguished effect is reverberation. (see CD I 00:08 - 01:08 and 02:14 - 03:14)

Description of Sonic Metabolism: The acoustic code of the space has distinctive compositional clarity, regarding to the sonic metabolism of the sound landscape. It is significant that one can clearly notice the dynamism of detectable clarity in the organisation of the sound objects in space. The majority of the emitted sounds are being perceived as foreground, in spite of the fact that the environmental sounds such as wind and undistinguished reverberant configuration of the space are creating the background. Therefore the organisation of the sounds can be considered as hierarchical structured.

3.1.2. HERDERPLATZ - LOCATION 2

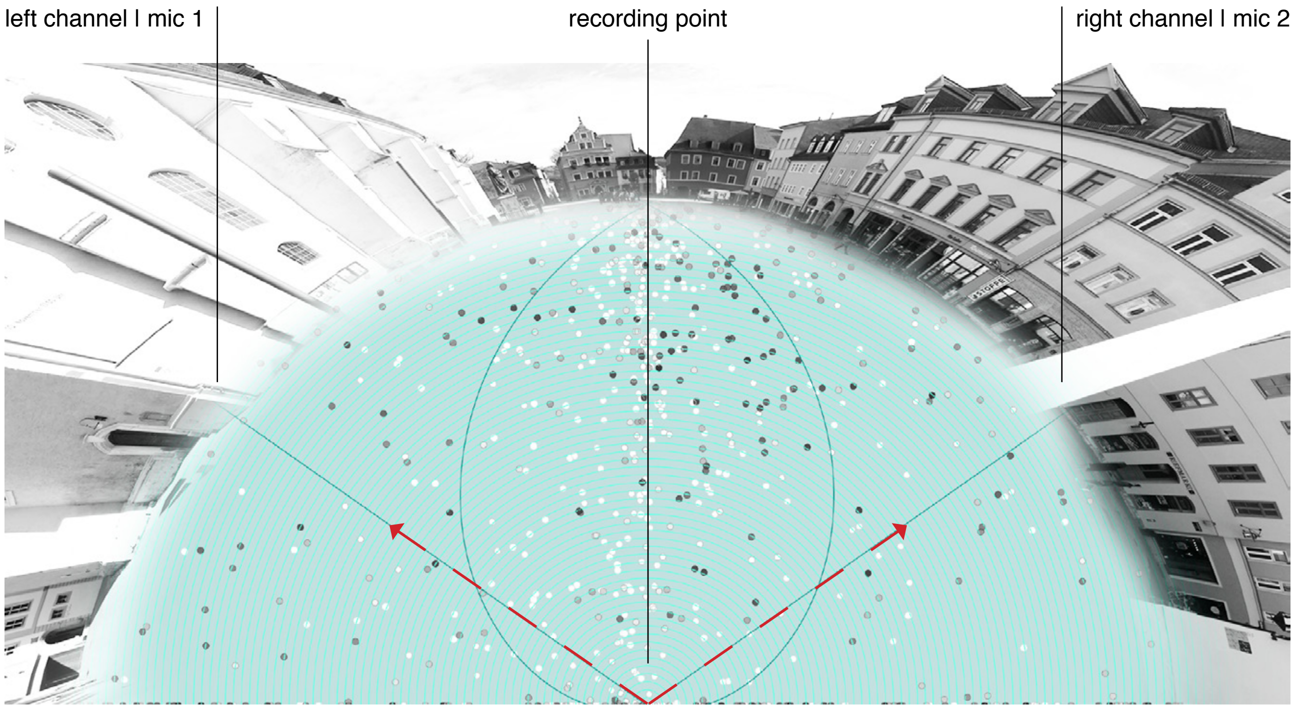


Fig. 3.3: Sound Objects in Herderplatz - Location 2

2

Date: 07.08.2016 I 13.08.2016

Weather condition: 24° C, Sunny

Time: 15:45 - 16:15

Duration of recording: 10 minutes each

Duration of analysis: 1 minute each

Frame count: 100 fpm (frames per minute)

Locational Information: The information has been provided in the previous chapter 'Herderplatz - Location 1'.

The recording and observation were made at the north west corner of the square, on the connection point with Eisfeld street.

Sound Sources: Pedestrians (footsteps, voice), car (passing by, engine), bicycle

Composition Effects: Decrescendo, Crescendo, Reverberation, emergence, fade-in / out, masking, mixing, re-entry, repetition.

Sonic Metabolism: Compositional clarity / Hierarchical structure

Description of Effects: As the previous recording point in the square, considering the mobility property, mixing, re-entry and repetition effects are conceived. The decrescendo effect, one can realise from the recording, which appears when the engine sound of a car stops. Conversely, one can realise the crescendo effect in the recording, when the engine sound starts. In this point of recording, the dominant sound effect is re-entry, since the dynamics around this point are more steady than the previous recording point. This relevant effect indicates the duration of use of the certain location. On the other hand, sometimes one receives private sounds from pedestrians, which utter de-contextualisation. Due to the spatial properties of the space (e.g. height of the surrounding buildings, dimensions of the square, materials), another distinguished effect is reverberation. (see CD I 01:11 - 02:11 and 03:17 – 04:17)

Description of Sonic Metabolism: The acoustic code of the space has distinctive compositional clarity, regarding to the sonic metabolism of the sound landscape. It is significant that one can clearly notice the dynamism of detectable clarity in the organisation of the sound objects in space. The majority of the emitted sounds are being perceived as foreground, in spite of the fact that the environmental sounds such as wind and undistinguished reverberant configuration of the space are creating the background. Therefore the organisation of the sounds can be considered as hierarchical structured.

