alarm/will/sound: A Multidisciplinary Research/Installation Project

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Abstract *alarm/will/sound* is a researched-based interdisciplinary project, currently being developed by Korea-based composer and sound artist Alexander Sigman and Stuttgart-based product designer/visual artist Matthias Megyeri—in collaboration with the IRCAM Sound Perception and Design (SPD) research team.

The primary objective of this project in progress is to transform the car alarm from a passive, oft-ignored public nuisance with a predictable repertoire of sounds into a dynamic and intelligent **interactive audio-visual instrument** that engages with the car's environment. The first phase of the project (January-August 2013) has consisted in building, organizing, and indexing sound libraries, generating semantic and acoustic descriptors, and designing machine-learning-driven interaction systems.

During the second phase (September 2013-February 2014), the sound library categories will be evaluated and refined through sound perception experiments, the interaction systems implemented and trained, and the hardware for a series of car alarm prototypes constructed. Uniting the fields of sound art, perception research, product design, and industrial design, it is hoped that the outcomes of this project will have artistic, research, and interface design applications.

To date, the audio and interface design for many components of vehicles—e.g., the sound system, engine, exhaust system, horn—have received significant attention. However, there is little variation from one automobile security system to the next in sound vocabulary and triggering mechanism design. Why is this the case? What *is* the essential function of the alarm system: to deter potential perpetrators, to alert a car's owner, to inform the public of a possible danger, or to delineate a boundary between a public space and the private space of the automobile? If a security system's sonic vocabulary is expanded and sensitivity to specific physical parameters is heightened, is its kernel identity preserved or shifted? In an effort to critically and creatively address these questions, Korea-based composer and sound artist Alexander Sigman and Stuttgart-based product designer/visual artist Matthias Megyeri—in collaboration with the IRCAM Sound Perception and Design (SPD) research team—are currently undertaking a pioneering researched-based interdisciplinary project entitled *alarm/will/sound.* This paper is intended as a broad introduction to and progress report on the project, rather than as documentation of a finished product.

1. Audio design and auto design—a mutual regard

The convergence of sound engineering and auto design is nothing new. Whether refining the acoustics of the sedan cabin, installing the optimal speaker-system, enhancing the invigorating sound emitted from the engine upon ignition, or selecting the tone assigned to a remote "entry system," the auditory aspect of the driving experience is treated with great sensitivity. Whenever a driver or (especially) a mechanic detects an internal malfunction, a degree of sophistication is required to isolate a given sound from a far more complex "scene," a veritable "orchestra" of sound -structures.

However, there are two sound-emitting devices for which little variation from one vehicle to the next is evident: horns and security systems. While there have been recent advances in car horn design **(Lemaitre et al 2009)**, a projected signal is meant in all cases to be unambiguous...and unambiguously directed towards a particular party. But the matter becomes more intricate when addressing alarms. To whom is the alarm -signal directed? The potential perpetrator? The owner? Passers-by/police? How is one to respond exactly? One may identify two common reactions: 1) such alarms are irritating, and continue for too long; 2) and are therefore often (to be) ignored.

There does exist a general tendency in designing any security system to prohibit the pure functionality of the system from being compromised or dwarfed by aesthetic considerations. Yet, the "repertoire" that typifies the standard car-alarm has established an iconic presence in itself in popular culture, divorced from a particular function. A brief survey of Youtube videos, for instance, will reveal countless examples of footage of people dancing to alarms. Although one may dismiss such actions as mildly comedic novelty acts, they do reveal a more serious implication, often taken for granted: parked in a public setting, the "private space" consists of not only the interior of the vehicle...but also extends to a rather wide radius around the car—i.e., even standing in close proximity to the vehicle, especially when an alarm has been activated, may be perceived as suspect.

In undertaking the current project, we have been exploring this delineated boundary between public and private space, as well as the influence of alarm-systems upon human behavior to a greater extent. What if the passerby's position in relation to the car—or a change in any other physical parameter—could alter one (or more) of the alarm's sound parameters? Would a security system be capable of inviting/engaging the unsuspecting pedestrian in an intimate, car-internal listening experience, rather than deterring such an intrusion? If an alarm-repertoire is (seemingly) incessant, but sufficiently interesting, will one modulate one's mode of listening, substituting a set of expectations proper to a concert-situation, rather than instinctively ignoring the alarm or avoiding the vehicle's location?

