Designing an interactive installation with sounds from rural areas
Explorations of the interactivity with sounds

Simone Marie Okholm Hansen
Abstract

This project takes a research through design approach, presenting the design process of an interactive sonic installation – SoundEscape – mounted on a walking bridge in Ørstedsparken, Copenhagen. SoundEscape makes people interact with sounds from rural areas of Denmark into the middle of the city. Featuring speakers and motion sensors, the prototype uses people crossing the bridge as an input for building up a soundscape – layer by layer as the person detected moves on. SoundEscape is just one prototype exploring how people can build up a soundscape through their movement across the bridge. The paper suggest more areas of the interactive design space to explore. Designing the installation, we went through four phases: field research, exploration synthesis, and concept development. Participants where included in the process to collect sound input from rural areas in Denmark. In all phases, we kept a close dialogue with the context, grounding design decisions in the observations and explorations we did on the bridge. We made two tests of the prototype: on a mini-scale model and in the park context. The paper presents a framework for interactive sonic installations that are used to analyse SoundEscape and compares it with another sonic installation on a bridge that have a different form of interactivity. Based on this analysis, the findings from the design process, and the two tests, the paper discuss the interactivity in the prototype. The paper suggest how the interactions with the soundscape can be further extended.
Preface
As an interaction design student, I have worked with many different materials. However, it is the first project I have done with sounds as a material, and I have learned a lot about how work with interactivity and sound. In the beginning of the project, I found the material ambiguous and liked the idea about making the sound more tangible, trying to make it visible to better understand it. Working in with this project, I have learned to appreciate sounds and see the value in getting sound sensory perceptions.

The project was done in cooperation with Katrine Lynggaard, a fellow interaction design student. Together we formed the design of SoundEscape, an interactive sound installation. We went through the entire process together from establishing the problem area, to field research, ideation, prototyping, and testing. We collected data from participants our selves and also facilitated a workshop each. Nevertheless we collected all the material from and synthesized in together, drawing on all the data. I am writing this Thesis on my own and will, thus, refer to me and Katrine’s collaborative process throughout the paper but seen through my perspective and through the theories that I have chosen to dive into. Katrine also writes a Thesis about the project, and I will refer to her paper when there is some aspects of the process that she covers.

The personal motivation for the project is Katrine and my own passion for the sound environment and values outside the city even though we both live in the city and identify us self as being people of the city. Both me and Katrine grew up outside the city – me by the seaside on Sjælland and Katrine on the countryside in Jylland. Having lived and felt home both places, I feel a strong relation to both sound universes. I believe that other people could likewise learn to appreciate the different soundscapes.
# Table of content

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>2</td>
</tr>
<tr>
<td>PREFACE</td>
<td>3</td>
</tr>
<tr>
<td>TABLE OF CONTENT</td>
<td>4</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>6</td>
</tr>
<tr>
<td>1.2 The concept and SoundEcape</td>
<td>8</td>
</tr>
<tr>
<td>2. THEORY</td>
<td>11</td>
</tr>
<tr>
<td>2.1 Theoretical Background</td>
<td>11</td>
</tr>
<tr>
<td>2.2 Related work</td>
<td>13</td>
</tr>
<tr>
<td>3. FRAMEWORK FOR INTERACTIVE SOUND INSTALLATIONS</td>
<td>14</td>
</tr>
<tr>
<td>3.1 Tightness of the interactivity</td>
<td>14</td>
</tr>
<tr>
<td>3.2 Type of feedback</td>
<td>14</td>
</tr>
<tr>
<td>3.4 Moment of interaction</td>
<td>15</td>
</tr>
<tr>
<td>3.5 The level of interactivity</td>
<td>15</td>
</tr>
<tr>
<td>4. METHODS</td>
<td>16</td>
</tr>
<tr>
<td>4.1 Observations/Contextual enquiry and interview</td>
<td>17</td>
</tr>
<tr>
<td>4.2 Sketching and prototyping</td>
<td>17</td>
</tr>
<tr>
<td>4.3 Doll play</td>
<td>17</td>
</tr>
<tr>
<td>5. DESIGN PROCESS</td>
<td>19</td>
</tr>
<tr>
<td>5.1 Field research</td>
<td>19</td>
</tr>
<tr>
<td>5.2 Exploration</td>
<td>23</td>
</tr>
<tr>
<td>5.3 Synthesis</td>
<td>25</td>
</tr>
<tr>
<td>5.3.2 Affinity clustering</td>
<td>32</td>
</tr>
<tr>
<td>5.4 Concept development</td>
<td>32</td>
</tr>
<tr>
<td>6. TESTING AND EVALUATION</td>
<td>36</td>
</tr>
<tr>
<td>6.1 Mini-Scale Model</td>
<td>36</td>
</tr>
<tr>
<td>6.2 Test on the Bridge</td>
<td>38</td>
</tr>
<tr>
<td>7. INTERACTIVITY ANALYSIS</td>
<td>42</td>
</tr>
<tr>
<td>7.1 The tightness of interaction</td>
<td>42</td>
</tr>
<tr>
<td>7.2 Type of feedback</td>
<td>42</td>
</tr>
<tr>
<td>7.3 The moment of interaction</td>
<td>42</td>
</tr>
<tr>
<td>7.4 The level of interactivity</td>
<td>43</td>
</tr>
<tr>
<td>8. DISCUSSION</td>
<td>44</td>
</tr>
<tr>
<td>8.1 Considerations for enhancing the interactivity of the concept</td>
<td>44</td>
</tr>
<tr>
<td>8.2 Interaction tightly related to the perception of the soundscape</td>
<td>44</td>
</tr>
<tr>
<td>8.3 Complexity of the soundscape and signal sounds as guiding stars</td>
<td>45</td>
</tr>
<tr>
<td>8.4 Moment of interaction</td>
<td>45</td>
</tr>
<tr>
<td>9. CONCLUSION</td>
<td>48</td>
</tr>
</tbody>
</table>
9.1 Future Perspectives .............................................................................................................................................. 48
10. Acknowledgement ................................................................................................................................................. 49
11. References ........................................................................................................................................................... 50
12. Appendix............................................................................................................................................................. 52
  1. Observations .......................................................................................................................................................... 52
  2. Interview, Ingeborg Okkels..................................................................................................................................... 52
  3. Interview Affinity Clustering ................................................................................................................................. 52
  4. Sound Library ......................................................................................................................................................... 52
  5. Instructions for Sound-Diary .................................................................................................................................. 52
  6. Collected Material from Sound-Diaries .................................................................................................................. 52
  7. Sound recording from the park context ................................................................................................................ 52
  8. Affinity Diagram of Reflective Probes and Workshops ....................................................................................... 52
  9. Library of Final soundscapes in themes .............................................................................................................. 52
1. Introduction

We experience most of our perceived world through the eyes, and visual objects are the most appreciated aesthetics in our world. Why are the society exceedingly conscious about the visual sensory perceptions but not the sensory perceptions of sounds? By nature, humans are excellent listeners. In prehistoric times, humans relied on their listening skills when hunting and protecting themselves from danger. Today, people living in the city ignore sounds in their everyday life or simply chose to wear headphones. Cities all over the world are growing; today 54.5% of the world population lives in urban areas compared to only 30% in 1950. This trend is predicted to continue to reach 66% in 2050 (United Nations, 2014). In the cities, people are surrounded by more sounds than ever before. Because of this noise pollution, people do not interact with the sounds in their everyday environment, leaving out some sounds from their consciousness (Schafer, 1993).

The division between people living in urban areas and people living in rural areas are growing in Denmark (Grønkjær, 2015). Furthermore, the people living in the cities find it hard to sympathize with the values that are practiced in the rural areas (Grønkjær, 2015). If we can learn people to appreciate other sounds than those offered in the city and open up for listening to different types of sound, we can maybe make them more open towards different kind of values practiced by people outside the city. Living in the city and identifying oneself with values associated to the city way of living do not exclude an inclusiveness towards other identities. Specially, we believe that the rural areas have something to offer the people living in the city when it comes to the sound environment. The soundscape of rural areas are more calming and relaxing, which also matches the values practiced in the areas (Grønkjør, 2015). Offering people in the city to engage with a soundscape from the rural areas of Denmark, people could experience how the change of the sound environment feels on their own body while also being more aware of the surrounding sounds of the city.

Through a sonic installation in the heart of Copenhagen, we will challenge this emerging trend of people in the cities distancing themselves from values practiced outside the city. Sound can be thought of as an information medium, communicating and evoking specific memories that could be attached to a place or a sensory experience (Augoyard & Torgue, 2014). Therefore, we can use sound to trigger memories and make people experience the soundscape from rural areas through their own perception of the world. Our test shows that people relate the sounds to sensory experiences, not specific places. Hence, the sounds from rural areas could evoke specific feelings and memories within a person that has never been outside the city, creating an aesthetic experience. By presenting a different soundscape to the people living in the city, we wish to make them more aware of the sounds in their everyday life. What sounds do they appreciate and what other sounds could be broad into their consciousness?

The installation is interactive, letting recipients interact with sounds. Hence, rather than passively observing the development of an installation, the recipients can take actively part of the development. The interactivity gives the recipient a chance to re-create and form his own perception of the work. In the sonic installation, the recipients will feel how the sounds becomes a part of their communication with the world when acting in the installation space. I will investigate the different forms of interactivity possible in the installation space. The paper will show how we can adjust different parameters and use different qualities to enhance the experience of the interaction.
1.1.1 Research question:
How can we design a sonic interactive installation in the middle of the city that makes people interact with sounds from rural areas? Focusing on how we can explore the interactivity of the installation, I further ask:

- How do people actively engage and interact with the sounds in the park context and how is the interaction with the sound material experienced?
- What possible interactions with the sound material does the concept and installation space affords?

