

Sound interaction design and creation in the context of urban space

Arango, Julián Jaramillo

Programa de Diseño y Creación
Universidad de Caldas
Grupo DICOVI
julianjaus@yahoo.com

Abstract. This paper reports recent theoretical and creative results of an ongoing postdoctoral study entitled Sound Design for Urban Spaces. The study focuses on the design process of novel audio devices and studies listening strategies for people in transit through the city. Firstly, we will review some conceptual contributions concerning listening and acoustic analysis from the perspective of urban studies. We will argue that urban studies interpretation of musical composition concepts stresses some aspects of sound and listening that are relevant for the sound designer. Secondly, specific methodologies and procedures for sound interaction design and creation in the context of urban spaces will be discussed. In the last section, we will recount the design process of the Smartphone Ensemble, a project that has been got under way along with MA students from the Design and Creation program at the Caldas University in Manizales, Colombia.

Keywords: Mobile Music, Urban Sound Design, Sound Interaction Design

1 Introduction

Wi-Fi, 4G and GPS smartphone capabilities have inspired a new set of locative tools for the contemporary pedestrian. The distribution of computer software and hardware in the public space allows the passerby to interact with computer music applications everywhere. The more urban technologies increase their scope, the more sound takes part in everyday human-computer interaction. This paper will discuss sound and everyday listening from the perspective of design studies, examining the conditions of the urban space as the premises in the design of mobile computer music applications, products and services.

The projects reported in this paper are being created under a two-years postdoctoral research study entitled Sound Design for Urban Spaces, it focuses on the design process of novel audio devices and studies listening strategies for people in transit through the city. The study is funded by the Colombian science and technology research agency (Colciencias) and the University of Caldas design and creation program in Manizales hosts it. In the *laboratorio de sonología* we have conformed a group of designers, musicians and engineers that have been developing design projects around a set of questions raised in the study, such as: ¿What is the role of

sound in the human occupation of urban spaces?, ¿How does sound act in the two-way link between the city passer and his/her mobile computer?

In the first section we will look through some conceptual contributions concerning listening and acoustic analysis from the perspective of urban studies. Augoyard's notion of sonic effect will allow us to examine Pierre Schaeffer's sound object and Murray Schafer's soundscape. We will argue that urban studies interpretation of musical composition concepts stresses aspects of sound and listening relevant in the field of sound design, such as user experience and sustainability. Next section is dedicated to discuss some methodologies for interaction design and creation in the context of public spaces. We will review British theorist Frauke Behrendt's framework of mobile sound, which has been helpful to identify defined procedures for designers and creators interested in the pedestrian-computer sonic interaction. The last section will describe the design process and aims of the Smartphone Ensemble, a group of musicians and designers from Manizales that adopts mobile phones both as musical instruments and as social mediators.

2 Sound analysis in the urban context

Some studies [1] [2] coming from the *Centre de Recherche sur l'espace sonore et l'environnement urbain* (CRESSON) in Grenoble, have been discussing sound and listening from the perspective of urban analysis. Notably the theoretic work by Jean François Augoyard [1] proposes a set of analysis tools adapted to the contingencies of contemporary cities, the sound effects. The study embraces concepts and notions from XX century music composition theory, such as Pierre Schaeffer's sound object and Murray Schafer's soundscape, in a way that some aspects, rarely discussed in music contexts, are highlighted. Under the Augoyard interpretation, the sound object and the soundscape become complementary tools in the analysis of the urban environment.

In the one hand, Augoyard defines the sound object as "... the interaction of the physical signal and the perceptive intentionality" [1]. The author connects listening to the problem of the user experience, that gathers different concerns in contemporary design thinking. User experience based design research has developed diverse methodologies to extract user needs and habits [3]. In the case of sound, the approach to aural perception introduced by Pierre Schaeffer provides answers and directions to the "problems" placed by the user, in this case the passerby. Furthermore, Augoyard extracts from Pierre Schaeffer the matter of sound subjective perception, discussing selective listening, memory and hallucination as current issues on auditory urban activity. Nonetheless, under the Augoyard's view the sound object is too narrow to analyze architectural and urban space acoustic phenomena. The out-of-context method of sound-by-sound examination provided by Pierre Schaeffer is compared with a linguistic analysis focused at the level of the words and syntagmas.