Besides the exploration of car-alarm/human interactions, questions regarding the identity of the alarm system, as an object, a product, in and of itself, have arisen. If the basic apparatus of the product is maintained, but its function has been modified or radically shifted, does its integrity as a product abide? Or does this mere "isomorphic" relationship to the alarm model constitute a complete redefinition of the object? That it so say: wherein lies the alarm system's identity—its hardware/components, the sounds projected, or the responses elicited from those within the vehicle's vicinity?

2. Artist Backgrounds and Motivations

As a composer, **Alexander Sigman** has recently been interested in the influence of the sounds of physical environments on the aesthetics of composers and sound artists, as well as the impact of composers and sound artists on physical environments. Many of his recent ensemble, electroacoustic, installation, and media works deal with the reconstruction of, interaction with, and importation of sonic source materials from urban and industrial environments. Over the past several years, he has collaborated with filmmakers, video artists, visual artists, sculptors, and dancers on a diverse array of projects.

In addition to his compositional activities, Sigman also has a background in Cognitive Science—Music Cognition and Timbre Perception in particular— and has thus been approaching the project from both an artistic and research perspective.

Coming from a political poster design and public art background, Stuttgart/London-based artist **Matthias Megyeri** is interested in how the human mind produces practical solutions for the problems of security as well as how one can create an alternative model by still keeping the conflict between power and control alive in the design process. This question may seem to be limited to the economy of industrial design, but through his multi-layered research and conceptual artistic approach the cultural, social, and psychological aspects of protection, and privacy comes out in accordance with how the language of security is visually articulated.

To date, Megyeri's work has spanned the artistic and commercial sectors. With *Sweet Dreams Security*®, his commercial home security company and brand established in 2003, Megyeri proposes a climate change for the way in which one approaches the "institution of security," demanding to rethink the way security is traditionally reproduced, and creating a line of alternative products, all by a simple gesture. This gesture replaces the fear from others with a friendly proposal just by smiling—sometimes literally, sometimes conceptually—and positioning them not as potential criminals, but potential friends. The strangers who pass by the windows secured with Megyeri's fences or doors locked by his bear-faced lockers are exposed to the expression of smiley – "they" become "we." Since 2006, five works from the *Sweet Dreams Security*® line have been part of the New York Museum of Modern Art permanent collection.

As a Stuttgart native, Megyeri has also maintained a long-standing interest in directly engaging with the automobile industry dominant in the region (Stuttgart is home to both Mercedes and Porsche)—with respect to both car design practices and relationships between car manufacturers and artistic institutions and artists.