3.1.3 THEATERPLATZ - LOCATION 1

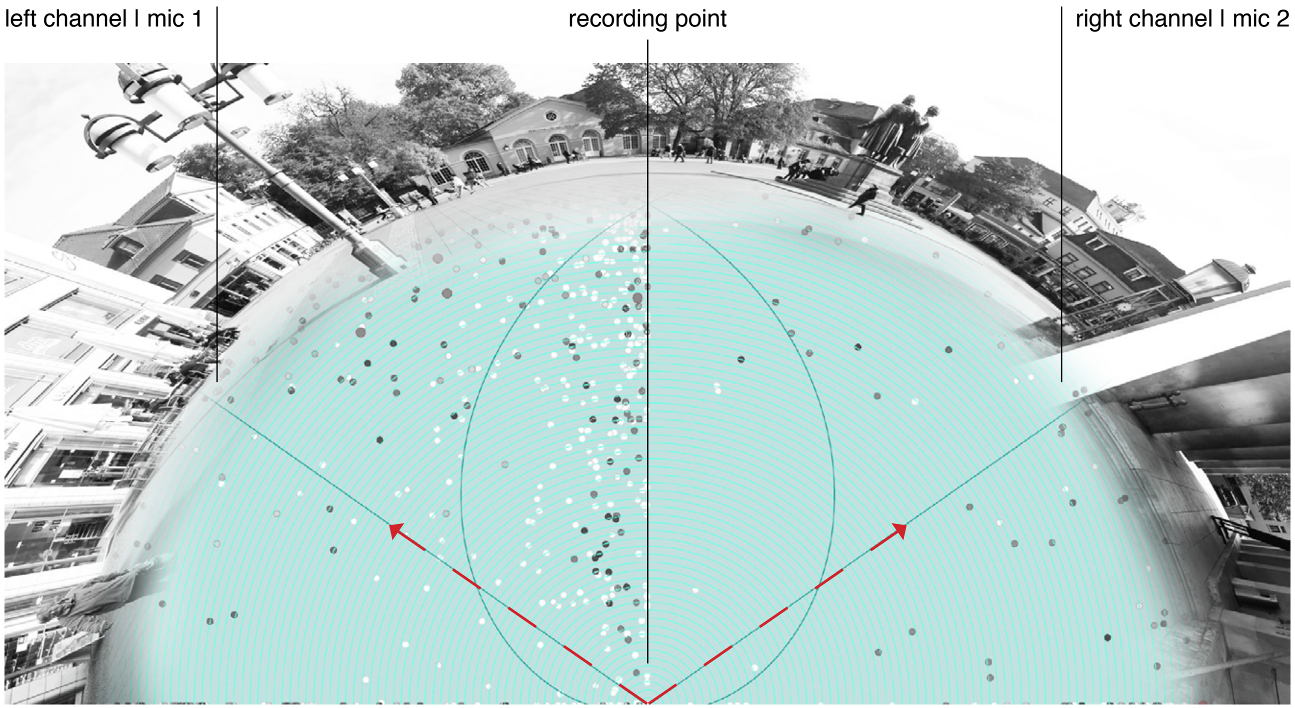
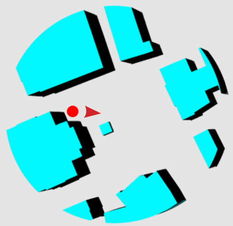


Fig. 3.4: Sound Objects in Theaterplatz - Location 1

3



Date: 06.08.2016 I 14.08.2016

Weather condition: 23° C, Partly sunny

Time: 15:45 - 16:15

Duration of recording: 10 minutes each

Duration of analysis: 1 minute each

Frame count: 100 fpm (frames per minute)

Locational Information: Theaterplatz is one of the main squares which is located in the central Weimar. It is surrounded by 2 - 4 floor buildings, Bauhaus Museum and the building of German National Theatre. The functions consist of tourism, theatre, shopping mall, stores, cafes and restaurants. The square connects to two other main squares in Weimar, Goetheplatz in the north and Marktplatz in the southeast. It is as well related to the main pedestrian walkway, Schillerstrasse.

The acoustic code of the place is mainly composed of the sounds of passers by and their footsteps, people standing or playing around the square, murmuring of the people sitting or walking, tour cars, bicycles, church bell from the close-by square Herderplatz, and some background noise. The dominant sound of this place is pedestrians.

The recording and observation were made at the north west corner of the square, on the connection point with Heinrich-Heine-Strasse.

Sound Sources: Pedestrians (footsteps, voice), car (passing by, engine), bicycle, church bell, music player, baby stroller, dog barking

Composition Effects: Reverberation, emergence, fade-in / out, masking, mixing, re-entry, remanence, de-contextualisation, repetition.

Sonic Metabolism: Compositional clarity / Hierarchical structure

Description of Effects: As a square situation, the place shows similarities with the previous recording point, considering the mobility property, mixing, re-entry and repetition effects are conceived. The dominant sound effect is re-entry, since the dynamics around this recording point are more steady, as it indicates the duration of use of the certain location. One can see the the remanence effect in the recording, after hearing the church bell. After the sound is stopped being emitted from its source, one can keep perceiving it for a while. On the other hand, sometimes one receives private sounds from pedestrians, which utter de-contextualisation. Due to the spatial properties of the space (e.g. height of the surrounding buildings, dimensions of the square, materials), another distinguished effect is reverberation. (see CD I 04:20 - 05:20 and 06:26 – 07:26)

Description of Sonic Metabolism: The acoustic code of the space has distinctive compositional clarity, regarding to the sonic metabolism of the sound landscape. It is significant that one can clearly notice the dynamism of detectable clarity in the organisation of the sound objects in space. The majority of the emitted sounds are being perceived as foreground, in spite of the fact that the environmental sounds such as wind and undistinguished reverberant configuration of the space are creating the background. Therefore the organisation of the sounds can be considered as hierarchical structured.