To answer this research question, I will in chapter 5 go through the design process of shaping the concept and the prototype, SoundEscape, applying the methods presented in chapter 4. Furthermore, I will highlight the main findings from the design process in chapter 5 to discuss them in chapter 8 in the light of the theory presented in chapter 2. Finally, I will establish a framework of interactivity in chapter 3 and use it to analyse one existing interactive sonic installation together with an analysis of the SoundEscape prototype (chapter 7) and further discuss this in chapter 8.

The concept of the interactive sonic installation seeks to address the problem of the social division between the city and the rural areas in Denmark. Using the problem as a starting point for the design, we applied various design methods to create the installation. First, we made field research to comprehend and map out the problem area, the material of sound, and the context that we were designing for. We went on to the exploration phase, where we investigated how people interact with new sound layers in the context. Through reflective sound-diaries and two workshops, we engaged people related to rural areas in Denmark in defining different layers of sounds. Building on the field research and exploration, we developed a concept for the installation and designed six different soundscapes for the concept based on the input from participants. Finally, we developed and tested a prototype, SoundEscape, using doll-play and later a Wizard-of-Oz setup in the park context.
1.2 The concept and SoundEscape

Having made a thoroughly research in the field, we have established a foundation for an interactive sonic installation on the bridge in Ørstedsparken. Through our work in developing the concept, we identified several interactions that the system should respond to and that needs to be explored further:

**Interactions**
- walking rhythm
- walking tempo
- orientation /direction
- number of people
- pauses on the bridge
- people passing each other
- positioning

We also identified several methods to modulate the sound output, corresponding to the interactions:

**Sound Output**
- layer of sounds
- orchestration
- ambient soundscape
- rhythm
- volume
- panning
- timing

Finally, we also identified some parameters to differentiate the designed soundscapes:

**Soundscapes**
- theme
- complexity
- types of sounds
- order of sounds
- type of theme
- time of narrative
- temporal form

In this bigger design space, we have chosen to make a prototype that investigates (Interaction) a generalized definition of the walking rhythm and the walking tempo, (Sound Output) the layer of sounds, and (Soundscapes) themes and complexity. Throughout the paper, I will have a strong focus on the interactions and the soundscapes in the explored design space.
1.2.1 The prototype: SoundEscape

The prototype, SoundEscape, is an interactive sound installation for the bridge in Ørstedsparken, Copenhagen. Sounds are triggered when people passes speakers placed in both sides of the bridge. The installation is called SoundEscape because it makes people escape from the existing soundscape into a new sound universe from outside the city. Furthermore, the name is derived from soundscape because the installation simply comprises a designed soundscape.

SoundEscape is build by approximately 14 speakers that are placed in the bottom of the railing on each side of the bridge as illustrated on figure 1. When a person (or several) crosses line 1 (see figure 1) from the left side, speaker 1 is activated, playing the first sound layer comprising a single sound. When line 2 are crossed, speaker 2 starts to play the next sound layer, which is the same sounds from speaker 2 but with one sounds added on top. This pattern continues until the two speakers in the middle are activated, comprising the entire soundscape. In this way the recipient gently build up a soundscape, layer by layer. Sometimes a clear sound is played in the beginning of a new sound layer, for example a seagull bawling once or twice. Six different soundscape themes was designed for SoundEscape: The Shore, the Garden, the Field, the Village, the House, the Forest.
Figure 1. Wireframe of the concept for SoundEscape
2. Theory

In this section, I will introduce the theories that have enlightened the design process and the theories that I use to shed light on the final outcomes in this paper. I will only make an introduction to the theories in this chapter and briefly explain how I later will use them as means for design and discussion.

2.1 Theoretical Background

2.1.2 Reflective technology and how we perceive it

Based on Merlue Pontys's phenomenological philosophy, Svanaæs (2013) claims that the human senses and perceives what happens in the world by actively interact with its surroundings. He gives an example about how we use our vision actively. We do not let the world passively emerge in front of our eyes but we use the vision actively to navigate us self around in the world. Two people looking out in the horizon, would not have the same experience because they would focus and rest their eye at different points, sensing and noticing different elements. Thus, it is the interaction with the horizon that determine what we see. In extension to this, Svanaæs (2013) point out that the respond on our interaction with the world – the sensory experience we get when watching the horizon – comes directly or milliseconds after.

2.1.3 Sound as material

In our design, we will work with sound as a material. We will create a soundscape consisting of sounds from rural areas and bring it into an existing soundscape of the city in Ørstedsparken. Schafer (1993) defines soundscape as “any acoustic field of study”. You can isolate an acoustic environment and define that as a soundscape - for example the soundscape of a radio program, a musical composition, or a place. Further, Schafer (1993) argues: “A soundscape consists of events heard and not objects seen.” While people have experiences with visual objects, e.g. reading a map, making a drawing, they do not have any experiences with analysing or creating a soundscape. From a historical perspective, there is no tradition for documenting the change of soundscapes while in comparison, endless of photographs, maps, and drawings have been archived. However, it is possible to reconstruct soundscapes of the past if sounds are vividly described (Shafer, 1993). In the same way, we will later use descriptions noted down by people from rural areas – constructing a soundscape containing the described soundscapes. See Lynggaard (2017) to read more theory on soundscapes.

In the project, we have worked with three type of sounds coined by Shafer (1993) that is used when analysing a soundscape or creating a soundscape:

**Keynote sounds**

are the fundamental sounds that makes every other sound exist - in a painting keynote sounds would be the background shapes and colours. Keynote sounds are often neglected because of their ubiquitous nature. They may not always be listened to consciously but they have a high influence on our behaviour and mood. In a landscape, keynote sounds are the sounds which are characteristic for the geographical position and the climate (e.g. water, wind, and birds).

**Signal sounds**
are the sounds that are consciously perceived and listened to - they are in the foreground. In a painting, they are the clear colours and shapes that stick out and cannot be avoided by the eye. In this classification, we will only talk about those signal sounds that are forced to be heard - their acoustic nature will make people nearby listen to them and they cannot be avoided as such. For example sirens, church bells, the lion’s roar, and cawing birds.

**Soundmarks**

have adopted their name from ‘landmarks’ and are sounds that are unique to a specific community. Soundmarks have a special value or quality that are noticed by the people in the community. In our painting analogy, a soundmark would be the unique touch that makes the painting something special for the people that owns it.

The three different types of sounds will be used when mapping out sounds with participants in the workshops (see section 5.3.2) and when building up a soundscape in the design of the prototype (see section 5.4.2).

2.1.4 Sound Interaction

When it comes to interacting with technology based on visual objects, the humans are experts – we perceive most of our experienced world through the eyes. However, when it comes to interacting with sonic systems, we are only beginners. Today most technology is build around our visual abilities. However, humans are great listeners. Thus, I believe that the reason why we still lacks essential skills for interacting with sound based systems is because the cultural and technological development that have not embraced this modality.

In an installation, there is not time for a learning process like when people practice an instrument for several years. Therefore, it is essential that there is a tight mapping to the sounds: “In interactive sound space installation, the mapping is the procedure that translates gestural input to audio output. The mapping largely defines the aesthetic expression of the space, and simultaneously plays a significant role in audience engagement.” (Jakovich & Beilharz, 2007).

Sonic installations usually reduce the interaction complexity compared to other interactive systems. To make the experience rich, they instead use more intense and diverse sound compositions (Schacher, 2009). Designing SoundEscape also points to this same conclusion that I will discuss in section 8.3. Schacher (2009) further claims that taking peoples gestures and behaviours into account at the concept development phase of a sound installation can result in more experience oriented interaction pattern. Having a specific gesture that makes people interact with the sounds, makes a couple between that action and the sounds, thus, building a more intuitive perception of the sounds. In SoundEscape, it is the action of walking on the bridge that are the link to the soundscape. Based on the design process in this paper, I will argue that we do not necessarily need to design a gesture but can use people’s existing gestures in a place to create a coupling to the sonic installation. In Lynggaar’s paper (2017, chapter 2.2) more theories on the sonic experience will be enlightened.
2.2 Related work

A bridge connects two otherwise separate parts, thus, making them accessible to each other. It could be a bridge between two islands or two countries. But it could also be bridging a mental challenge, bridging two social groups, or bridging two time periods. In our context, the bridge in the park is connecting two sides of the lake and on a more metaphorical level, our design builds a bridge between the rural areas and the city by bringing in the soundscape of the rural areas in the middle of the city. Previously, other small physical bridges have put their bodies on the line for sonic installations.

A small walking bridge crossing the city channel in Malmö is housing a sonic installation, Via by Kim Hedås (2015). The installation composes a complex music piece that plays through 21 speakers hidden underneath the wooden benches on the bridge. The music plays around the clock all year round, and only repeats itself after eight weeks. The music is moving along the bridge and are played in different patterns, making the music move around in different directions. The installation is not interactive, thus, the movements are desultory and not related to the people on the bridge. However, visiting the installation, I had a feeling that the music were following me. The author’s intension is that individuals will have a unique experience – the combination of how the music moved in that specific moment and on how the person moves across the bridge (tempo, direction etc.). When developing SoundEscape, we wanted to make “the music” respond to these movements so that the person can feel some kind of ownership and engage with the sounds themselves. Whereas Via is about giving people a pleasurable experience through sound, SoundEscape is about making people engage in a soundscape.