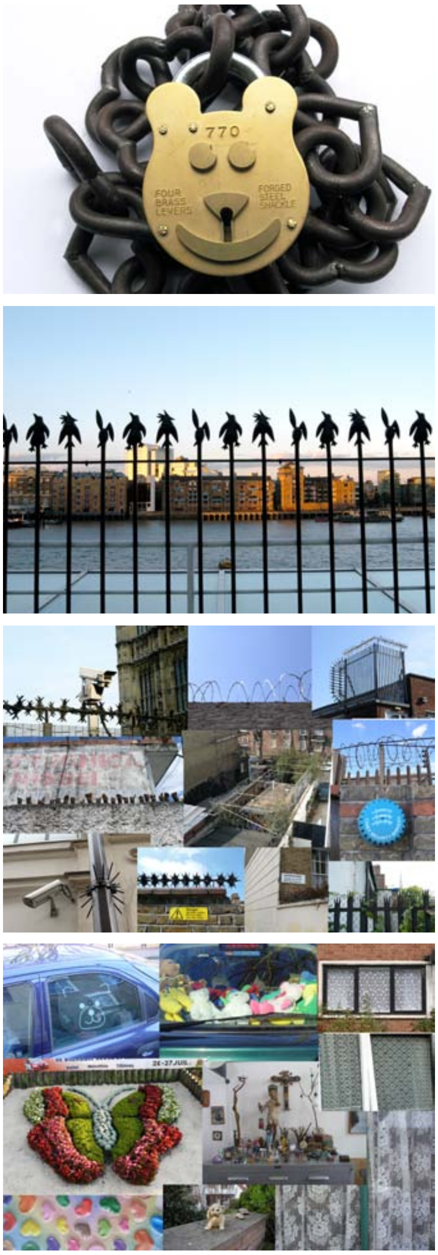

Figure 1. From top to bottom: Matthias Megyeri's *Sweet Dreams Security*® bear-shaped padlock; Megyeri's animal picket fence; examples of security devices at the boundary of public and private space; examples of cute objects at the boundary of public and private space.

3. IRCAM and the Auto Industry: Research Precedent

In recent years, the IRCAM Sound Perception and Design (SPD) team has been engaged in several research projects pertaining to both environmental and automobile sound design and perception. In 2009, a study on car horn sound quality was conducted (see reference above) that aimed at providing perceptually-based specifications for creating new sounds for car horn. In the same period, another research project dealt with a methodological question: the perceptual influence of instruction modality (verbal vs. visual) on identification and judgments of car interior sonic events **(Susini, Houlx, Misdariis et al. 2009)**. In the Human-Computer Interface (HCI) field, the team has also contributed several significant publications, including studies on: a) the influence of audio features on the perceived urgency and its design application to several car interior Human-Machine Interfaces (HMI) **(Suied et al. 2008);** and b) different sonification approaches of an automotive media-center hierarchical menu and its evaluation in terms of navigation performance **(Misdariis et al. 2011).** More recently, IRCAM's partnership with the French automobile manufacturer Renault, in conjunction with composer Andrea Cera, on sound design for electric vehicles (one commercialized model and several concept-cars) **(Misdariis et al. 2012),** has received significant publicity. This project has led to complementary works-in-progress in this domain such as a recent study of electric vehicle detectability in urban environments **(Misdariis et al. 2013)**.

alarm/will/sound follows in this line of timbre-perception-research-driven vehicle sound design. Besides adapting methodologies proper to previous IRCAM researches, we are drawing upon the extensive auditory warning literature—both specific to automobile auditory signals **(Yamauchi et al. 2004)** and to more general categories of auditory signal **(Edworthy & Hards 1999; Kuwano et al. 2007; Petocz, Keller & Stevens 2008; Stanton & Edworthy 1998).** In addition, studies in sound classification **(Claude 2006; Michaud 2012)** and auditory display **(Barrass 1997)** have informed our research and design approaches.

4. Car Alarm Origins

The first car alarm patent dates from 1919. The invention consisted of a switchboard for enabling and disabling the alarm (either the existing car horn, or an additional electric horn), and a mechanism for opening the ignition circuit for preventing car operation. The controlling switchboard functioned like a combination lock: the driver threw a certain number of switches, with no visible change to the outward appearance to the switchboard. If a perpetrator were to reset the incorrect switches (assuming that the device is not concealed), or to crank the car or start the battery without disabling the alarm, the horn would sound.

An alarm invented nearly a century ago, prior to the introduction of the key-operated ignition circuit, may seem primitive at first blush. Nonetheless, the combination lock model upon which the alarm-activation interface was based provides a compelling model for possible car alarm interaction design innovations—whether taken literally or loosely interpreted (see Section 10 of this paper).

5. Alarmingly Useless: Problems with the "Car Alarm as Deterrent" Model

Why introduce innovations to a purely functional device that is ostensibly straightforward in its design? In a 2003 report analyzing the benefits, costs, and effectiveness of car alarms in New York City **(Friedman et al. 2003)**, evidence supporting the overwhelming inadequacy of audible car alarms as deterrents is clearly presented. According to a former alarm installer interviewed by the authors of the study, "'[t]he vast majority of alarms can be disabled in, literally, ten seconds…[a]nd a knowledgeable thief can take apart the most sophisticated $1,000 alarm system in less than five minutes.'"[1] The report indicates that "[o]rganized professionals now account for 80% of stolen cars, and alarms don't deter them at all."[2]