3.1.4 THEATERPLATZ - LOCATION 2

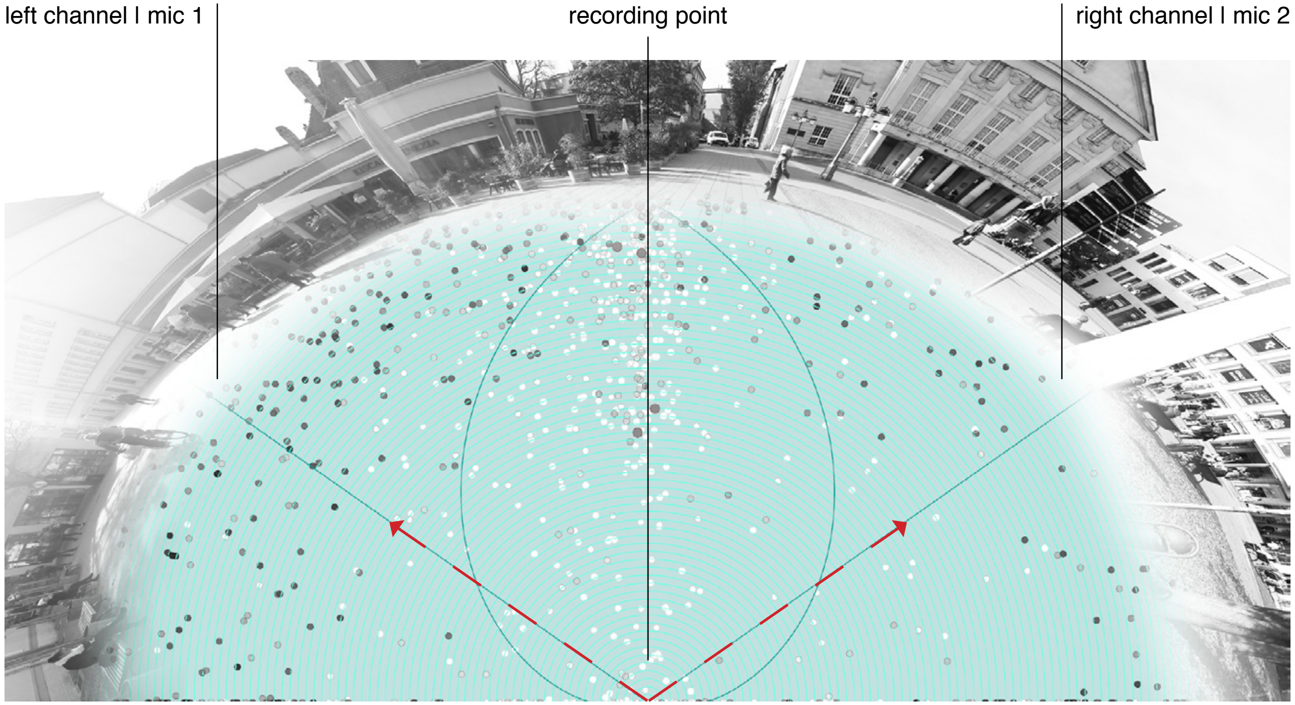
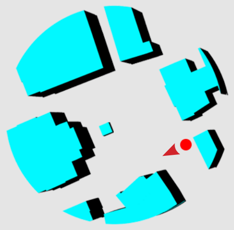


Fig. 3.5: Sound Objects in Theaterplatz - Location 2

4



Date: 06.08.2016 I 14.08.2016

Weather condition: 23° C, Partly sunny

Time: 15:45 - 16:15

Duration of recording: 10 minutes each

Duration of analysis: 1 minute each

Frame count: 100 fpm (frames per minute)

Locational Information: The information has been provided in the previous chapter 'Theaterplatz - Location 1'.

The recording and observation were made at the south east corner of the square, on the connection point with Wielandstrasse and Zeughof street, opposite to Dingelstedt Strasse.

Sound Sources: Pedestrians (footsteps, voice), car (passing by, engine), bicycle, musical instrument, baby stroller, restaurant (cutlery and dishware sounds, customers)

Composition Effects: Reverberation, emergence, fade-in / out, masking, mixing, re-entry, wave, de-contextualisation, repetition.

Sonic Metabolism: Compositional clarity / Hierarchical structure

Description of Effects: As a square situation and also as a cross point, the place shows similarities with Herderplatz – Location 1, considering the mobility property, mixing, re-entry wave and repetition effects are conceived. The dominant sound effect is fade-in / out effect, since the observation point and the characteristics of the space trigger mobility. For instance, the wave effect is perceived here as well, when the car moves from left to right. While the sound of the car creates temporarily masking effect, the continuous sound from the restaurant is representing the permanent masking for the recording location. On the other hand, sometimes one receives private sounds from pedestrians, which utter de-contextualisation. Due to the spatial properties of the space (e.g. height of the surrounding buildings, dimensions of the square, materials), another distinguished effect is reverberation, how ever it is not as audible as the previous locations. (see CD I 05:23 - 06:23 and 07:29 – 08:29)

Description of Sonic Metabolism: The acoustic code of the space has distinctive compositional clarity, regarding to the sonic metabolism of the sound landscape. It is significant that one can clearly notice the dynamism of detectable clarity in the organisation of the sound objects in space. The majority of the emitted sounds are being perceived as foreground, in spite of the fact that the environmental sounds such as wind and undistinguished reverberant configuration of the space are creating the background. Therefore the organisation of the sounds can be considered as hierarchical structured.

3.1.5 SCHILLERSTRASSE

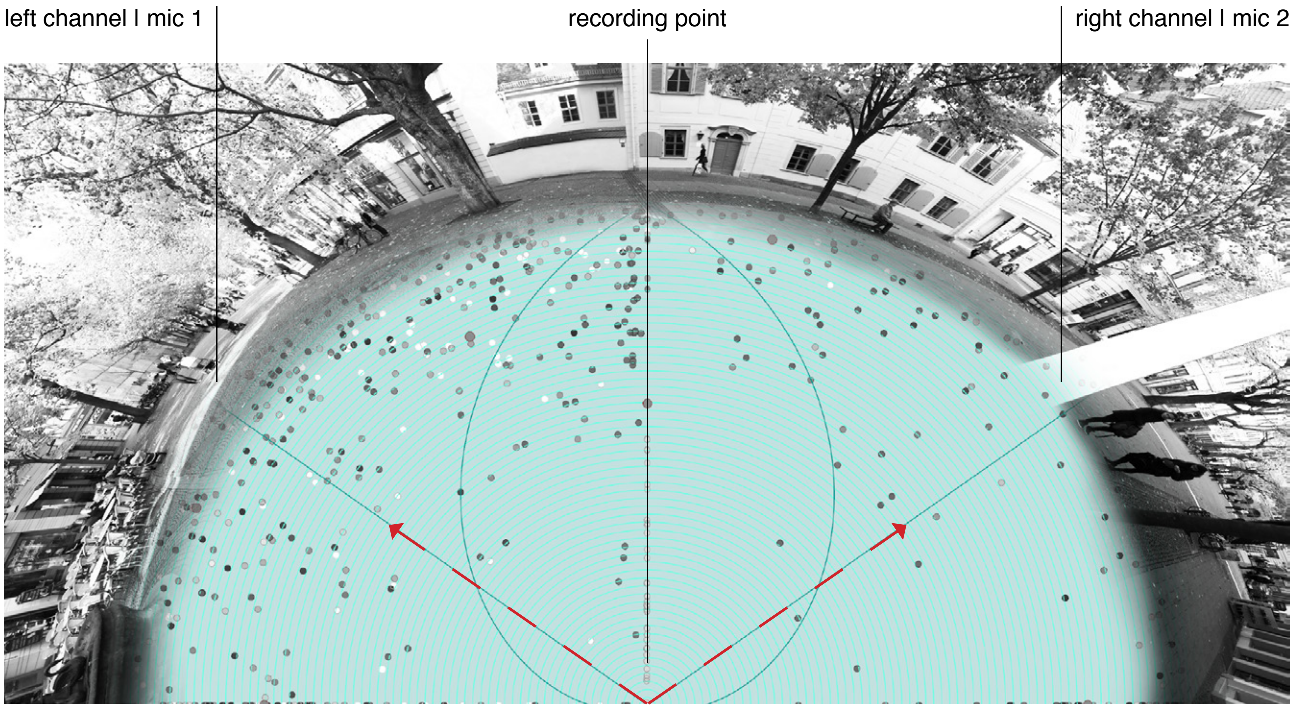
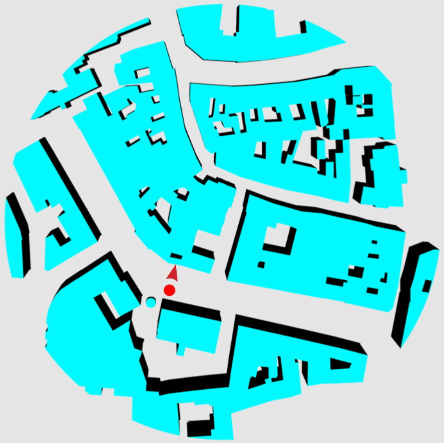