In the other hand, CRESSON researchers critically adopt the soundscape theory. While recognizing its expansive evolution, the soundscape theory is assumed as the main model to understand environmental acoustics. For designers the soundscape concept becomes a fruitful analysis tool since it faces sonic urban activity as a sustainable design problem [2]. We would suggest that, unlike Pierre Schaeffer or John Cage approach to sound, listening and audio recording technology, the

soundscape theory is the only one that openly deals with sustainability from the perspective of design and creation [4], [5]. In the Murray Schafer conception of sound design, the musician is re-inserted into the society, playing the aesthetic role in a multidisciplinary ecological project. Augoyard, for his part, argues that the soundscape theory blurs the analysis of the urban acoustic environment, leaving out a series of everyday urban situations that would belong to the Murray Schafer's "low-fi" category. Therefore, Augoyard places soundscape theory near the linguistic analysis tools that covers the whole structure of the text.

In his catalogue Augoyard integrates Pierre Schaeffer and Murray Schafer theories in the inclusive concept of sound effect. To continue the linguistic analogy, sound effects would correspond to an analysis at the level of the sentence. Augoyard goes around acoustic and listening phenomena from different domains of reference that describe them: physical and applied acoustics, architecture and urbanism, psychology and physiology of perception, sociology and everyday culture, musical and electroacoustic aesthetics and textual and media expressions. Augoyard identifies the fields in which his study can be helpful, extracting a set of new directions for the urban sound designer.

3 Methodologies for urban sound design and creation

The theoretical contributions coming from CRESSON contemporary urban design have feed our aim to envisage new venues for computer music experiments and to find ways to engage new computer music practitioners. The complexity of sound and listening activity in the urban context examined by Augoyard have been one of the conceptual resources of the two-years postdoctoral study "Sound Design for Urban Spaces" [6]. Listening topics involving subjective sound perception, such as anamnesis, phonomnesia or perdition [1], have been explored in our analysis of the local acoustic environment faced by the pedestrian in Manizales.

Along the first phase of the postdoctoral study we have created the *laboratorio de sonologia* in the School of Design. We are identifying and evaluating alternative technologies available to designers and useful in the field of Sonic Interaction Design, that can be defined as the "... practice and inquiry into any of various roles that sound may play in the interaction loop between users and artifacts, services, or environments" [7]. The projects developed in the *laboratorio de sonologia* are oriented to the urban context; furthermore the study identifies the pedestrian as the main recipient and the end user of the design projects. The study aims to feed what Brazilian media theorist André Lemos calls "informative territories" [8], inserting sound into the equation of mobile technology, locative media, the internet of things, and the recent concept of Smart Cities.

Frauke Behrendt classification of locative media sound projects has been helpful to identify defined procedures for designers and creators interested in the pedestrian-computer sonic interaction. The study proposes a framework with four different directions in the field of sound mobility: musical instruments, sonified mobility, sound platforms and placed sound [9]. This study In the *laboratorio de sonologia* we have created portable systems that would belong to the Behrendt musical instruments

category, such as the application prototypes developed for the Smartphone Ensemble. Since the mobile phone were not designed with a specific musical purpose, play an instrument with it could be considered a kind of “mis”-use; moreover when the musical performance is being carried out in the public space. Furthermore, we have developed a study that evaluates musical instrument apps based on self-developed expressiveness criteria [10]. The AirQ Jacket [6], a wearable computer that displays through light and sound air quality data, could be an example of Behrendt notion of sonified mobility. This category comprises works “...where audience [or user] mobility is ‘driving’ or influencing the sound or music they hear while being on the move” [9]. Finally, cartography and soundwalk exercises carried out with MA students, where audio recordings and sonic compositions are geo-referenced with a local park in Manizales, could be considered in Behrendt taxonomy: in the placed sound category, “... artists or designers curate the distribution of sounds in (outdoor) spaces, often – but not exclusively – by using GPS”. [9].