The Sound Bridge by John Morton (2015) is an installation in Yonkers, New York, that makes a sonic connection between the past and the current urban environment, bringing in industrial and environmental sounds on the bridge. There are four speakers on the bridge connected to four visible sensors mounted on the railing. Visitors can activate, manipulate, and layer the sounds by sliding their hands on the railing in front of a sensor. Every hour, the speakers play stories by local residents about their memory of the city. In chapter 7, I will analyse The Sound Bridge and later discuss how the interaction with the sound universe differs from that in SoundEscape (section 8.1).
3. Framework for Interactive sound installations

I will now present the framework that I will later use to analyse SoundEscape and The Sound Bridge. The framework consists of four parameters that can be used to categorise and describe interactive sonic installations. The parameters are carefully selected with the purpose to discuss the interactivity of SoundEscape. Many more parameters could have been included in the framework. For example: context interaction, collaboration, temporality, scalability, and direct interaction. However, for the scope of this paper, I have only included the parameters that have relevance for the later discussion.

3.1 Tightness of the interactivity

When there is a tight connection between input and output, the recipient will easily learn the rules of the system. Lowering the tightness can add complexity to a sonic installation but can also make the recipient lacking an experience of being in control.

Inspired by (Wensveen, Djajadiningrat, & Overbeeke, 2004), I will use three qualities to describe the tightness of the interactive sonic installation:

- Instantaneous: How instantaneous is the feedback?
- Graduated: Is the respond graduated by the recipients input?
- Co-located: Is the input and output located co-located?

3.2 Type of Feedback

Feedback is the respond that users get when interacting with any form of interactive system (Wensveen m.fl., 2004). There are several forms of feedback that can be used to guide and enhance the experience. In this framework for interactive sonic installations, I will define four different types of feedback inspired by Wensveen et. al’s, (2004) design framework for interactive products:

Sound output as feedback

Sounds played by the system are in themselves means of feedback. When the user hears a sound, it informs him about the system and its interaction space. The recipient can learn how the system works by trying to couple his interaction with the sound outputs. If there is a low level of tightness (see 3.1), it is difficult to use sound output as feedback.

Augmented feedback

This is the feedback that are putted on top of the system to support the interaction. It could be a light display on a phone charger.

Inherent feedback

The feedback that is naturally produced when the user acts – it is a by-product of the action. For example the vibration in a Wii-controller. Inherent feedback relates to motor skills.
3.4 Moment of interaction
The moment of interaction is when the recipient is responding to the system. The system will be ready for this moment, waiting for an input to detect. There cannot be an interaction without perception – interacting with a system is an active action (Svanæs, 2013) and, hence, the point of interaction is not before the recipient consciously respond to the system.

3.5 The Level of Interactivity
In a sonic installation, there can be different levels of interactivity. The level of interactivity is defined by how much control the recipient is given – are the recipient merely observers of the unfolding system around them or are they determining the rules of the system? I will formulate three levels of interaction inspired by Kwastek’s (2013, chapter 4) presentation of different instrumental views on interactivity:

- Participation (the recipient are a part of the system but have no power to alter the sounds)
- Co-creation (the recipient can manipulate the sounds but have a restricted power that is determined by the rules of the system)
- Intercommunication (the recipient can change the rules of interaction in the system)
4. Methods

In this chapter, the methods used throughout the project will be presented, hence, showing how I have addressed the research question (see 1.1.1). Initially, I will explain how a constructive design approach have been the focal point of the entire project. Subsequently, I will present the theory behind the methods that are used in the design process and the following testing and evaluation of the design, and, furthermore, comment on how we have adopted and altered the method.

4.1 Research through Design
The umbrella approach in the project have been research-through-design. As the name indicates, the approach use design as the underlying basis for research (Redström, 2007, Koskinen, Zimmerman, Binder, Redström, & Wensveen, 2011). The structure of the paper reflects the research-through-design approach in the sense that the design process (chapter 5) is the main empirical input analysed and discussed. According to Zimmerman, Forlizzi, & Evenson (2007), new knowledge is generated by bringing design iterations into the world that change the current stage to a more desired stage. Following a research-through-design approach, we applied design methods relevant for the specific design space and user scenarios. I will outline the most central design methods in the following subsections.

4.2 Context based design
It has been an essential aspect of this project to design for the specific context of the bridge in Ørstedsparken and ground our design decisions on the qualities and specific features of that context. This chosen context was our starting point, and we have kept turning back to it during the entire process. Visiting the park eight times during the project period, we have gained valuable knowledge about the place and environment that we are designing for.

Suchman (1987) introduces the term, Situated Action, which is about how people react in a specific situation. Instead of separating the actions from the context, Suchman (1987) encourages designers to see action and context as interdependence. Following this thought, (Dourish, 2004) writes about how Embodied Interaction, a phenomenological theory, dictates that actions are realised and created in the context that they are embedded in. Many other authors within the field of human computer interaction have also written about similar concepts (Bjögvinsson, Ehn, Hillgren 2012: 101; Büscher et al 2001, Simonsen, Jesper, et al. 2014). It is a part of this bigger movement in human computer interaction design that the context have become an essential mean for design. You cannot isolate yourself in a design lab and design for the world outside – you need to be in the field designing.

4.3 Participatory Design
Drawing on the field of participatory design, we involved people related to rural areas in designing the soundscape. In participatory design, the essence is to give users and stakeholders a voice in designing technology – empower them (Simonsen & Robertson, 2012). Furthermore, participatory design is about democracy and mutual learning (Simonsen & Robertson, 2012). We facilitated two workshops with two groups (4-6 persons) related to two different rural areas in Denmark. Thus, we made the process of defining soundscapes of rural areas more democratic, letting people related to rural areas have a say. Through activities in the workshop, we endowed participants with knowledge on how to recognize and listen to sounds in their everyday environment, whereas they enriched us with their stories and
reflections about all the specific sounds that characterize their place – it was a practice of mutual learning.

Inspired by Gaver, Dunne, & Pacenti’s (1999) cultural probes, we conducted what we call reflective probes. People captured and collected sounds in their surroundings and reflected about them in a ‘sound-diary’. In line with the cultural probes, we are not trying to reach an objective understanding of the user group but rather an impressionistic account of their world and aesthetic preferences (Gaver m.fl., 1999). However, we are not inspired by people’s desires and cultural differences (Gaver m.fl., 1999) but their definition of the sound environment and their reflections (memories and feelings) related to the sounds. Thus, we developed the instructions for the sound-diaries to fit this purpose, sending out instructions to participants, making them generate data in their home environment.

4.4 Contextual enquiry

We used observation in different phases of the process. First, we observed various contexts that could constitute the frame for the installation. Then we observed the behaviour on the bridge in the field research and in the exploration phase, we explored how people react on sounds in the context. Finally, we used observation again when testing SoundEscape on the bridge. In many cases the observations where supplied by a brief interview of the observed subject. Observation is a tool for collecting data and gives the opportunity to compare what recipients say they do with what they actually do (Blomberg & Karasti, 2012).

When exploring the field of sonic interaction, we had two unstructured interviews with two start-ups working in the field. In an unstructured interview, the researcher have an idea of what he wants to get out of the interview beforehand, but the questions are not fixed and can new and unexpected directions (Brinkmann, 2014). According to Brinkmann (2014), unstructured interviews are useful when exploring a new area.

For gaining relevant knowledge about the sound as a material, we conducted an Interview with an expert in the research phase. The interviewed followed structure of what Brinkmann (2014) coins as a semi-structured interview. It is characteristic for a semi-structured interview that there is a clear structure prepared beforehand. As the interview unfolds, the researcher is free to follow new directions, however, only for a period before returning to the structure. It gives structure to the interview while also giving the researcher some flexibility and power to follow interesting topics emerging at the interview (Brinkmann, 2014).

4.5 Sketching and prototyping

From the very beginning of the design process, we have used sketching as a method to generate ideas. I use Buxton’s (2010) definition of sketch and prototype to distinguish between the two design activities. The sketch is evocative in its form and is unpolished. The prototype is polished and didactic in its form. While sketches are opening up for dialog, critique and interpretation, prototypes are answering questions and instructively present an idea (Buxton, 2010). In this paper, I will present various sketches representing the specific iteration in the given phase. The prototype, SoundEscape presented in the introduction (1.2) is a result of all the previously iterations and will be tested in chapter 6.

4.6 Doll play

Props in form of dolls and doll play in a design session can be used to represent users and use situations (Jakobsen, 2012). The tangible nature of doll play makes the session dynamic and
engaging and the doll play together with mini environmental representations help participants to keep a context perspective in the design session (Jakobsen, 2012). In our session when testing SoundEscape, we used PlayMobil dolls and a mini-scale model of the bridge. The scale models – in our case PlayMobil dolls - make the participant think activity into a bodily action, in which the scale models help the test person to build experiences in the design situation (Buur, Nakamura, & Larsen, 2015). However, compared to enactment conducted in the real setting, doll play do not provide the rich bodily experience of acting in the envisioned use situation (Jakobsen, 2012). We only had one participant acting with one doll on the bridge at the same time. Thus, we did not explore different scenarios of several people interacting on the bridge but could instead focus on the perceived experience of the soundscape.
5. Design Process

In this section, I will describe how we applied the presented methods by going through the design process in a more or less chronological order. In every subsection, I will clarify relevant findings and elaborate on essential design decision, grounding them in the research and explorations conducted in the beginning of the project.

Overview

I have divided the process into five phases: Field Research; Exploration; Concept Development; Synthesis; Testing and detailed design. Figure 2 illustrates what methods we used in each phase, giving an overview of the entire process.