Fig. 3.6: Sound Objects in Schillerstrasse

5



Date: 10.09.2016

Weather condition: 28° C, Mostly sunny

Time: 15:45 - 16:15

Duration of recording: 10 minutes

Duration of analysis: 1 minute

Frame count: 100 fpm (frames per minute)

Locational Information: Schillerstrasse is the main pedestrian street which is located in the south east of Weimar and connects the Frauentorstrasse and Wielandstrasse. This axis essentially has importance for connecting two main squares in Weimar, Theaterplatz and Marktplatz. It is surrounded by 3 - 4 floor buildings and the house of Friedrich Schiller. The functions mainly consist of museum, stores, cafes and restaurants. It is as well situated very close to the other pedestrian walkways and the touristic locations.

The acoustic code of the place is mainly composed of the sounds of passers by and their footsteps, people standing or playing with the fountain, murmuring of the people sitting or walking, bicycles, water sound from the fountain, sound from restaurants and cafes and some background noise. The dominant sound of this place is pedestrians.

The recording and observation were made on the elbow point of the street which is situated on the middle and next to the fountain.

Sound Sources: Pedestrians (footsteps, voice), bicycle, baby stroller, restaurant (cutlery and dishware sounds, customers), fountain

Composition Effects: Reverberation, emergence, fade-in / out, masking, mixing, re-entry, attraction, de-contextualisation, repetition.

Sonic Metabolism: Complexity

Description of Effects: The place shows similarities with Herderplatz - Location 1 and Theaterplatz – Location 2, considering the mobility property, mixing, re-entry wave and repetition effects are conceived. However, here, the ubiquity is much more effective and therefore these effects are mostly conceived in the constant sound events. The dominant sound effects are fade-in / out and masking effects, since the observation point and the characteristics of the space trigger mobility. The continuous sound from the restaurant and the fountain are representing the permanent masking for the recording location. The sound from the fountain, is also essential for the attraction effect. On the other hand, sometimes one receives private sounds from pedestrians, which utter de-contextualisation. Due to the spatial properties of the space (e.g. height of the surrounding buildings, dimensions of the square, materials), another distinguished effect is reverberation, how ever it is not as audible as the previous locations. (see CD | 08:32 - 09:32)

Description of Sonic Metabolism: The acoustic code of the space has complexity in the level of hierarchical composition, regarding to the sonic metabolism of the sound landscape. It is difficult to notice clearly the organisation of the sound objects in space, therefore it can be as well called discomposed, to certain extend. The majority of the emitted sounds cannot be perceived as foreground, which creates the complexity in the background sounds.

3.1.5 WINDISCHENSTRASSE

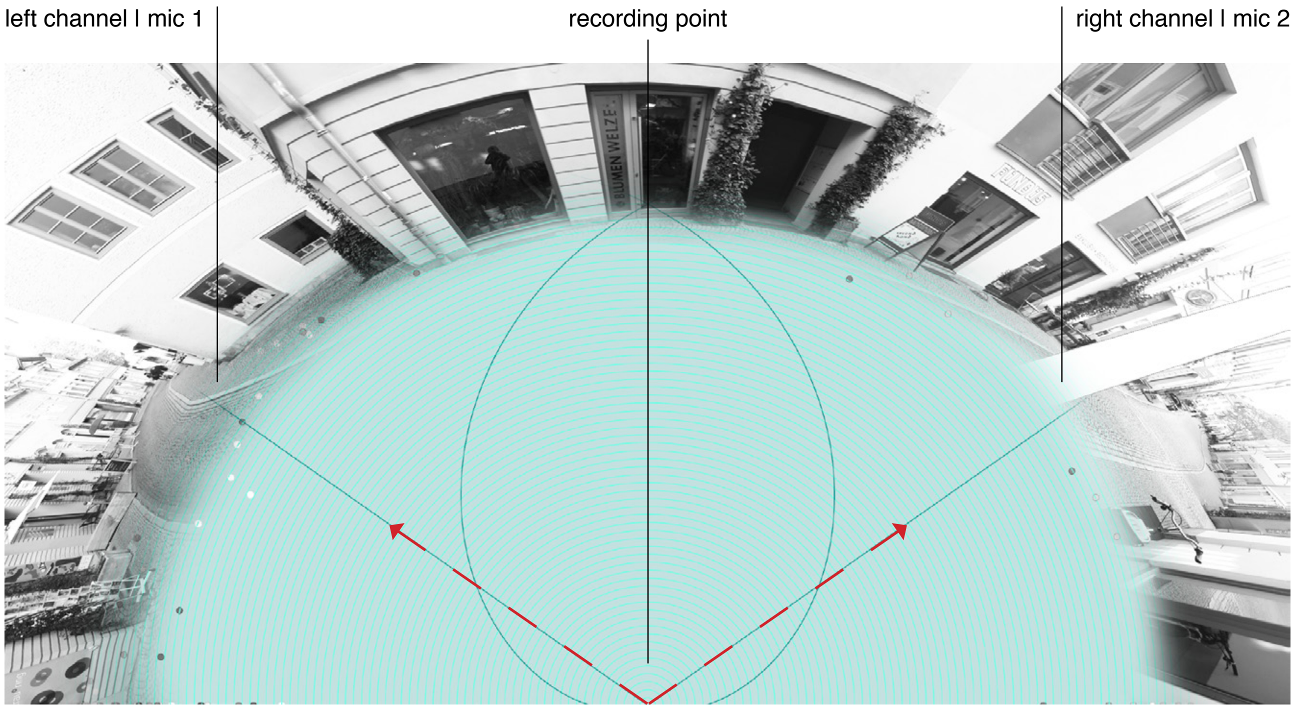
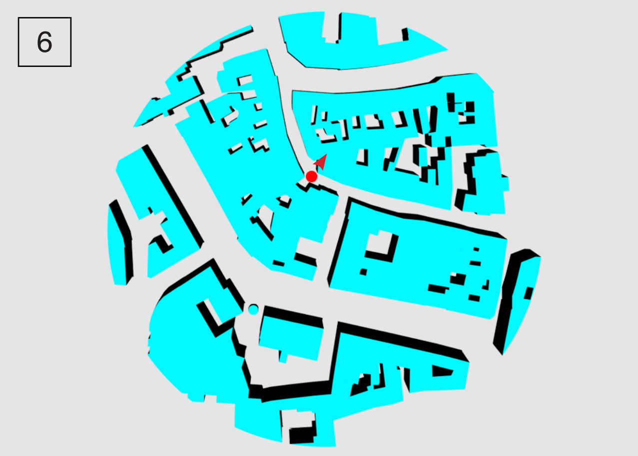