4 Designing prototypes for the local urban environment: the smartphone Ensemble

The Smartphone Ensemble (SE) consists in including six regular members coming from the Master in Design and the Music School. On the one hand, the group explores smartphones as musical instruments creating custom-made applications with different computer music synthesis methods. We have created audio processing software using Peter Brinkmann libpd library [11] that allows sketching audio applications in the Pure Data Vanilla distribution. The GUI devices have been created with Daniel Iglesia’s MobMuPlat, [12] which provides a GUI prototyping tool available to designers.



Fig. 1. Public intervention of the Smartphone Ensemble at the Gotera Park (Manizales) on November 13, 2015.

On the other hand, the SE explores smartphones as social mediators performing public interventions in urban spaces. SE improvisation based performances are structured according to short and defined tours around a specific public place (the university campus, a neighborhood, a park, a building, a shopping mall, a market). In this spirit, atypical places can become a suitable performance space for SE musical interventions. Since additional amplification is required in urban environments, we designed a wearable speaker system for SE outdoor interventions and rehearsals []. The first SE performance was carried out in the Manizales Gotera park on November 13, 2015, within the “electronic picnic”, a regular event organized by governmental institutions Vivelab [13] and Clusterlab [14]. The group walked through the park following a trajectory while improvising over four different musical ideas.

In the *laboratorio de sonologia* we conducted an experimental study examining which components and qualities of smartphones are more propitious for implementation on a musical environment and observing collaboration, intuition and interdependency phenomena [15]. The study was developed taking into account that musicians and non-musicians have different approaches, as a Master dissertation in Design Studies.

Instead of discussing smartphone capabilities, as recent studies do [16], [17], our study is focused on usability. In this regard, we adopted some user-centered methodologies [18], [19], [20] that led us to a four phase process: (1) information and research where relevant data were gathered, (2) analysis where user needs were observed and identified, (3) synthesis in which possible solutions were proposed and (4) evaluation where proposals were valued. We conducted two sets of surveys; one of them requested general opinions about musical interaction with smartphones over a population of 21 non-experts. The other one, conducted over the 6 SE members, addressed the concept of musical expressivity, defined as the index among precision degree (P), action-response correspondence (C) and visual feedback quality (V). Being familiar with smartphone music making, the ensemble was requested to value musical expressivity playing rhythmic patterns and sustained notes in custom made applications that we developed for the study.

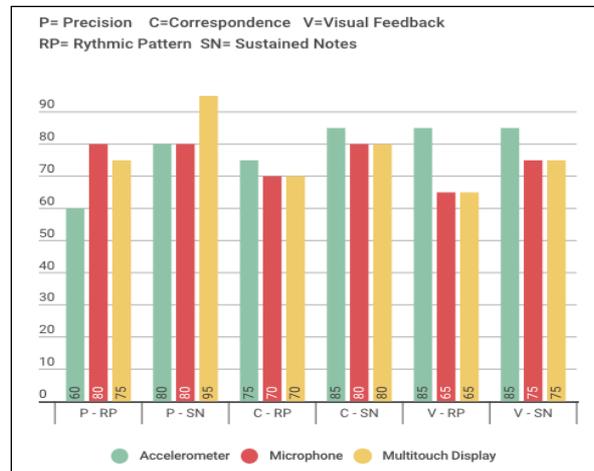


Fig. 2. Musical Expressivity valued in different smartphone input methods by the six members of the Smartphone Ensemble.

There are different conclusions that we have drawn from the study results. In this paper we would remark that although touch screen and microphone seems to be more precise than the tilt sensor, they were comparatively less valued in the action-response correspondence appreciation. When visual feedback was rated, the tilt sensor was significantly better valued than the other tested input methods. It suggests that the freedom of the body movement, allowed by the tilt sensor and hindered by the touch screen and the microphone, is an important consideration in the design of mobile music applications. Moreover, the results support our intuition that mobility, in this case through the city, is an essential consideration in smartphone music making.

5 Conclusions and further Work

In the city the sound designer faces a challenging context, not only because an arsenal of technological resources is now available, but also because new conceptual directions are being discussed. On the shoulders of Pierre Schaeffer and Murray Schafer, Augoyard extracts concrete urban listening situations for close examination. His interpretation raises relevant topics in the design thinking, such as user experience and sustainability. For her part, Berhendt proposes concrete design procedures gathering projects in defined categories. Her classification of mobile music helps to recognize other projects goals and to identify truly original ideas from apparently spontaneous insights. However, the creation process in the field of sound design still requires methods of evaluation that allows the designers to go further in their projects. The Smartphone Ensemble proposes a research-creation-observation-evaluation iterative cycle. Since the process is still in the second round, we are still drawing usefull conclusions in order to improve the design prototypes.

