

# Sonification of distance between stations in train journeys

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## Background

This study has been conducted in the framework of the ISHT - Interior sound design of high-speed trains project<sup>1</sup>. Main goal of the project is the development of design methods and acoustic artefacts for improving the sound environment in high-speed train of the future. The role of KTH in the project was the testing and design of new sound-based signaling methods for providing travel information to passengers on the train.

## Aim of the study

The study at hand presents the testing of sonification for communicating the distance between two stations in a train journey. We wanted to investigate if it is possible to provide the traveller with information about the distance left to the next station by using non-speech sounds. The idea is that of using a sonification independent from culture and language and that can be understood by international travellers.

## Method

We designed the sonification of the distance between two train stations by using an iconographic representation of the sound (soundscape) in the landscape outside. When the train was close to a station we mixed typical city soundscapes (car traffic, train station sounds, crowds), when the train got further away from the station, the sonification used was that of a soundscape resembling a natural environment (birds, forest sounds). The sonification would fade out the city soundscape according to the distance from the station, and similarly fade it in when approaching the next station, and making the opposite fading for the rural soundscape.

Nine participants (8M, 1F) of seven different nationalities (China, Germany, Greece, India, Iran, Sweden, Venezuela) took part in a listening experiment. The experiment was conducted on

<sup>1</sup><http://ishtkonstfack.blogspot.se/>

a passenger car on a train during a return trip between Stockholm and Gävle. The distance in each direction was 182 km, with four stops. Both trips had an estimated travel time of 1.5 hour, and the train was on schedule.

The participants were wearing open headphones and during the travel they would randomly listen to either classical music (JS Bach's Brandenburg concertos), two soundscapes that gave a sense of motion (Billström & Atienza, 2012), or just silence. Participants could choose to temporarily switch from the music, soundscape or silent condition and listen to the sonification of the environment outside the train, as often as they wished. While listening, they were asked to rate the sense of how far the train had come on its journey between two stations on a scale from 1 (no sense at all) to 5 (very clear sense). Participants were asked to answer to a post experiment survey composed by six questions for checking the degree of acceptance of the sonifications proposed.

## Results

Preliminary results confirm that our sonification helped participants to get an idea of the distance left for reaching the next station. Participants listen to the sonification of the environment outside the train during longer intervals of time when the train was coming closer to the arrival station. More results will be presented at the conference. Post-experiment comments collected from the participants were mainly positive. Here are some of them: "I could divide the distance into five segments according to the type of the outside noise I perceived." "Easy to know the period of the trip, beginning, middle or ending." "Yes it's fun to match what you see with what you hear." "I'm pretty sure it actually does help you get a sense of how far you have travelled, which probably could enhance the travelling experience."

## Conclusions

The preliminary analysis of data collected in the experiment suggests that it is possible to use sonification for providing a sense of how far the train

had come on its journey between two stations by using non-speech sounds. This opens for the possibility of developing new sound-based services which can enhance the travel experience from both an informative and aesthetically point of view.

### **Keywords**

*Sonification, Sound design, High-speed railroad car*

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### **References**

Niklas Billström and Ricardo Atienza (2012). Fighting “noise” = adding “noise”? Active improvement of acoustic environments. In: *Sound and Music Computing - Sweden*. TMH-QPSR Volume 52(1):36, 2012.