<table>
<thead>
<tr>
<th>Field Research</th>
<th>Exploration</th>
<th>Synthesis</th>
<th>Concept Development</th>
<th>Testing and detailed design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>Interview</td>
<td>Reflective probes</td>
<td>Workshop</td>
<td>Sketching, Prototyping</td>
</tr>
<tr>
<td></td>
<td>Sound-test</td>
<td>Park Pranks</td>
<td></td>
<td>Doll-play, Test</td>
</tr>
</tbody>
</table>

Figure 2. Overview of the process

5.1 Field Research

We wanted to design a soundscape that resembled the rural areas of Denmark and bring this soundscape into Copenhagen to make people interact with and reflect on the sounds that they do not meet living in the city. The first thing, we asked ourselves, was: What existing soundscapes are present in Copenhagen? Where should such a future installation be placed for people to interact with? What context would be interesting to ‘hack’ with our interactive soundscape? Hence, we went out to explore the city and visited some different places: the neighbourhood around Bethlehems kirken (a church placed in the inner city facing a heavily trafficked road), Drosseringen ved Søerne (a gravel path along the lakes in the centrum), Ørestadsparken (a small undulating park in the heart of the city). In these places, we identified some specific spots that could be interesting to make into an interactive space. For example: a brick wall, stairs down to the water, benches, trees along the walking path, a tunnel, and a small walking bridge crossing a lake (see picture 1).

We decided to explore the latter two spots further. The tunnel is interesting in this project because it works as a vacuum, isolating a lot of sounds from the city around, giving space for new sounds to wealth. The tunnel is usually perceived as sinister and repulsive; could we change the way people perceive the tunnel by bringing in sounds from outside the city? And further, letting people interact with another world of sounds, would that change the behaviour of people in the context of the tunnel?

The bridge in the park has an interesting soundscape; you can sense the sounds of the city in the distance (the cafes, groups of people, traffic noise) but inside the park these sounds step into the background and are replaced by a more silent sound universe letting you notice less dominant sounds like the wind in the trees, the ducks splashing in the water, children at a playground, singing birds, and the dove. People are crossing the bridge, coming from both directions. If you stand on one side of the bridge, you can feel when someone enters the
bridge on the other side (around 20 meters away), the entire bridge is resonating with the steps and sends a humming vibration through your body. Touching the railing of the bridge, enhances the feeling, as the metal railing of the bridge is vibrating accordingly.

Some days after, we went to explore the two contexts further but this time, we brought speakers and a conducted library of sounds associated with rural areas. Playing the sounds in the tunnel, we wanted to see what the sound could do to the place. The tunnel was cold, dark, smelly and absolutely not pleasurable. We played out different recordings – it had a great effect as the sounds were sent forward and back between the walls in the tunnel. People passing by where smiling at us but whether it was because they liked the sounds or simply appreciated our presence in the otherwise deserted tunnel was hard to tell. Everyone was walking from one end of the tunnel to the other in a fast tempo - the tunnel is not a place where people stop up and interact with the space. We realised that simply changing the soundscape in the tunnel would not change the atmosphere as it is also connected to the look, feel, and smell of the place. Furthermore, working on creating a pleasurable soundscape would take us too far away from the problem area, wishing to integrate the sound of rural areas in the city, which are not necessarily pleasurable. Thus, we decided to discard the tunnel as a context for the interactive soundscape.

Instead, we chose to carry on with the bridge in Ørstedsparken. The context is characteristic for the city and parks are frequently being referred to as ‘the lungs of the city’. This is especially in terms of the green, spacious areas, nevertheless, it also reflects the soundscape that are light and mild in contrast to the stifling soundscape of the streets in the city. In light of the problem, it is interesting to work in this context, because the park compliments the feeling of escaping the city, giving space for people to reflect and meet other alternatives. In the same time, it is encapsulated by the dense grasp of the city soundscape. The context is an opportunity to create a place where people, in the heart of the city, get to interact with the
rural areas of Denmark while having space to reflect about the contrasting sound universes of the city.

5.1.1 Behaviour Observations on the Bridge
We went to observe how people are using the bridge in Ørstedsparken, and initially, placed ourselves fifty meters away from the bridge, having a perfect view from the outside. We wanted to find out how people behave on the bridge, what is characteristic for the context that we are designing for. We sat down on a bench, noting down everything we saw was going on at the bridge for about 30 minutes (see appendix 1).

The observations showed that the bridge is being used a lot. There were more periods with people on the bridge, than periods when it was empty. The people observed on the bridge were for example women with baby-carries, families, elderlies, groups of young people, and couples. We also observed the sounds in the park. Observing how people were crossing the bridge, I found that there seems to be some characteristic behaviours that I will divide into three categories:

A) People that cross the bridge in a fast tempo looking straight ahead or down on their phone.
B) People that strolls over the bridge interacting with the surroundings. Some people in this category have a dog that are leading the walking path.
C) People that go out on the bridge and take a rest (usually they stop in the middle). Some people stand and talk, others simply look out over the lake and stops to take pictures.

There were most people observed from category C) and less from category A). It is worth noting that the behaviour on the bridge reflects the season, the day, the time, and the weather. We did the observations in the spring, on a Friday, at lunch time, and the weather was mild and sunny. Later when testing the prototype (section 6.2), I will return to the categories and use them to evaluate on the interactions with the installation.

5.1.2 Interviews and expert inputs
We visited an organisation in Copenhagen, Lydens Hus (Translated from Danish to English: The House of Sounds). Here we met BlackBox, a start-up that makes interactive sound installations, and Awe, a start-up that works with augmented sound and makes sound based app software. We presented our project for the companies and got feedback from their representative expert fields. Since we do not have any experience working with sound as a material, it was an important part of our field research to investigate the area and find out how other people are working in this field. The two meetings confirmed that our problem formulation is relevant and that it is possible to achieve it using sound as a material. A relevant questions were raised: what kind of sounds do we want to work with? Should it be live-sounds from a small village, modulated sounds, abstract sounds etc.? We realized that it should be very simple, recorded, and non-modulated sounds that, we can mix together into a soundscape.

Following Brinkmann’s (2014) semi-structured interview method, we interviewed Ingeborg Okkels who is a sound consultant (see appendix 2). As interaction design students, we know a lot about how to design for different interactions between human and technology, however, we do not have any experience working with sound as a material beforehand and could,
therefore, use some professional input. It was a 1 hour long interview that took place in Lydens Hus. Now I will point out the essentials insights that we got from the interview.

We tried to comprehend and get an overview of the knowledge by clustering it into themes (see appendix 3). It resulted in four themes that I will use to describe our main insights from the interview:

**Sound layers**
Different soundscapes can exist together side by side and it is possible to create a room of sounds in a noisy place by matching the right sound frequencies. It is a sound collage that we are doing, adding another layer of sounds to the already existing soundscape.

**Orientation**
We use sounds to orient ourselves in the world - just as we use our sight. If there is a mismatch between the sound input and the visual input then it can disorient people. To create a soundscape that do not confuse people, we should only use realistic instead of abstract sounds, make a sound horizon, and use clear sounds to guide people in the space. Furthermore, we should try to find sounds that fill in available gaps in the sound frequency of the park. The added sounds will disappear into the existing soundscape if the frequencies used are already full.

**Self reflection**
When you listen, you throw yourselves out in the world and receive something in return – it is an interaction. How you chose to interact with the sounds is individually, and experiences sounds is a self reflection. Every sound will mean something different and trigger something different depending on who is interaction with the sound.

**Consciousness**
Ingeborg makes workshops, with children and adults, to make them listen to the soundscapes that surrounds them. According to her, we can teach participants in a workshop to be more consciousness about sounds by playing a recording for them and then start guiding them through the soundscape, raising questions to what they can hear.

Based on theme 1) and the observations in the context, it was clear to us that we would integrate the sound installation in the space, hence, making people reflect about the space and interact with it. Therefore, we skipped all the initial ideas we had about creating isolated rooms to interact with the sounds (see section 5.4.1).

Theme 2) was an essential key point when designing SoundEscape as we several times discovered how people were disoriented when adding sounds in the park, and I will, thus, return to this several times throughout this chapter. Theme 3) is something I will return to when testing a mini-scale model of the installation as our test persons had many different self-reflections when experiencing the prototyped soundscape from rural areas. Finally, theme 4) served as inspiration for a workshop later in the process (see section 5.3.2).
5.2 Exploration
We used the internet to discover sounds that we ourselves related to rural areas. Both of us grew up outside the big city and thinking back on what sounds we missed from our childhood gave us inspiration for sounds. We used www.freesounds.org and www.zapsplat.com to find sound recordings. We now had a library of around 20 sounds that represented rural areas (see appendix 4). E.g. a cat meowing, a dog barking, potato peeling. We used this library, when exploring the effects of adding sounds to the context and to explore how people are reacting on the sounds in the park which are clarified in the two following subsections.

5.2.1 Testing sounds on the bridge
A main concern was that we could not get the desired acoustic experience in the outdoor environment of the park. The recordings would need to be played in a high enough volume for people to engage with the sounds. To address this concern, we went to the park for a small test, playing sounds on the bridge.

The test went surprisingly well according to the criteria of getting people’s attention: With two Bluetooth speakers, we were able to fill the entire space around the bridge with sounds. However, the test also showed that the sounds made people disoriented: Two visitors in the park reacted by looking up in the threes trying to find a bird when we played a bird-sound on the bridge. A man walking with his dog was passing us at the bridge when we played a cat meowing. The dog reacted immediately and tried to figure out where the sound source came from. The test proved that it would be possible to create a sonic installation that people can interact with in this context but that we need to further explore how people can interact with the sounds.

Testing the sounds in the context, made us reflect on, how the sounds relate to the existing sound universe of the park. Some of the sounds that we found interesting listening to on the computer, sounded differently on the bridge, and some of them even disappeared into the existing soundscape. One bird-recording completely faded into the bird sounds in the park while other bird-recordings added new sounds to the park. A recording of a tractor passing by sounded spectacular and interesting, nevertheless, in the park, it added extra noise to the sounds of the cars from the road in the background.