On May, 2016, The University of Caldas will host the *Festival Internacional de la Imagen* [21]. SE will perform a new intervention in the hall of the event main building. Other projects developed under the Sound Design for Urban Spaces study will be presented in the *Festival* such as, the running prototype of the AirQ Jacket, a project of visualization and sonification called Esmog Data and a one-day seminar called *Encuentro de Sonología* [6], where researcher from different academic institutions will present works and reports of sound related projects [6].

6 Acknowledgements

This work is a result of a research funded by Departamento Administrativo de Ciencia, Tecnología e Innovación (COLCIENCIAS), Grant 656.

References

1. Augoyard, Jean François, Torge, Henry (2005). *Sonic Experience, a guide to everyday sounds*. Montreal, McGill-Queen's University Press
2. Hellstrom, Bjorn. "Towards sound Design". (2003) In. *Noise Design. Architectural Modelling and the Aesthetics of Urban Space*. Bo Ebya Forlag. Sweeden. (pp 31-40)
3. Norman, D., *The Design of Future Things* (2005). Paperback. New York
4. Gallopin, Gilberto. (2003). *Sostenibilidad y desarrollo sostenible: un enfoque sistémico*. Santiago de Chile: Cepal
5. Manzini, Ezio. (2006). *Design ethics and sustainability*. Milano: Dis-Indaco-Politécnico di Milano.
6. J. J. Arango. *Diseño de Sonido para el Espacio Urbano*. (2015) <https://sonologiacolombia.wordpress.com/>
7. Rocchesso, D., Serafin, S., Behrendt, F., Bernardini, N., Bresin, R., Eckel, G., et al. (2008). *Sonic interaction design: sound, information and experience*. CHI '08 extended abstracts on Human factors in computing systems, Florence
8. Lemos. A. *City and mobility. Cell phones, post-mass functions and informational territories*. (2007) *Matrizes, SãoPaulo*, n1, p121-138,
9. Behrendt, Frauke., (2010) *Mobile sound: media art in hybrid spaces*. PHD Thesis, University of Sussex.
10. D. Melan (MA Dissertation). (2015) *Interactive design for collaborative sound creations via mobile devices: Towards a perspective of music creation through design practices*. 2015. Design department. University of Caldas.
11. P. Brinkmann, P. Kirn, R. Lawler, C. McCormick, M. Roth, & H.-C. Steinser. *LibPD*. (2011) *Embedding pure data with libpd*. In *Proc Pure Data Convention*.
12. D. Iglesia. *Mobmuplat*, (2013), mobile music platform <http://mobmuplat.com>
13. *Vivelab Manizales*. <http://www.vivelabmanizales.com/>
14. *Clusterlab*. <http://clusterlab.co/networking/eventos/ii-picnic-electrnico-20>
15. G. Weinberg, *Interconnected Musical Networks: Toward a Theoretical Framework*. (2005) *Computer Music Journal* 29(2):23–39.

16. G. Essl., M. Rohs. "Interactivity for Mobile Music Making", (2009) Organised Sound 14:2 197-207
17. A. Misra, G., Essl, M., Rohs. "Microphone as Sensor in Mobile Phone Performance" (2008) In Proceedings of the 8th International Conference on New Interfaces for Musical Expression (NIME 2008), Genova, Italy, June 5-7
18. A.B. Findeli. Research Through Design and Transdisciplinarity: A Tentative Contribution to the Methodology of Design Research. (2009) http://www.swissdesignnetwork.org/daten_swissdesignnetwork/docs/04_Findeli.pdf.
19. S. Moroni. Apuntes Introducción Diseño - apunte_01-taller-de-diseno-y-creacion. (2008) https://disenoaiep.files.wordpress.com/2008/03/apunte_02-taller-de-diseno-y-creacion.pdf.
20. J. C. Jones. Design methods. (1992) John Wiley & Sons.
21. Festival Internacional de la Imagen. www.festivaldelaimagen.com/