Furthermore, the majority of alarms are false. False alarm estimates have varied, but most fall within the range of 95% to 99%.[3] As a result, alarms are most often ignored. The report cites a Progressive Insurance Company survey, which found that fewer than 1% of respondents would call the police upon hearing a car alarm.[4] Journalist Patrick Cooke provides anecdotal evidence supporting this tendency:

> "One evening not long ago, while walking his dog along West 77th Street, writer Charles Mann spotted a fellow at the end of the block behaving strangely. 'The guy was going down the street rocking parked cars back and forth,' Mann recalls. This rocking inevitably set a car alarm to wailing. By the time Mann had reached the end of the block and saw the broken glass, he had figured out what was going on. 'The thief knew that nobody in the neighborhood would pay the slightest attention to a car alarm,' he says, 'so he used the noise to cover the sound of breaking the window. Then he stole the radio out of the car.'"[5]

6. Extant Alternatives to the Audible Alarm

Besides devices such as brake and wheel locks and passive immobilizers, the Lojack Stolen Vehicle Recovery System has proven to be a highly successful alternative to the standard audible car alarm. Rather than emitting tones, the Lojack system is a radio transceiver installed in various locations in vehicles that employs GPS technology to track a vehicle in the event of a reported theft. As many stolen cars are destined for the "headquarters" of professional auto theft crime rings, this device enables authorities to prevent future car theft and locate additional (unreported) stolen vehicles.

While the objective of our project is to modify and extend *audible* alarm systems, it would be of interest to utilize embedded GPS in designing interaction models (see Section 10).

Other (relatively) successful deterrence strategies that have informed our research derive from the public space security domain. In the past decade, there have been campaigns to curb anti-social behavior amongst younger people congregating in urban centers—particularly in the UK and Netherlands. The so-called Mosquito anti-loitering device is one such innovation emerging from such campaigns (see Figure 2). The Mosquito emits a high frequency (17 KHz.) that lies outside of the audible range for most adults above the age of ca. 25. For those within the age range of 13-25, the painful sound level at which the frequency is emitted (theoretically) causes crowds of loitering teenagers to disperse.

Another targeted dispersal method involves the projection of classical music recordings into public spaces. Comforting to all but individuals exhibiting anti-social behaviors, there has been evidence of such individuals avoiding these designated areas. Needless to say, this practice brings up a host of sociological concerns regarding the relationship between security and music aesthetics, the use of music as a defensive weapon, the perpetuation of associations of classical music with social class and authority, and public/private space boundaries.

One aspect of our investigation of social behaviors vis-à-vis alarm systems will entail an inversion of this music-as-deterrent protocol. As is elaborated in Section 9, one category of our alarm prototype sound corpus consists of synthetic fragments typical of digital electroacoustic music, but strange or unfamiliar to most listeners. We intend to analyze responses to this sonic material when it is presented in the context of a car alarm system's repertoire. Will it be possible through the expansion of the alarm's sonic vocabulary in this manner to *encourage* close listening and interaction with the alarms?

Figure 2. The Mosquito. (http://movingsoundtech.com/our-products/mosquito-mk4-with-multi-age)

7. Car Alarm Communication Model

From our perspective, the alarm system may be regarded not only as a functional deterrent, but also as a nodal point of interaction. In the context of *alarm/will/sound*, the alarm prototypes to be developed have been conceived as both **instruments**, activated and manipulated by humans, and as intelligent "**interlocutors**," sensing and responding to changes in the environment, and adapting their behavior patterns accordingly. As such, the alarm's relationship to society expands from a fixed one-way communication stream to a fluid, environment-specific dialogue. The alarm prototypes will thus bear the potential to expand the usual repertoire of **modes of deterrence,** while introducing several **modes of user engagement**.

8. Project Phases and Tasks

The project has been divided into two primary phases: 1) conception, design, and production of sound libraries and interactive systems; 2) refinement and validation of results.

Phase I (January-August 2013):

The first objective in this phase of the project was to define the functionality of the alarm systems. In keeping with our "interactive instrument" alarm model, two salient alarm functions were established: 1) perpetrator deterrence *and* user engagement via an expansive, unpredictable, and time-varying catalogue of individual sounds and sound-complexes; 2) detection and communication of local (physical and cultural) environmental information to the user.