Thus, an important finding was that the soundscape that we design will be a new layer in the already existing soundscape of the park, which request a fine balance between the two soundscapes. Therefore, we have to test out the sounds in the real context when later designing the installation. There is different frequencies of sounds, and we have to find some free frequencies for the new sounds, otherwise they will not be noticed but instead interpreted as noise as Ingeborg Okkels explained in the interview (theme 2, section 5.1).
5.2.2 Park pranks
Based on the initial sketching (read more in section 5.4.1), we sat up a scenarios that we could try out on the bridge. We wanted to make a simple set-up on the bridge to explore how people react on the changing soundscape - what would happen when people hear sounds that do not belong to the context and how will they interact with the sounds?

Scenario:
When a person steps into the bridge, the first speaker plays a signal-sound (see section 2.1.3) that have the purpose of inviting the person to the sound installation. When he passes the middle of the bridge, a landmark sound (see section 2.1.3) will start playing from the second speaker.

We thought that it was necessary with a signal-sound to make people aware that they were stepping into a sound installation. We adopted the idea from Ingeborg’s workshop and our own experience when listening to sounds: if you educate people, they will start opening up and be more aware of the sounds around them. Likewise, we thought that the signal-sound could have the same effect: making people aware about a different soundscape on top of the existing soundscape and that it would make them more aware when going further into the bridge, making them explore the less intrusive sounds of the soundscape.

However, the park prank showed us that it was not what happened. Instead, they were disoriented – they certainly reacted to the sound. But they were confused, kept looking for the origin of the sound, not able to orient themselves as there was no visual support for what they were hearing. Therefore, they did stop up in the beginning of the bridge, but did not seem to be more aware of more natural sounds when continuing across the bridge.
5.3 Synthesis

The sound library we already made were great for the above mentioned experiments but for the final prototype, we would need to collect sounds more carefully. There is not one specific definition dictating the soundscape of rural areas - it varies from place to place, even within a village or farm community, there can be several soundscapes according to place, seasons, and the subject listening. Thus, we could not design the soundscape only drawing from our own subjective input – participation from a wide variety of people related to rural areas were requested.

Through two workshops with two different groups of people closely related to a rural area, we gained data input for the sound material, and furthermore, we collected reflective materials from individuals related to different rural places all over Denmark. All this material was later gathered and through an affinity mapping of the sounds, six themes emerged that would form the future soundscapes for the bridge.

5.3.1 Collecting reflective sound material

Sound material was gathered by sending out instructions to participants (see appendix 5), letting them generate the material on their own. The participants were asked to make a ‘sound-diary’ using their mobile phones to record sounds, take pictures of the context, and note down reflections. There was two groups of five people participating: One group with people who live outside the city, and one group with people who live in city but have grown up outside the city.

I was facilitating the group of people who grew up outside the city but now lives in the city. They got the instructions before heading home to visit their family outside the city where they grew up and were then told to conduct the material while they were away. In this way, they had great conditions to reflect on how the soundscape in their home-place differs from the soundscape of the city that they just came from.

I received material from five people, ranging between the age of 23 and 57. They were coming from five different places (both small villages and the countryside) in Syd Sjælland, Fyn, Sønder Jylland, Nord Jylland, Bornholm, and Færøerne (see figure 4). I received written reflections from four participants, three videos from one participant, and a sound recording from one participant (see appendix 6).
Figure 4. The distribution of participants on a map of Denmark
5.3.2 Workshop: Defining the soundscape of Sørbymagle

The workshop I facilitated took place in a small village, Sørbymagle, in Vest Sjælland – six people in the age from 18 to 75 participated. The intention was to make the participants reflect about the soundscape that represented their place and map out the sounds accordingly to the type of sound (keynote, signal, soundmark). The purpose was to use the outcome of this to feed directly into the design of the soundscape for SoundEscape. There was three activities at the workshop - the first two activities took one hour, and the last activity took one hour. I will explain the two first activities shortly and put more focus on the last activity since the former were only conducted to give the participants the means for the latter activity and did not serve as input for the design. See picture # from the workshop.
1. Activity: Learn to listen

The purpose of the first activity was to make the participants start to notice the sounds around them. Inspired by the interview with the sound consultant, Ingeborg Okkel, I played a recording from Ørstedsparken to the participants, and asked them where we are, who is passing by, how is the weather etc. It worked as a warm up activity to get our participants into the mode of listening while in the same time teaching them about the different sound layers. I played a sound recording from the bridge (see appendix 7) for about 15 minutes, while sometimes pausing it to discuss what we just heard. Following, they started to talk about the sounds that exist in their soundscape. For example, the neighbour’s dog would make a screaming sound every time the newspaper were delivered and the sound of machines driving out with slurry and the following smell. Thus, the participants already started to identify soundmarks.

2. Activity: recording sounds

Having identified the different sounds in the recording of Ørstedsparken, the participants were well prepared to go out and make their own recordings. They went around in a garden, listening, and used their phones to record. The purpose was to make them reflect about the sounds in their community and make them aware of how a soundscape is composed by several separated sounds.

They noticed the bird sounds as soon as the weather started to clear up. They also recorded all the sounds that were produced by the garden work. For example, rushes was cutted down, mud shovelling, raking in the kitchen garden, grating the porch, and a chainsaw. They identified “the falcon of the neighbourhood” as they called it. They talked about the cars that they could hear from the main road further away: “There was a truck just now”. “No, I think it was the buss, it always passes by this time every hour.”

3. Activity: mapping out sounds

After the first two activities, the participants were ready to map out sounds, defining the soundscape of their place. I gave them pink post-its to write down every sound that they related with their village, Sørbymagle. However, the specific place and time of the sound did not matter. They placed the post-it on a circle map, classifying the sounds according to the type of sound (see figure 5). The inner circle represented the sounds that they are most aware of (the signal sounds) – the further away from the middle, the less conscious the sounds are heard. The sounds in the outer ring, thus, represents background sounds in the environment (keynote sounds). Orange post-its were used to attach a description of the sound blue post-its to note down a related story or memory that were associated to the sound. For example, I could write ‘Lawnmower’ on a pink post-it and place it in the second ring of the circle because it is a sound that are in my consciousness when I pay attention. I would write ‘machinery, shearing, smell of grass’ on an orange post-it and on a blue post-it, I would write ‘reminds me of my dad in the garden when I was a child’.
Figure 5. Circle map used for workshop activity 3
Each participant presented their reflections for each other. Presenting a sound often let to a discussion about a shared memory. New post-its were added to the circle-map as stories were presented and question raised by other participants about the description or story behind. More than 30 sounds were mapped out by the participants (see picture #). The identified sounds are a result of the mapping and discussion participants among, and will be used later for prototyping the soundscape of peripheral Denmark. On the following page, I have highlighted some of the participant’s stories and descriptions of the sounds. All insights gathered from Katrine’s workshop can be found in Lynggaard (2017, chapter 4.2.4).

Picture 3. Result from participants mapping out sounds
“I often hear some children playing on a big trampoline or on the playground. It is a really happy sound - they are laughing loudly.”

“The beach is not nearby our village but we often go there, just walking on by the shore. You hear this sound of the ocean slopping and it is very characteristic and wonderful”.

“The sound of the grandfather clock is something I miss. I like that it is always present – it makes me relax.”

“I have noticed the squeaking sound of the old houses - it is not like in the city - the houses out here have more sounds.”

“QUATES

“You can often hear people yelling - it is like people are speaking louder on the countryside.”

“When I walk with the dog in our Village, I have noticed the sound of the rusty garden gates. The wind makes them open and close.”

“I remember that we used to search for the GØEN in the forest – it was a good tie killer.”

“Out here many people uses small stones in their driveway. The small stones give an amazing sound when walking in them or when a car drives through them. You could always hear when grandfather was coming home from the field.”
5.3.2 Affinity clustering
Katrine and I brought together all the material that we had collected on our own (the reflective sound-diaries and the workshops). We used affinity clustering to gather and comprehend the vast amount of sound inputs that we got from the participants. Only the sounds were clustered – descriptions and stories of the sounds were left out. We coded the material from the sound-diaries by writing down the sounds from the reflections on post-its. Initially, we merged all the material into the same mapping of the different sound layers that we did in the workshops. Afterwards, we identified the source of the sounds resulting in four themes: Machine, Nature, Animals, and Cultural Sounds. In the end, we mapped the sounds according to their location in the landscape, resulting in the following six themes: The Forest, the Field, the Shore, the House, the Village, and the Garden.

The three groupings:

1. Position in the soundscape (foreground 1, middle ground 1, middle ground 2, background)
2. Source of the sound (Machine, Nature, Animals, Cultural Sounds)
3. Location of the sound (Forest, Field, Shore, House, Village, Garden)

Grouping 1. was necessary to merge all the material and provided an overview of all the material gathered. The mapping of the position in the soundscape were great insights for which sounds to use for building up a soundscape later in the prototyping phase (chapter 6).

Grouping 2. gave us an insight in the different sound sources in a soundscape which was valuable when later having to combine sounds into a soundscape on our own. There were a great balance between sounds produced by machines, nature, animals, and cultural. This balance we also tried to keep when designing SoundEscape. We chose to discard all the sounds under the category Machines. Even though, there were some important soundmarks in between, like the potato-sorting-machine, we knew from our previously small test on the bridge that all the machine sounds would disappear into the existing soundscape and it would not be possible to detect one machine sound from another in the park context.

Grouping 3. turned out to be a key-finding for the design since we later used the six identified landscapes to thematise four soundscape for the final prototype. Even though the participants had not worked with a specific landscape, they had painted out these six sound landscapes (see appendix 8).