Fig. 3.7: Sound Objects in Windischenstrasse



Date: 11.09.2016

Weather condition: 27° C, Mostly sunny

Time: 15:45 - 16:15

Duration of recording: 10 minutes

Duration of analysis: 1 minute

Frame count: 100 fpm (frames per minute)

Locational Information: Windsichenstrasse is located in the south east of Weimar and connects Marktplatz and Marktstrasse. It is a parallel street of Schillerstrasse, which is the main pedestrian street of Weimar. It is surrounded by 3 - 4 floor buildings and the Schiller Museum. The functions mainly consist of museum, stores, cafes and restaurants. It is as well situated very close to the other pedestrian walkways and the touristic locations.

The acoustic code of the place is mainly composed of the sounds of passers by and their footsteps, bicycles, and as well sounds from other locations around; such as, restaurants/cafes and horse cart sounds. The dominant sound of this place consists of the sounds of other locations, in other words background dynamics.

The recording and observation were made on the elbow point of the street which is situated on the middle and on the connection point of Neugasse.

Sound Sources: Pedestrians (footsteps, voice), bicycle, sounds emitted from the other locations such as; restaurants / cafes (cutlery and dishware sounds, customers) and horse cart

Composition Effects: Reverberation, emergence, fade-in / out, masking, de-contextualisation, repetition.

Sonic Metabolism: Distinctness

Description of Effects: The place shows differences with the other previous locations, considering the mobility properties, and the ubiquity of the sound objects. However mobility does exist in this recording location, since one can perceive noticeable fade-in / out effects. The dominant sound effect here is repetition, in extent to the emitted sounds from other locations; such as, restaurants / cafes and horse cart sounds. On the other hand, sometimes one receives private sounds from pedestrians, which utter de-contextualisation. Due to the spatial properties of the space (e.g. hight of the surrounding buildings, dimensions of the square, materials), another distinguished effect is reverberation, however it is not as audible as in the previous locations. (see CD I 09:35 - 10:35)

Description of Sonic Metabolism: The acoustic code of the space has distinctness in the level of background dynamics, regarding to the sonic metabolism of sound landscape. The main effects, which depict the metabolism in hierarchical context, here create the background code. This is mainly because of the lack of distinctness. Therefore any change or emergence in the sonic metabolism can draw attention. Although the majority of the emitted sounds cannot be perceived as foreground, it cannot form the background as well, in this context the ubiquity effect slightly appears.

RESULTS

RECORDINGS	LEFT CHANNEL	RIGHT CHANNEL	LOUDNESS
①- Herderplatz l Loc. 1	54	46	11
②- Herderplatz l Loc. 2	60	40	20
③- Theaterplatz l Loc. 1	81	19	24
④- Theaterplatz l Loc. 2	69	31	37
⑤- Schillerstrasse	75	25	38
⑥- Windischenstrasse	75	25	8
	sound objects (%)	sound objects (%)	%

Fig. 3.8: Table of Sound Object Distribution and Loudness

As the table above shows, each location has their own characteristics according to the activities which are situated around the recording points. One can clearly see from the results whereabouts of the social events. On the other hand, the percentages of loudness illustrates the acoustic qualities of each location, in Weimar. For the simultaneous calculation of the sound object distributions, you can see the video.

Through the case study, and its framework analysis, the locations are subcategorized under four main context, which are;

1- Sonic metabolism
2- Dominant sound effects
3- Complication level in the scale of communication
4- Density level in the scale of social behavior

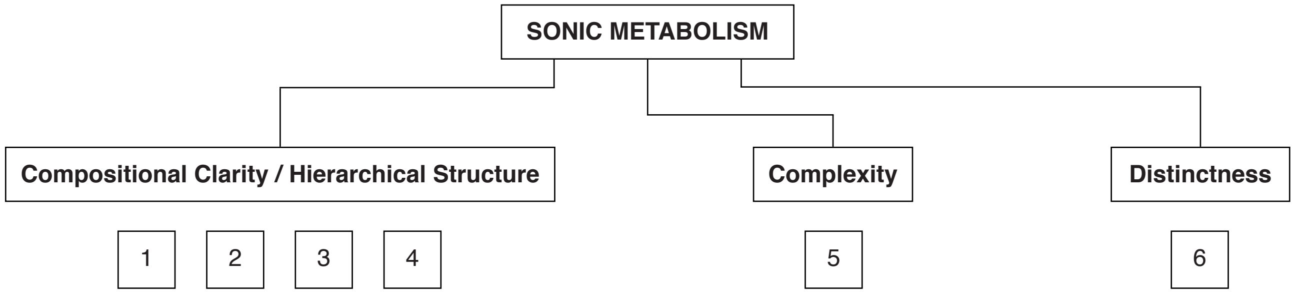


Fig. 3.9: Classification of Locations: Sonic Metabolism

A dynamic - 'meta-stable' – structure, in which the instability of the emerging sounds, or the exchanges between figure and background sounds, takes an identifiable form. In other words, the sonic metabolism indicates the dynamic stability of a sound climate. [116]

As it had been structured in the work of Hellström, by following the researches done by Cresson Institute, one can investigate under three main categories, which were thoroughly described previously in the relative analysis of the locations.