With these functions in mind, a sound library taxonomy was constructed (see Figure 3). Representative sounds for each category and sub-category in the taxonomy were selected, generated, edited, and tagged with semantic descriptors. In parallel, interaction and hardware designs were drafted, and necessary materials and possible hardware configurations determined (see below).

Phase II (September 2013-February 2014):

The experimental component of the project will revolve around the sound library produced in the first part of the project. Experiments will be designed and conducted based upon both the composer's (A. Sigman) and the product designer's (M. Megyeri) intuition and expertise, together with preliminary formal knowledge on alarm sound morphology/functionality and everyday sound perceptual structures. The main goal of the experiments will be to define semantic and/or acoustic categories relevant to organizing the original sound library, as well as to estimate physical or perceptual distances between actual alarm sounds and the non-standard sounds included in the corpus. Further expansion and refinement of this corpus will subsequently be informed by the results of these experiments.

Two main sets of experiments will be conducted. The first will test for salient acoustic descriptors to be applied to the sound library entries. Once these descriptors have been applied accordingly, semantic categories will be derived and assigned. The experimental protocols and goals are described in greater detail below.

Acoustic descriptors experiments. An objective characterization of the corpus will be undertaken in order to reveal shared and/or specific features among the sound corpus entries, either in terms of spectral or temporal (morphological) aspects. Standard acoustic descriptors will be computed and correlated with perceptual similarity data.

Sound category membership experiments. A subjective evaluation of different dimensions (similarity, urgency, annoyance, preference, etc.) will enable estimation of different perceptual distances (either mutual or related to an actual alarm sound reference), leading to the definition of semantic categories and descriptors by which the sound corpus may be tagged in a perceptually relevant manner. This approach will make use of traditional methods such as similarity judgments, categorization tasks, semantic scale evaluation, etc. Moreover, given the size and scope of the sound corpus and the explorative specificity of the experiments, utilizing a crowdsourcing protocol for deploying such experiments online will be strongly considered.

9. Sound Categories, Parameters, and Sources

Categories and Sound Parameters

As is indicated in Figure 3, three primary sound categories were devised: 1) real alarm sounds; 2) individual sounds; and 3) "auditory scenes," or sound complexes of various durations composed of multiple individual sounds. Category (3) was then subdivided into a) recorded and b) synthetic sounds.

Individual sounds were grouped according to a) context; b) sound source **semantic category**; c) sound source **physical material;** d) sound source **physical mode of production** and e) sound source **acoustic property description.** Acoustic properties include attack-type, temporal envelope, spectral envelope, and (relative) duration.

As such, the **Individual Sound** taxonomy becomes rather complex. At the highest level in this taxonomy, constituent sounds were segmented into **Synthetic/Electroacoustic, Natural/Vocal, Mechanical/Industria**l, and **Film Danger Icon** categories.

The **Synthetic/Electroacoustic** category consists of sounds created via synthesis techniques typical of electroacoustic music of the past 40-50 years, as well as auditory illusions (e.g., Shepard glissandos and monaural beats). Human and animal vocalizations—primarily of a threatening, urgent, or otherwise attention-attracting nature—are included under the **Natural/Vocal** rubric. As the most multifaceted category, the **Mechanical/Industrial** rubric is constituted by electrical and mechanical tool, appliance, and vehicle sounds (trains, boats, airplanes, and helicopters), as well as explosions, gunshots, impacts, and ricochets. **Film Danger Icons** are clichéd (or at least highly recognizable) tension/danger cues found in classic and modern cinema scores. Finally, the **Real Alarm Sounds** category consists of six entries belonging to a standard car alarm cycle—in sequence, and in combination with an iterated car horn.

In all cases, sounds that were too similar to auto/traffic sounds, were likely to be masked by the vehicle's physical environment, or did not draw adequate attention to themselves (e.g., ambient natural sounds) were avoided.