5.4 Concept Development
In the concept development phase, we had to narrow down the design iterations. From the very beginning, we made paper sketches to iterate on the design. Nevertheless, it was not before this point in the design process that narrowed the ideas down to a single concept. Finally, I will explain how we went on to prototype the concept.

5.4.1 Sketching and ideation
Presenting the sketches from the beginning to the final concept shows how the design decisions have evolved as we have been informed in our process. Picture 4 shows some initial sketches where we imagined a more closed context in which people would interact with the sounds, not integrated with the context.
Picture 4. Sketches from the beginning of the process
In picture 5, the sketches are produced around the context of the bridge, thus, using the different qualities and physical affordances on the bridge. At this point, we were more focused on having some kind of tangible point for interaction. E.g. sliding the hand on the up and down on the railing would create different sound orchestrations. Some of the ideas are also supported by light.

Picture 5. Sketches developed in the middle of the Exploration phase of the design process

After the Synthesis phase, we went into a new iteration. Using sketching, we developed the idea for the prototype, SoundEscape (see picture 6). We chose this concept with the sound-layers because we had great input from the workshops on sound layers. Exploring how to build up a soundscape, seemed to be a good place to start. To give an idea of the entire design space we have worked in, see the concept presented in the introduction (1.2) where all the elements relevant for the problem field are identified.

Picture 6. Sketching the concept
5.4.2 Prototyping the soundscapes
Using the six themes from the affinity clustering as a starting point, we created a library of sounds for each theme (appendix 9). We searched for all the sounds identified by the participants. During this phase, some sounds were discarded because it was not possible to find a recording that had the right identity or quality. It was important for us to find a recording that reflected the origin of the sound. Thus, we would choose the sound based on following criteria: it should be a high quality recording, the sound should give a clear impression of the event taking place, the environment in the recording should match the Danish landscape that it belonged to. E.g. If we found a great recording of some partridges for the forest theme, we would not use it, if the environment sounded like a marketplace or if the environment were exotic and clearly not from a Danish forest.

Having the library in place, we went on to build a soundscape for each theme. We used Audacity, a simple sound editing program, to create the soundscape. Also in this phase, we discarded some sounds because they did not had the desired effect when mixing them with the other sounds from the theme. It was a process of trying out different combinations, adjusting the volume of a specific sound, cutting of parts of a recording, extending recordings, and inserting breaks. We started with a few sounds, and as soon as we had a good base, we could add more sounds one at the time, while constantly listening and evaluating the effect it had on the soundscape. See the final soundscapes presented in section 1.2.1.
6. Testing and Evaluation

Having developed a concept and six soundscapes, we were ready to test it and further develop the design. We did two tests: a test of the experience on a mini-scale model and a Wizard-of-Oz test of the concept on the bridge. I will go in more detail with the latter test of the concept since it rises more findings of interest to how people interact with the installation and the other test gives more input on how people experience the installation. You can see the findings in the mini-scale model test relating to the experiences in Lynggaard (2017).

6.1 Mini-Scale Model

With a laser-cutting machine, we made a mini-scale model of the bridge (see picture 7) that matched the size of a PlayMobil doll. Bringing the model to the IT-University of Copenhagen, we planned to make test persons cross the bridge, playing the character of a doll, while experiencing a soundscape. The purpose was to test the soundscapes that we prototyped – what would they mean to other people who have not been a part of the process?

We had five test persons that each experienced the installation set-up twice with two different soundscape themes. First, they picked a character to use for the doll-play. Then we told them to walk over the model bridge and listen to the sounds, keeping in mind that it takes between 30-60 seconds to cross the bridge in Ørstedsparken. We had one speaker where all the sounds were played through, controlling everything in Audacity on a computer. When the test-person entered the bridge with the doll, one or two keynote sounds would start playing. When the doll came a little further, more sounds would be added on top of the first sounds. Once or twice, a signal sound would be played. I will now highlight some findings from the test that have relevance to the interaction with the soundscape. See the set-up for the test session at picture 8.
One person noticed that it is not like looking into a soundscape but rather feels like you are going through it. He imagined himself walking over the bridge in the context of a forest. Specially the forest theme, he found easy to relate to because he could see the bridge in his picture of the forest. I find it interesting how he brings in the bridge in the landscape he imagines, and I will later discuss how it is the interaction with the installation through the doll that creates the link to the perceived experience (section 8.2).

Another test person likewise explained that he was “physically drawn away” when acting on the bridge through the soundscape. However, he first experienced walking in Ørstedsparken with his grandmother because he often have done that and are familiar with the park. When he heard a sound of a cow, he first became confused but slowly the conception changed into the context of a Danish island, Bjørnø, where the test person have been on a farm vacation several time also with his grandmother. It was interesting how his grandmother was a consistent figure in his perceptions of the sounds – it was like his grandmother were linking the two places to each other.

It is hard to register how the sounds are triggered. However, all the participants felt that they are the centre of the sounds and that they must continue to keep experiencing the soundscape. None of the test persons stopped up or tried to go back. One person explained that it never occurred to him because he felt that he were keeping the soundscape alive by walking. Another person said that he felt encouraged to move forward to experience more sounds. Testing the forest theme, a third person explained how listening to events that he was passing on his way, experiencing that he was going through a soundscape. He did not have the same feeling when we tried the House theme because he could not imagine that he walked through a landscape.

A key finding from the test was that all the experiences were individually. The test persons interacted with the sounds based on previously experiences and, thus, had very different experiences of them. It was not the same sounds that the participants noticed or payed attention to. It was incredible how all of them could relate to the sounds to a picture – fictive or based on a memory. They found a personal stand to the sounds, perceiving the sounds from their perspective.
6.2 Test on the bridge

The final test was on the bridge where we made a wizard-of-Oz setup of the prototype, SoundEscape, manually triggering speakers as people passed by. Even though SoundEscape consist of 14 speakers (see 1.2.1), we only used three speakers for the test because it was not possible to manually control more speakers at the same time. We placed the three Bluetooth speakers on one side of the bridge to make sure that visitors would get a coherent experience of the sound layers. Speaker 3 was placed in the middle, speaker 2 was placed three meters before the middle, and speaker 1 three meters before the second speaker (see figure 5). All speakers were placed at the bottom of the railing, being visible to people on the bridge, however, not everyone noticed them when interacting with the sounds.

![Figure 5. Setup of the Park Prank scenario. The yellow crosses marks the position of the speakers. The red lines are the trigger points. The two grey spots are the position from where Katrine and I controlled the speakers.](image)

We stood on the opposite side of the bridge, using our mobile phones to control the three speakers - starting and stopping the sound files. Beforehand, we had prepared sound files for each speaker in all the themes, making it possible to build up the previously designed soundscapes. When a person, a couple, or a group walked passed the first speaker, we would start to play the sound file for speaker 1 in a theme, containing a few simple sounds from the theme. As they passed the second speaker, we would play a sound file with one or two more sounds on top of the sounds played in speaker 1. Passing by speaker 3, a sound file with further 1 or 2 sounds added to the soundscape would be played immediately. Sometimes the sound files for speaker 2 and 3 would have a signal sound added in the beginning of the recording, resulting in a clear and loud sound in the moment people passed the speaker.

The test is separated in two: in the first part, we simply observed how people interacted with the installation without informing them about the installation. For the second part, two participants experience the installation, knowing that they stepped into a sound installation. These findings are not essential to my paper but for interest, read about them in Lyngaard (2017).
6.2.1 Findings: test on the bridge

Table 1 illustrates how many people that reacted and engaged with the sounds in each theme and for every speaker. For each theme, there is three observations. Thus, the maximum people who interacted with the sounds in each theme is nine. Both the Forest and the House were successfully engaging people in the soundscape. Also the Field and Village were working as intended. In the Garden and Shore theme, it was not before the last speaker in the middle, that people noticed the sounds. Most likely, this is because the keynote sounds played in layer 1 and 2 are very similar to the park environment (e.g. birds, insects, and water).

Table 1. Observations on reactions at each speaker for the six different themes

<table>
<thead>
<tr>
<th>Theme</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shore</td>
<td></td>
<td></td>
<td>●</td>
<td>1</td>
</tr>
<tr>
<td>Garden</td>
<td>●</td>
<td>●</td>
<td>● ●</td>
<td>3</td>
</tr>
<tr>
<td>Field</td>
<td>●</td>
<td>● ●</td>
<td>● ●</td>
<td>6</td>
</tr>
<tr>
<td>Village</td>
<td>● ●</td>
<td>●</td>
<td>● ●</td>
<td>7</td>
</tr>
<tr>
<td>House</td>
<td>● ●</td>
<td>● ●</td>
<td>● ●</td>
<td>8</td>
</tr>
<tr>
<td>Forest</td>
<td>● ●</td>
<td>● ●</td>
<td>● ●</td>
<td>8</td>
</tr>
</tbody>
</table>

However, it is important to note that we cannot evaluate the themes in general but only the soundscapes that we designed for each theme. The Forest theme also shares some keynote sounds with the park (e.g. birds, leaves, wind going through trees, and barking trees) but still worked well in the context. I think that there are two main reasons for this. First of all the Shore and the Garden are very simple designed soundscapes compared to the Forest. Both consist of only four sounds and no signal sounds – the forest have in comparison 8 sounds and several signal sound. Secondly, the exact sounds that Katrine and I chose when designing the soundscapes influences the outcome. We could design a new soundscape called Garden with some sounds that matched the existing sounds in the park better. Hence, the test could be used as a mean for improving the soundscapes. Based on the results, we should change the sounds in the shore theme, the sounds in speaker 1 and 2 for the Garden theme, speaker 1 in the Field, and speaker 2 in the Village. Alternatively, we could add more signal sounds on top of the soundscape in the mentioned critical points.