- Compositional clarity
- Distinctness

116 Hellstörm, 2003, p. 235

- Complexity

The sonic metabolisms of the six recording points, are subcategorized considering these features of the sound landscape, which one can see by watching the formation of sound landscape for each location (see CD).

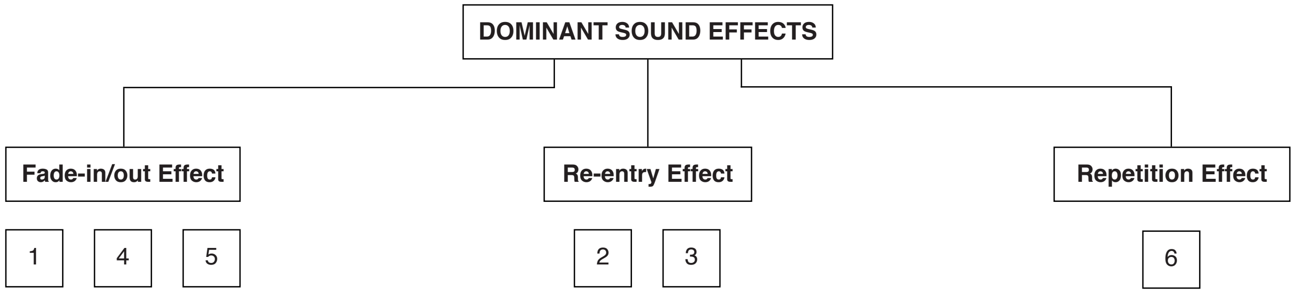


Fig. 3.10: Classification of Locations: Dominant Sound Effects

Besides the complementary sound effects, which were occurred in the locations, the dominant sound effects helps to understand the whole moment form. These dominant effects, in this case study, consist of three variations;

- Fade-in / out effect
- Re-entry effect
- Repetition effect

The fundamental concern was to focus on public life during the decoding process of the locations. In this extent, the focus points were mobility, duration of stay or use, and the rhythm of the life on each location. For instance, fade-in / out effect had occurred in the locations, which intrinsically behave as transition points; such as (1)Herderplatz - Location 1, (4)Theaterplatz - Location 2 and (5)Shillerstrasse. The second effect had been occurred in the locations, which have considerably longer duration of stay or use; such as (2) Herderplatz - Location 2, (3) Theaterplatz - Location 1. The third effect, repetition, was indicating the rhythm of the location, which was more visible and audible in (6) Windischenstrasse.

Other effects, which were mentioned in the analysis, as well depict certain activities and characteristics. For instance, the masking effect in this case study happened by a constant sound propagation; such as a fountain or restaurant sound. Another example would be the wave effect, which mostly occurred by vehicles; such as cars or bicycles.

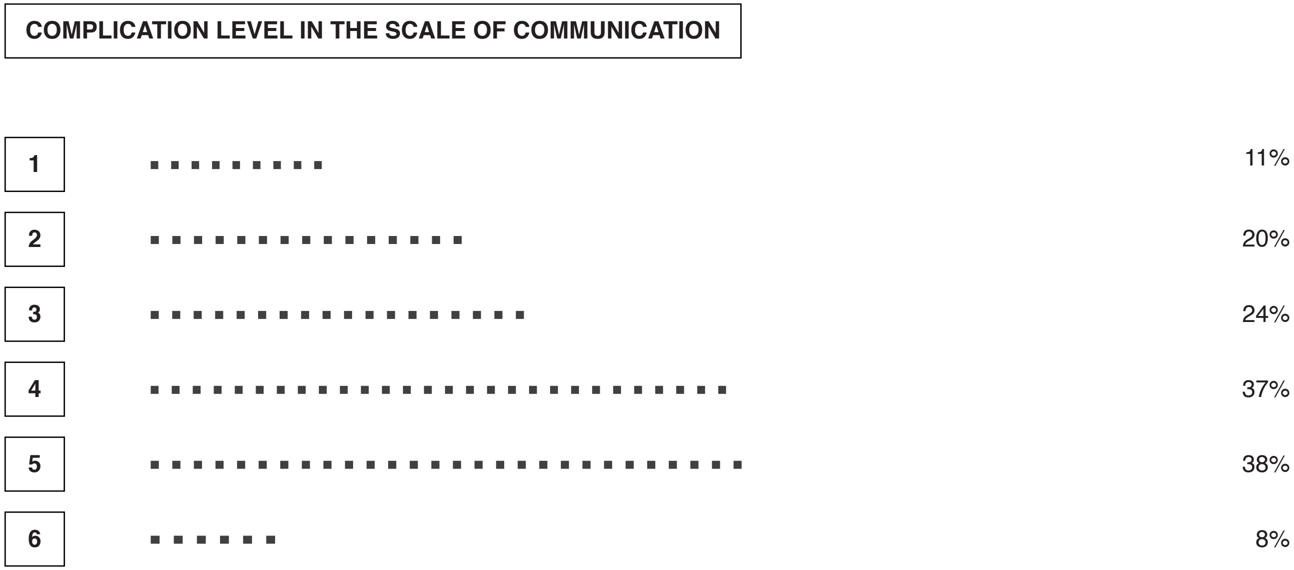


Fig. 3.11: Classification of Locations: Complication Level in the Scale of Communication

In this category the locations are evaluated according to their level of loudness. It is directly proportional to the lombard effect, which had been explored by Augoyard and Torgue.