Sound Sources

Among the non-synthetic sounds in all three primary categories, the majority were mined from existing sound databases (e.g., SoundIdeas, Blue Box, Auditory Lab [http://www.psy.cmu.edu/~auditorylab/website/index/home.html], and freesound.org). Under the "Auditory Scenes-Recorded Sound" rubric, a series of field recordings of public spaces in Paris—streets, the Forum Les Halles shopping concourse, the Centre Pompidou, metro stations, and train car interiors—were compiled in February 2013. It is intended that the collection of field recordings be expanded over time to include further site-specific entries, both by the authors and by alarm prototype users (see below).

Synthetic individual sounds were generated and edited using such synthesis software as AudioSculpt, Pure Data (Pd), SuperCollider, and the Python-based concatenative synthesis program Audioguide (authored by composer Ben Hackbarth).

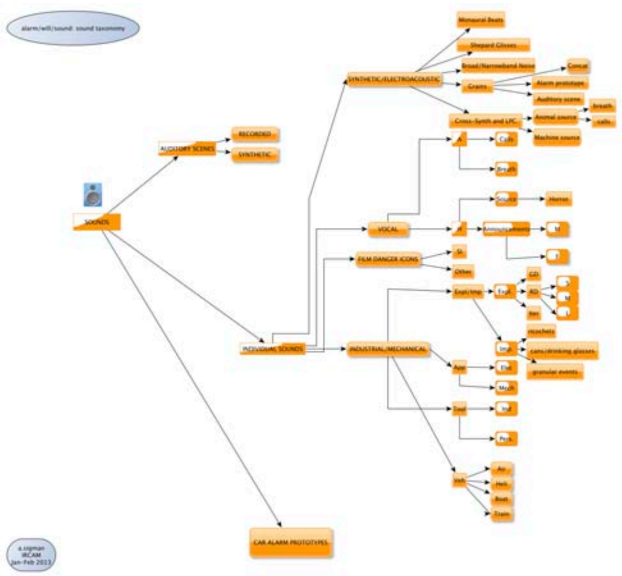

Figure 3. Sound library taxonomy.

10. Interaction Design Models

There will be three basic modes of interaction associated with our alarm prototypes: enabling/disabling, triggering, and data transmitting. Extending the "combination lock" functionality of the earliest patented car alarm (discussed in Section 4), we have been experimenting with physical enabling/disabling codes: a sequence of gestures on the surface of or in close proximity to the vehicle detected by a sensor network.

Activation-type will vary according to three possible alarm triggering settings: 1) self-triggered; 2) time-constant, passerby-triggered; and 3) time-varying, passerby-triggered. In the self-triggering scenario, the alarms will be set off at irregular intervals, independent of the actions of the passerby. For the time-varying setting, changes in sound quality, type (i.e., sound library entry), or spatial location will correspond to changes to any detectable physical parameter associated with the passerby (e.g., proximity, position with respect to the vehicle, orientation, angle, and speed).

As a supplement to these standard alarm functions, we will repurpose the GPS technology at the core of Lojack and other systems in order to sonically convey localized environmental data to the vehicle driver. Such data will include (but not be limited to) weather conditions, urban "auditory scenes," and location-specific musical samples and acoustic information.

11. Expected Project Outcomes

Given the authors' activity in and interplay with artistic, research, and industrial domains, it is intended that the research and development of car alarm prototypes a) be presented in site-specific installation contexts; b) inform future research pertinent to security systems and car sonification; and c) apply to car industry innovations.

The installations will be designed according to two basic scenarios: a) as a series of public space "interventions" and b) as an interactive exhibition in a gallery space. In the former situation, alarm prototypes will be embedded in vehicles parked throughout an urban environment. These alarms will be alternately triggered by passersby and self-triggered, and responsive to physical and environmental changes. In the latter, the prototypes will possess the same functionality as in the public space scenario, but also enable exhibition visitors to control, manipulate, and expand the sonic repertoire and patterns emitted by the alarms. Visitors will be able to search the sound database via entering descriptive terms at a central console and select individual sounds or construct "auditory scenes." In addition, they will be requested (via an online platform) upload recordings derived from their respective physical environments for possible inclusion in the sound corpus.