Comparing the results of table 1 with the complexity of each theme is interesting. The most complex designs were the forest, the house, and the village. These are the same themes that have most people interacting with them according to table 2. It indicates that the complexity of the soundscapes makes it easier for people to interact with the soundscapes, and I think that people can better orient themselves in the soundscapes if there is more sounds to guide them.
Table 2. Observations on reactions at each speaker compared to the social constellation

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>● ●●</td>
<td>●</td>
<td>● ● ●</td>
<td>9</td>
</tr>
<tr>
<td>Couple</td>
<td>● ● ●</td>
<td>● ● ●</td>
<td>● ● ●</td>
<td>13</td>
</tr>
<tr>
<td>Group</td>
<td>● ●</td>
<td>● ● ●</td>
<td>● ●</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 2 distinguishes between three categories: people that walked alone, people who walked in couples, and people who walked in groups. Comparing the three groups gives inside to the dynamics of interacting with the sound installation in different social constellations. Five observations were made for each category so the total number of observations for all the speakers would be 15.

The diagram shows that more couples than groups or singles, engaged with the installation. Even though that the results would need to be backed up by more numbers of observations, it was also what we observed being on the bridge for a half day.

The groups seemed to have a dynamic that did not allowed interference from outside the group. Common for all the groups that did payed attention to the speakers was that it was a single person in the group that noticed the sounds and then that person would involve the others in the installation.

Most of the single persons were walking in a fast tempo and did not seemed to be near as present as the people walking in a couple. There can also be a social boundary for how to behave in public place like the park.

Table 3. Observations on reactions at each speaker compared to the walking style

<table>
<thead>
<tr>
<th>Category</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>● ●</td>
<td>*</td>
<td>● ● ●</td>
<td>7</td>
</tr>
<tr>
<td>B</td>
<td>● ●</td>
<td>● ● ●</td>
<td>● ● ●</td>
<td>11</td>
</tr>
<tr>
<td>C</td>
<td>● ● ●</td>
<td>● ● ●</td>
<td>● ● ●</td>
<td>13</td>
</tr>
</tbody>
</table>
Using the three categories defined in section 5.1.1, table 3 illustrates the correlation between how people cross the bridge and their experiences of the soundscape. The people observed in category A (fast tempo) are those who react less to the sounds as expected. The people in category C (stopping on the bridge), were those who reacted most and category B (slow tempo) only had two less reactions.

It did not seem like the sounds made people change their behaviour significantly on the bridge. Those who entered the bridge in a fast walking tempo simply turned their faces towards the speakers but kept the same walking tempo. Most noticeable was that some of the people who entered the bridge in a slow walking tempo already stopped before the middle to investigate the sounds. It is hard to know from the results if people in category C would have been placed in category C or B, if the sound installation was not there.
7. Interactivity Analysis

I will now analyse the interactivity of two interactive sound installations, The Sound Bridge and SoundEscape, by applying the framework that was presented in chapter 3.

7.1 The Tightness of Interaction
Both Sound Bridge and SoundEscape gives an instantaneous feedback. In the sound Bridge, the distance of the recipient’s hand from the sensor gives a gradually output, altering the sounds. SoundEscape is on the other hand not graduated. If the recipient change his walk (the input gesture), the sound output do not change accordingly.

The interaction in SoundEscape is co-located: the visitor gets the feeling that the sounds are where he is and that he are triggering them while crossing the bridge. However, it is not as strongly co-located as Sound Bridge because you can walk on one side of the bridge and then start the speakers on the other side. Furthermore, the action of walking makes the location of the interaction become more fluent, the person is constantly moving, so he will have passed the speaker the moment after he triggers it, and soon the speaker will be several meters behind him. To embrace this, we could move the speaker a bit in front of the sensor triggering it. This will however result in a less co-located experience but support the act of keep moving forward to explore more sounds.

7.2 Type of Feedback
Both the Sound Bridge and SoundEscape gives functional feedback while not providing any additionally feedback to support the recipient’s interactions. The functional feedback in Sound Bridge is the changing sound of the recordings played. The recipient gets immediately feedback in form of the modulated sounds when placing the hands in different distances from the sensor. The sounds on the bridge is, thus, direct respond to their gestures.

Also in SoundEscape it is only the sounds themselves that gives a clue on the interaction. It is a simply on/off interaction. If a person is registered by the sensors, the sounds are triggered. What makes it more complex is the layer of sounds and the different sounds used in each layer. I will argue that the signal sounds adds another perspective to the feedback. Being a part of the designed soundscape, it is still functional feedback. However, their positioning in the foreground of the soundscape, makes them much easier for recipient to orient themselves after.

7.3 The Moment of Interaction
The moment of interaction in Sound Bridge is when the recipient put his hand in front of the sensor and the sound output is alter as a respond. Putting the hand in front of the sensor, the recipient enters the space of interaction. The recipient could have been informed of the interaction beforehand by observing other recipients interacting with the installation or reading the sign for the installation. It could also be that the recipient finds the point of interaction by playing with the mounted sensors on the railing.

On the other hand, the recipient of SoundEscape do not actively trigger the sounds when he hear the first layer of the SoundEscape. When the recipient passes the first speaker on the bridge, he activates the first layer of sound in the soundscape more or less unconsciously. However, this is not necessarily the moment of interaction but rather the invitation to the space. The moment of interaction is when the recipient reacts on the sounds and realises that he is a part of the soundscape.
7.4 The Level of Interactivity
The interactivity of Sound Bridge is at the co-creation level because the recipient can manipulate the sound output by sliding his hand in front of the sensor and adding an extra sound layer by using two hands. The interactivity of SoundEscape is at the level of participation in the framework because the recipient can only activate the sound layer but not altering the sounds in any way. The recipient experiences that he is the protagonist – the entire soundscape being build up around him.
8. Discussion

8.1 Considerations for enhancing the interactivity of the concept

Based on the analysis of SoundEscape, I have identified some interactions that should be considered and tried out in the concept.

The analysis showed that the interaction with SoundEscape is not graduated and there is no alignment of the functional feedback. Thus, I will suggest that the walking tempo could be used to graduate the interaction. The walking rhythm could affect the narrative of the soundscape – making the soundscape play faster if the recipient walks in a fast tempo. Furthermore, if the recipient stops or shifts tempo, it should result in a corresponding sound output. For example, the soundscape could start panning, if the recipient stops up on the bridge, adding an extra dimension to the installation and giving the recipient another experience.

Giving the recipient more control could also enhance the interactive experience. When the recipient knows that he can interact by triggering speakers, he might want to start different speakers at the same time. This could be achieved if there are more players on the bridge at the same time which is often the case in Ørstedsparken. Different scenarios should be set up for how to trigger the speakers when there are more than one protagonist coming from different directions and in different tempo. Another scenario is that the recipient starts playing with the system and then go back from where he just came from. Then the system could react by removing a sound layer or starting over with a new theme.

8.2 Interaction tightly related to the perception of the soundscape

An interesting insight from the mini-model test was that the test person couples his interactions on the mini-scale bridge together with the rhythm of the soundscape. He did not pay attention to the rhythmical sound (in the case of the House theme, it was the grandfather clock) – it was more a bodily experience through the doll. Instead, he experienced all the other sounds, subconsciously following the rhythm of the underlying sound. Based on this insight, I will argue that it influences the experience of the perceived soundscape that you walk forward when listening to the sounds. Compared to a scenario where you stand still and perceive the sounds, the interaction of walking makes you bodily engage with the soundscape.

All the participants got pictures of imagined landscapes in their head when experiencing the installation. One participant explained in detail how the bridge also was an element in his imagined landscape. Two participants explained how the landscape were growing bigger and bigger as they went further on. It is interesting that the interactions of triggering new sound layers are tightly related to the perceived experience that each person had. Based on this, I will not include the House theme in the final concept. The test persons trying the House theme did not had the same feeling of actively walking through a perceived landscape. I believe that the theme do not fit with the interaction or the context of the bridge.

It is worth noting that the participants in the mini-scale test did not stop up to investigate the sounds as the visitors did in the real context. The mini-model does not encourage participants to stop up because there is nothing to explore. There was only the laser-cutted bridge and one single speaker where all the sounds came from. This actually gave the participants an opportunity to focus solely on the sounds, immersing themselves into the soundscape. On the
bridge in Ørstedsparken, you are also interacting with the environment: the stunning view over the lake and the other people on the bridge. However, I believe that it is possible to get a similar experience of building up a bodily-perceived landscape in the park context. It would demand that we find the exact frequencies for creating a new soundscape in the park. I think that this is a desired result since the participants in the mini-model test related the sound with personal states and had a rich emotional experience of the sounds. It would be interesting to see how such a space in the park would have changed people’s perception of the place. How would it be to enter this sound space and then leave it again to turn back to the soundscape of the park? I believe that it would make people reflect about the sound environment that they live in - what sounds do they hear in the city and what sounds would they like to have?

8.3 Complexity of the soundscape and signal sounds as guiding stars
When analysing the test of SoundEscape (6.2), I found that the most complex themes were best at engaging people in the soundscape, thus, giving visitors a more fulfilled experience of the installation. I will argue that it is because the sounds are the only feedback in the installation, thus, visitors are fully depended on the sounds to guide them in the space – the more sounds, the more reference points of interaction. You could also argue that it will enhance the interaction with the sounds to make a visual coupling between the interaction and the sounds that are otherwise invisible for the user. For example, light installed under the bridge could change colour in the spot where a new sound is activated. However, that would take some of the focus away from the soundscape and make people engage more with the light instead because they are used to sense and react to visible point of interactions.