Behavior connected to listening attention; the greater the increase of intensity in an acoustic space, the greater the listener's vigilance grows without prejudging the intelligibility of the signal. [117] Therefore the difficulty of communication, so the intensity of the sound emission, increases by the loudness level of the locations. (see CD)

DENSITY LEVEL IN THE SCALE OF SOCIAL BEHAVIOR

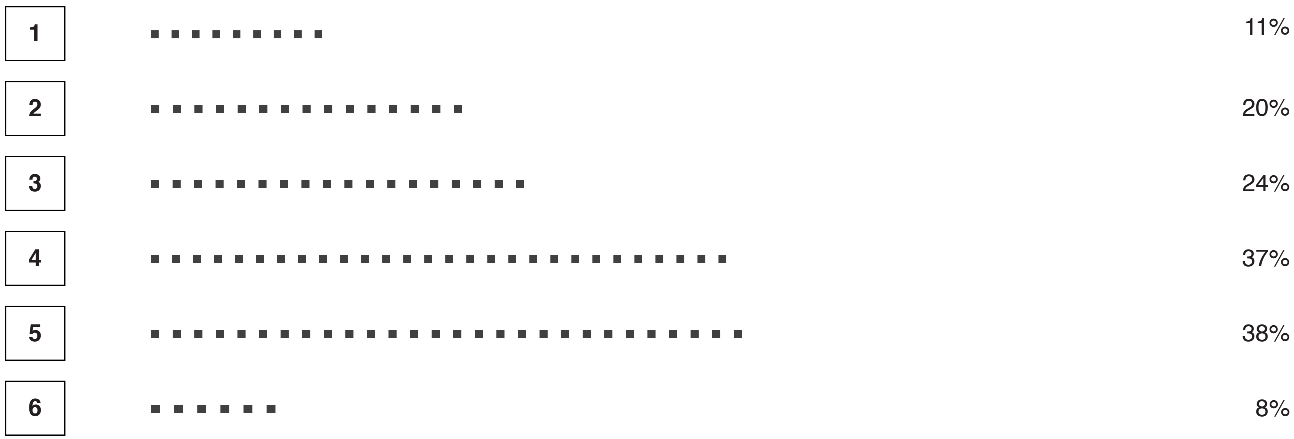


Fig. 3.12: Classification of Locations: Density Level in the Scale of Social Behavior

As the previous category, this matter is as well an evaluation of the loudness level of the locations, which is directly proportional to the emergence effect.

Emergence effect illustrates the appearance of the sonic events, therefore sound objects, in the moment form (see CD). Because the loudness calculation had been made by comparing the emergent sound objects in the recording range with the entire possible sound objects in the location, the higher the density the louder the location is. One can conceive the dynamics of public life, in extent to social behavior, through this evaluation, which is illustrated in the figure above.

117 Hellstörm, 2003, p. 228

“Sound is simply too loud to be ignored.”
- Trosten Wissmann

CONCLUSION

Throughout the framework of this research and analysis process, it was fundamental to bring various methodologies to analyze public life in the context of sound landscape. Starting from Goffman’s frame analysis for social behavior and Lefebrvre’s approach to rhythm of everyday life, one begins to involve the urban setting, in extent to its dynamics and characteristics, which outline the interaction rules of agonistic communication system and framing the scenes from everyday life in order to analyze and interpret the situations.

This work had been conducted from the beginning as a system with its own rules and layers, which guides us to abstraction in order to find the inherent configurations of its own, out of actual representations. These symbolic representations are the essential features of the urban settings in a comprehensive way and they provide information about the analytic structure of the system.

Each of these urban settings have their own spatial sound identities, in other words acoustic codes, in consequence of the existing sound objects. Through the acoustic code, one can read the acoustic configurations of the space, as well as the social behavior in a certain setting. Therefore the investigation had been made to prove the existence of the reciprocity between the social behavior in public space and the sound landscape. According to the hypothesis and the results, one can distinctly conceive the existence of this reciprocity, and the effects of the public life on the sonic configurations of the space or vice versa.

Decoding embodied messages through sound, assembling and interpreting frames, perceptually remapping the city can be useful for creating spatial awareness. When this complete work is seen as a tool for deploying the acoustic and social properties of a public space, it can be applied in the decision-making process by urban designers and architects. On the other hand this tool provides a new representation and notation system for sound designers and as further benefit, pedagogically it enhances our ordinary listening skills and enhances the way of perceiving public life and space.

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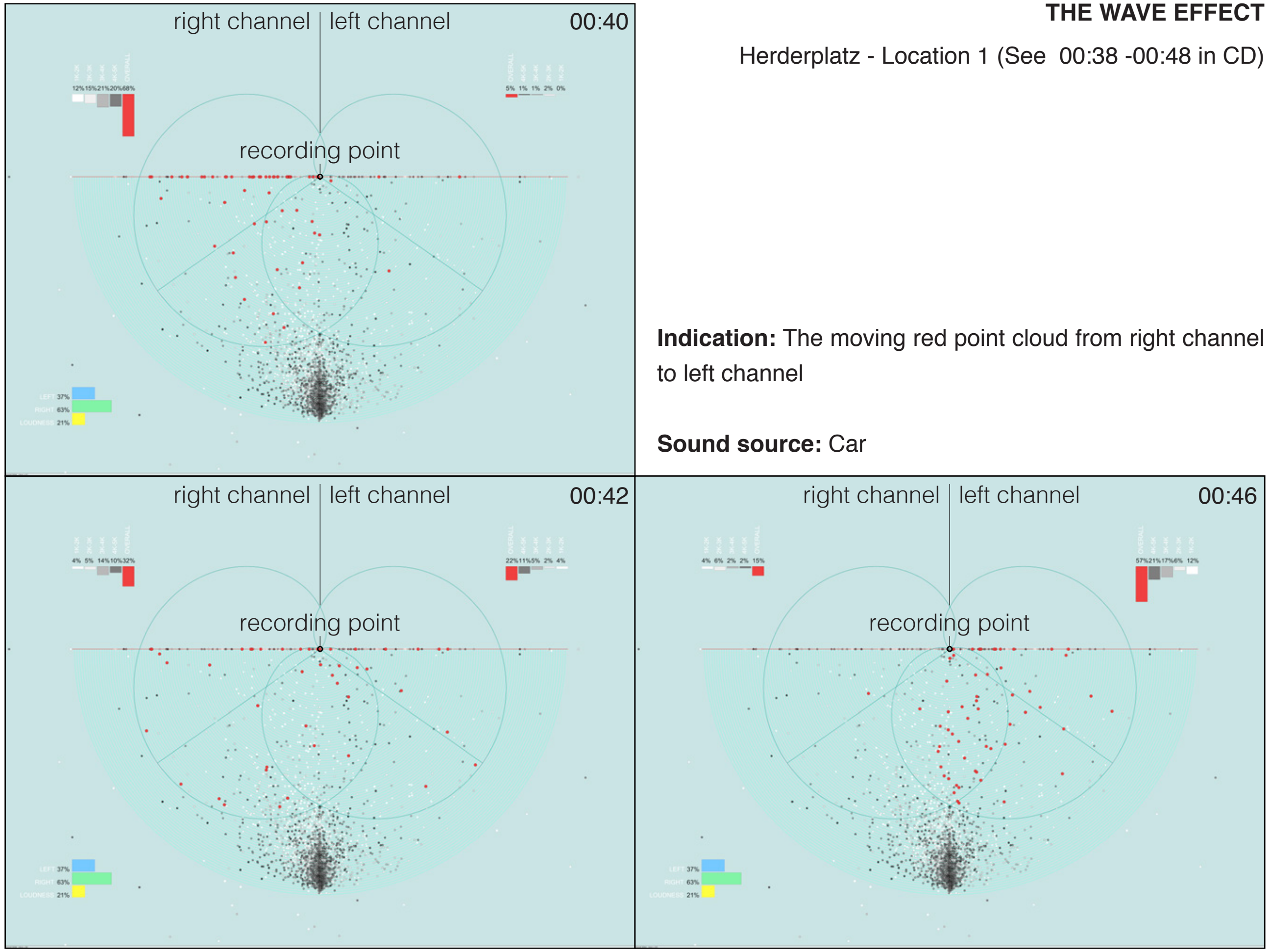
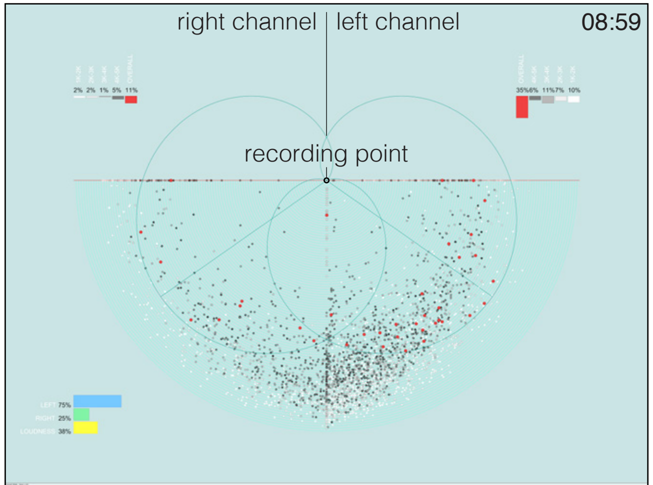


