Common Sound Scenarios –
A context-driven categorization of everyday sound environments for application in hearing-device research

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ABSTRACT

In order to design laboratory tests (for evaluation of signal-processing features) that have the potential of indicating real-life benefit, there is a need for more information about the listening situations people encounter and the intentions people have in these situations.

Based on a literature review, a structured framework of common sound scenarios (CoSS) was developed. Intentions and tasks constitute the main categories in the framework, and 14 common sound scenarios were selected and described.

The literature search showed a general lack of studies investigating acoustic environments and listening situations, in particular studies where normal-hearing informants are included and studies performed outside North America and Western Europe.

METHOD

A literature search was performed September – November 2013. Acoustic environments and listening situations were extracted and categorized using a systematic approach.

1. First, a *general literature search* was performed with the purpose of identifying central research areas.

2. Then, a more *specific literature search* was performed with the purpose of finding studies that could be used for data extraction.

3. Data were then *extracted* from the publications found and *categorized* in a systematic way.

4. Finally, a set of *common sound scenarios* was selected.

| Intention	Speech communication						Focused listening				Non-specific			
Task	2 people		More than 2 people		Through device		Live sounds		Through media device		Monitoring surroundings		Passive listening	
	Two people having a conversation		Several people having a shared conversation		Two or more people having a shared conversation through a communication device		Focused listening to sound without being able to control the sound source		Focused listening to sound while being able to control the sound source		Conscious or unconscious screening of sound of relevance to current activity		Unconscious perception of environmental sounds, without relevance to current activity	
Scenario	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14
Occurrence														
Importance														
Difficulty														
Scenario	Conversation at home	Conversation on metro	Meeting in an office	Car ride with family	Phone call at home	Mobile call in the street	Lecture	At a concert	Watching TV	Listening to car radio	Vacuum cleaning	City walk	Relaxing with a book	Relaxing on train

General literature search
Using PubMed and Google Scholar, 733 publications were found.

Exclusion criteria:
1. Studies on non-human test subjects
2. Studies with irrelevant research questions
3. Studies with informants that would have made it difficult to generalize to "common" sound scenarios

After exclusion, 41 studies remained.

Relevant area identified: *Soundscape ecology.* ISO-12913-1, 2014.
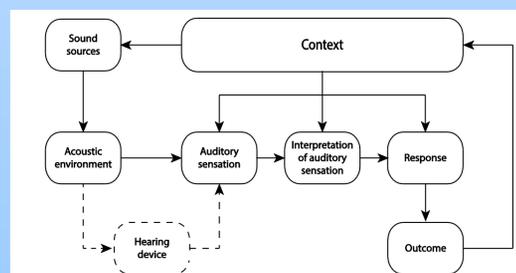
A strong focus on context guided the current categorization strategy.

Specific literature search
Among the 41 references found in the general literature search, references were kept if they provided data on real-life acoustic environments or listening situations reported by informants.

7 published and 3 unpublished articles were found, all from the audiological literature.


Data extraction and categorization
187 listening situations were extracted and printed on separate pieces of paper, adding all available information (including number of informants, reported frequency of occurrence, difficulty and importance). When context was not explicitly stated, the authors made interpretations based on the available information.

Based on the soundscape concept, the categorization was then performed using a qualitative and context-driven approach. A new intention category was created when a situation did not fit into the already defined categories. This was done until all situations were placed in an intention category.

Then, the same approach was used for the task categories. Last, two sound scenarios (selected based on reported frequency of occurrence, importance to hear, and listening difficulty) were added to each task category.
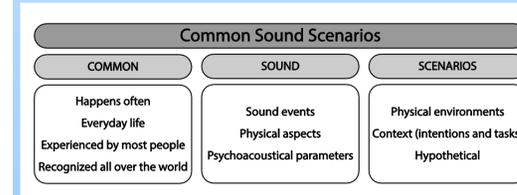
The now suggested common sound scenarios should be viewed as two data-driven examples of each of the seven task categories. These scenarios might be exchanged or supplemented by other scenarios that are equivalent in terms of intention and task.

Article	Study goal(s)	Informants (number)	Data collection method
Eckardt (2013)	1. Auditory ecology 2. Listening effort	NH (10) HI noHA (10)	Questionnaire EMA
Galvez et al (2012)	1. EMA 2. Auditory ecology	HI HA (24)	EMA
Gatehouse & Noble (2004)	1. Disabling effects 2. SSQ evaluation	HI noHA (153)	Questionnaire (SSQ)
Jensen & Nielsen (2005)	1. Auditory ecology 2. HA performance	HI HA (18)	1. Audio recordings 2. EMA
Kochkin (2010)	1. HA satisfaction	HI HA (3174)	Questionnaire (MarkeTrak)
ORCA Europe (2013)	1. Auditory ecology	HI HA (7)	Questionnaire
Schulte & Meis (2013)	1. Listening effort methods 2. Auditory ecology	HI noHA (7) HI HA (13)	Focus groups
Wagener et al (2008)	1. Auditory ecology 2. HA performance	HI HA (20)	Audio recordings Lab evaluation
Walden et al (2004)	1. Everyday listening sits 2. Mic preference	HI HA (17)	EMA
Wu & Bentler (2012)	1. Auditory lifestyle of younger and older HI adults	HI HA (25) HI noHA (2)	Dosimeter EMA

CONCLUSIONS

Potential use of the Common Sound Scenarios framework (CoSS):
- Development of ecologically beneficial signal-processing features.
- Design of realistic laboratory tests and other outcome measures.
- Demonstration of the functionality of signal-processing features.

Next steps:
- Detailed technical description of the common sound scenarios
- Ideally, the framework will be suitable for further work on common sound scenarios.