Furthermore, the test (6.2) indicated that signal sounds are important elements in the soundscape as the two themes with no signal sounds did not work well. I believe that the signal sounds are a main factor for inviting people into the world of sounds. Signal sounds are difficult to ignore and will demand the attention of people nearby (Schafer, 1993). Most of the recipients in the test would start investigate the other sounds after a signal sound caught their attention. Thus, the signal sounds serve as an invitation to the soundscape - it makes people aware about this augmented layer of sounds in the park. They are not pleasant to listen to over and over again, but hearing them once, the sensory apparatus is alarmed, thus, more open for interacting with sounds.

8.4 Moment of interaction
The analysis of the interactivity in SoundEscape claims that the moment of interaction is not the time when the sounds are triggered but rather when the recipient are consciously interacting with the installation. This should be seen in the light of Svanæs’s (2013) notion of Embodied Perception that explains how interaction is an active and conscious act – when interacting with our surroundings, we actively choose what to sense and therefore, we will not have the same sensory experiences even though we watch the same painting or use the same technology. Going back to the analysis of SoundEscape it is, therefore, not relevant that the sounds are triggered even though people are not interacting with the installation. Some people will sense the sounds and emerge themselves in the soundscape and others will not sense the sounds or simply choose not to interact with the installation. This was exactly what happened in the test of SoundEscape in the park (6.2). It is not any different from Sound Bridge where some people could also cross the bridge, ignoring the massive sensors mounted on the railing and others will stop to investigate the sensors. Thus, the moment of interaction in the two
sonic installations – Sound Bridge and SoundEscape – is not that different from each other as first interpreted. The moment of interaction in both installation is when the recipient actively engages with the sounds. The difference is only that in Sound Bridge the two moments – the moment of interaction and the invitation for interaction – are melted together and happens at the same time.

8.5 The design process
For a final remark, I will discuss the applied methods and approaches in the design process. Taken a research-through-design approach, we were seeking to find new understandings of interaction design, extending the current user needs (Gaver m.fl., 1999). It was hard in some situations to distinction between design for research and design for user needs. In a research setting, a bad design decision can lead to an interesting and fruitful knowledge contribution. However, we cannot make designs that are too detached from reality – the design should speak into the contemporary reality, suggestion new versions of that reality. Most people are not familiar with interacting with sound material, and, therefore, we have to design for the current conventions about sounds and then extend people’s ability from that point. More importantly, people do not have any needs for sound experiences. We seek to extend the user needs, showing them how interacting with a soundscape can change the experiences of a place, and how a sound experience in the middle of the city can make people relate to impressions connected to rural areas.

A central element in the project was to engage participants in designing the soundscapes of the rural areas in Denmark. We could have designed the soundscapes using our own judgement to create and define the soundscapes. However, our conception of what rural areas in Denmark sounds like is not the only one that exist. Therefore, we wanted to make a more inclusive design, which resulted in many other perceptions feeding into the design. The final result is a more democratic design material that most likely speak to a wider group of people. The sound material is more unique because it captures not only the viewpoint of two design students but also 21 people of different gender and age group related to rural areas.

Turning back to the context throughout the entire process, we let the context inform our design iterations. Important feedback were gathered when taking design iterations to the park context, making the context respond to a suggested change. Weather it was playing a simple sound or testing out a prototype, the context could give some kind of feedback which could give a confirmation, call for a new direction, or lead to new ideas in the situation.

Finally, working in a pair throughout this thesis project have turned out to be a great advantage. From the beginning, we have created a discussion about the field, challenging each other in how we approach the research and the design problems - a discussing I could not have had with myself. Even though Katrine and I come from a similar background, she thinks differently than me and every decision, we have taken in the design process is a result of a negotiation between our different views on the world around us. This negotiation have enlighten the project by bringing new ideas to the table, seeking to compromise our different standpoints. Several times, new knowledge has come to the table as a result of me and Katrine trying to understand each other’s perspectives. Hence, I will claim that either I or Katrine could have done this project on our own.
9. Conclusion

In the project we sat out to design a sonic interactive installation with sounds from rural areas in Denmark. In this paper, I have presented how we went through the design process where we engaged people from rural areas in designing the soundscape. The outcome of the process is a concept that suggests three groups of parameters that should be considered and used for making future scenarios for the installation. The parameters are Interactions, Sound output, and Soundscapes. We developed a prototype, SoundEscape, that explores some of the parameter in each group. Two tests were conducted of SoundEscape: one on a mini-scale model of the bridge and one in the park context. Making a framework for interactive sound installations, I have analysed and explored the interactivity of SoundEscape and compared it with an analysis of an existing interactive sound installation.

The paper have investigated how people actively engage and interact with the sounds in the park context and how the interaction with the sound material is experienced. The former was explored through the test on the bridge and showed how people engaged with the installation depended on the composition of the soundscape, the social constellation, and their walking style. I found that a complex soundscape comprised of many layers gives the best result. Furthermore, it is important to use signal sounds to give the recipient a feeling of tightness when interacting with the installation. The latter was explored through the mini-scale model test and showed that participants experience interaction with the soundscape as a landscape that was unfolding as they crossed over the bridge. It was essential that the recipient could follow a rhythm in the soundscape and that the theme afforded the conception of a landscape.

Furthermore, the paper sat out to investigate what possible interactions with the sound material, the concept and installation space affords. This was investigated through the design process and the analysis of SoundEscape. The analysis suggest that the following interactions should be taken into consideration: walking rhythm, walking tempo, orientation / direction, number of people, pauses on the bridge, people passing each other, positioning. It also suggest that these different forms of interactions on the bridge should be aligned with the sound output and the designed soundscapes.

9.1 Future Perspectives

The soundscapes should be developed further to fit the frequencies in the park. In the project, we tried to accomplish this by listening to the sounds in the context. However, for a full effect, it is necessary to use a professional tool to measure the exact frequencies. The goal is to create a soundscape within the soundscape of the park, giving a feeling of walking into a new room. If this is made possible, people could experience new sound universes like the test people in the mini-scale model test did. In the park context, people would experience how the soundscape are an alternative to the soundscape of the city, thus, inviting them to reflect on both soundscapes.

Developing SoundEscape, we have explored some essential aspects of the concept. Prospectively, we should create 1-3 prototypes that can explore other parameters highlighted in this paper. Scenarios based on the findings of SoundEscape should be created. Specially, parameters from the sound output needs to be explored and coupled together with different types of interactions. See Lyngaard (2017) on future perspectives for manipulating with the sound output.
10. Acknowledgement

My greatest greetings go to Katrine Lyngaaard for our collaboration throughout this entire project - it has been inspiring and fruitful to work with her. Thank you to our supervisor, Anne-Marie Hansen who have been a great source for inspiration and academic guidance - specially her knowledge about interactivity and sound as an interactive material have been much appreciated.

Thank you to all the people who have participated in the design process - SoundEcape is highly influence by their contributions. Both to those who have made sound-diaries and those who have participated in the workshops. Also thank you to the people who help us in the mini-model test and in the test of the prototype on the bridge.

I am also thankful for all the other people have help me and Katrine in the project, giving supportive feedback for the design work and the paper: Ingeborg Okkels, David Duacelles, Anuradha Venugopal Reddy, and Agnieszka Billewicz.
11. References


Buxton, B. (2010). Sketching user experiences: getting the design right and the right design: getting the design right and the right design. Morgan Kaufmann.


12. Appendix

1. Observations
https://docs.google.com/document/d/1UEluNroVi6w5q_1amhx9ArD8GZlWkRNc9CThHygWmf0/edit?usp=sharing

2. Interview, Ingeborg Okkels
https://drive.google.com/file/d/0B1S39ILUp2zZOGpiU3VuS0pXeHM/view?usp=sharing

3. Interview Affinity Clustering
https://drive.google.com/open?id=0B1S39ILUp2zZVTJpT2FoRlJrMG8

4. Sound Library
https://drive.google.com/open?id=0B56ech4PToHrV3IrMUFDZg4Nlk

5. Instructions for Sound-Diary
https://drive.google.com/open?id=1uGCul4vpyaqZLQN-xbyw9iU6Gi_msZ6ZfuAyg_Dg9KE

6. Collected material from Sound-Diaries
https://drive.google.com/open?id=10cS-w9I1dyGvnnAHs61Bo4wonXoOLOOGP0uc4i7Q
Video1: https://drive.google.com/file/d/0B1S39ILUp2zZdGdXV0IJzRvc0k/view?usp=sharing
Video2: https://drive.google.com/file/d/0B1S39ILUp2zZS1YywGWF4Q3RmRjg/view?usp=sharing
Video3: https://drive.google.com/file/d/0B1S39ILUp2zZMW8tRDeZQTQ5dHM/view?usp=sharing

7. Sound recording from the park context
https://drive.google.com/file/d/0B56ech4PToHrbGFUJRNlTVQcDA/view?usp=sharing

8. Affinity Diagram of Reflective Probes and Workshops
https://drive.google.com/open?id=1a_mGif1z8AYIKIhniLH5nrtR1skFtU0SyooffcHsBo

9. Library of final soundscapes in themes
Farm: https://drive.google.com/open?id=0B56ech4PToHrTF9SZGILtnJVNVE
Field: https://drive.google.com/open?id=0B56ech4PToHrVy1pwIU4UEJVTIQ
Forest: https://drive.google.com/open?id=0B1S39ILUp2zZWEJsvDQOQ4Y00
House: https://drive.google.com/open?id=0B56ech4PToHrd1ZnZ1VymO9MREU?usp=sharing
Shore: https://drive.google.com/drivefolders/0B56ech4PToHrd1ZnZ1VymO9MREU?usp=sharing
Village: https://drive.google.com/open?id=0B1S39ILUp2zZS25QbfFMyT29iR2M