THE WAVE EFFECT

Herderplatz - Location 1 (See 00:38 -00:48 in CD)

Indication: The moving red point cloud from right channel to left channel

Sound source: Car

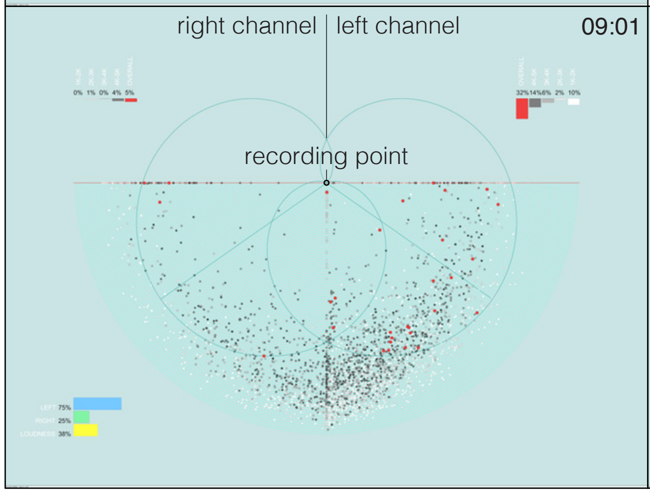


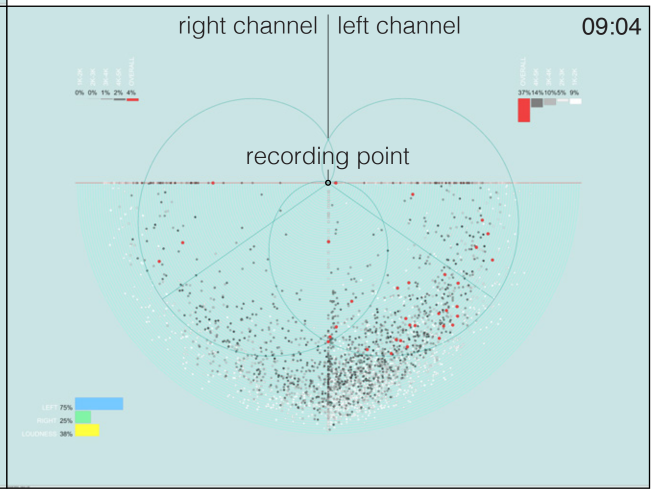
THE MASKING EFFECT

Schillerstrasse (See 08:32 -09:32 in CD)

Indication: The point cloud on left channel, the restaurant and the fountain sound, is creating masking effect, therefore it is harder to perceive the red points (sound objects).

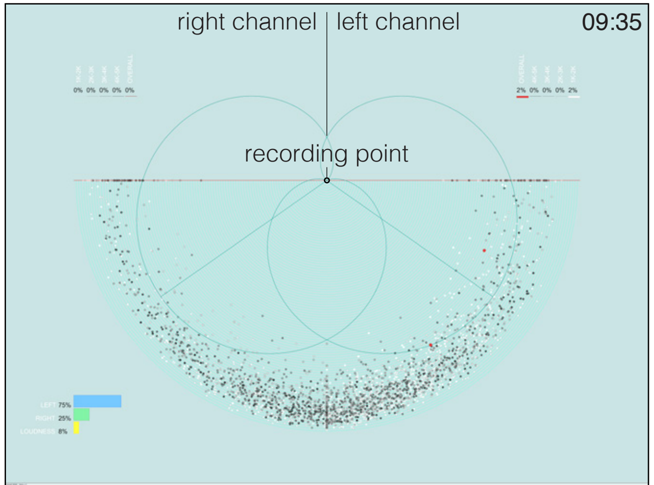
Sound source: Pedestrians (footsteps, voice)





THE EMERGENCE EFFECT

Windischenstrasse (See 09:35 -09:38 in CD)



Indication: Appearance of two red points (sound objects) at 09:36 on right channel

Sound source: Pedestrians (footsteps, voice)