In recent years, certain high-end automobile manufacturers (e.g., Porsche and Rolls-Royce) have customized features of their models according to customer specifications. Given the experimental and idiosyncratic nature of our project, it is expected that our alarm prototypes will bear more potential "bespoke" than mass-market applications. However, given the ever-increasing integration of mobile technologies, the need for creative solutions for (mass market) car companies to differentiate themselves from their competitors, it is not unimaginable that aspects of these prototypes—be it the interactive system designs or sound corpus entries—could be adapted by auto industry sound design teams.

12. Conclusion

By February 2014, it will be highly unlikely that the *alarm/will/sound* project will have attained completion. Rather, it is our intent to lay a firm foundation—through design, production, and experimentation—for continued expansion and refinement. The constraints and specifications applied to *hardware* design of the alarm prototypes—a dimension of the project not thoroughly addressed in this paper—will largely be determined by the nature of our collaboration with the auto industry.

References

Barrass S. (1997). *Auditory Information Design*. (Doctoral Dissertation.) Australia National University, Canberra, Australia.

Claude O. (2006). *La recherche intelligente des sons*. (Masters Thesis.) Université de Provence, Aubagne, France.

Edworthy J., Hards R. (1999). Learning auditory warnings: The effects of sound type, verbal labelling and imagery on the identification of alarm sounds. *International Journal of Industrial Ergonomics* 24: 603-618. London: Elsevier.

Friedman F., Naparstek A, Taussig-Rubbio M. (2003). Alarmingly Useless: The Case for Banning Car Alarms in New York City. *Transportation Alternatives*. Retrieved from http://www.transalt.org/files/newsroom/reports/carala rms/ on February 08, 2013.

Kuwano S., Namba S., Schick A., Höge H., Fastl H., Filippou T., Florentine M. (2007). Subjective impression of auditory danger signals in different countries. *Acoustical Science and Technology* 28/5: 360-362. Tokyo: The Acoustical Society of Japan.

Lemaitre G., Susini P., Winsberg S., Letinturier B., McAdams S. (2009). The sound quality of car horns: Designing new representative sound. *Acta acustica united with Acustica* 95/2: 356-372. Stuttgart: S. Hirzel-Verlag.

Michaud P.-Y. (2012). *Distorsions des systèmes de reproduction musicale: Protocole de caractérisation perceptive.* (Doctoral Dissertation.) Aix-Marseille Université, Marseille, France.

Misdariis N., Gruson A., Susini P. (2013). Detectability study of warning signals in urban background noises: a first step for designing the sound of electric vehicles. *Proceedings* *of Meetings on Acoustics (POMA)-ICA 2013 Montreal*. Melville, NY: Acoustical Society of America.

Misdariis N., Tardieu J., Langlois S., Loiseau S. (2011). Menu Sonification in an Automotive Media Center : Design and Evaluation. *Human-Computer Interactions in Transport,* ed. Christophe Kolski: 233-281. London and Hoboken, NJ: ISTE Ltd./John Wiley & Sons, Inc.

Petocz A., Keller P.E., Stevens C.J. (2008). Auditory Warnings, Signal-Referent Relations, and Natural Indicators: Re-Thinking Theory and Application. *Journal of Experimental Psychology: Applied* 14/2: 165-178. Washington, DC: American Psychological Association.

Stanton N., Edworthy J. (1998). Auditory affordances in the intensive treatment unit. *Applied Ergonomics* 29/5: 389-394. London et al.: Elsevier Ltd.

Suied C., Susini P., McAdams S. (2008). Evaluating Warning Sound Urgency With Reaction Times. *Journal of Experimental Psychology: Applied* 14/3: 201-212. Washington, DC: American Psychological Association.

Susini P., Houix O., Misdariis N., Smith B., Langlois S. (2009). Instruction's effect on semantic scale ratings of interior car sounds. *Applied Acoustics* 70/3: 390-399. London et al.: Elsevier Ltd.

Yamauchi K., Choi J., Maiguma R., Takada M., Iwamiya S. (2004). *Journal of Physiological Anthropology and Applied Human Science* 23/6: 295-298. Tokyo: Japan Society of Physiological Anthropology.

[1] Friedman et al (2003), 10.

[2] *Ibid.*: 9.

[3] *Ibid.*: 2.

[4] *Ibid.*: 1.

[5] *Ibid.*: 11.