

# Augmenting Signals against Noises: Understanding Human Body with Data Sonification

Hiroko Terasawa  
University of Tsukuba/JST, PRESTO

While decreasing “bad sounds” in healthcare facilities is critical, “good sounds” can promote positive emotions, better communications, and creative explorations in the healthcare context.

Sound is a medium that connects inside and outside of human being. People observe and understand the surrounding environment by listening to sounds, and express our response back into the environment by making sounds. Our data sonification project borrows this paradigm: We represent biological information with synthesized sounds so that people can intuitively understand and respond to the data in an embodied and enjoyable manner.

In this talk I will present our research on (1) auditory biofeedback system for physical therapy and (2) brain wave sonification for multi-channel EEG data analysis.

By listening to his/her own motion, people can move more efficiently and easily. Our auditory EMG biofeedback system (AEB) transforms the muscular movement data into sound in real-time, to help blind and sighted people undergo physical therapy with better control and comfort. In the evaluation test, blind people conducted a gripping task more accurately and easily with AEB, while sighted people also reported increased easiness with AEB. Another experiment showed that both auditory and visual biofeedback systems offered comparable efficiency in helping ankle-joint rehabilitation task even for sighted people. In both experiments, the participants reported that AEB gave them an enjoyable and reliable impression.

Sonification is valuable as data analysis tool as well: With our EEG data sonification, people without knowledge of neuroscience easily detect the presence of a special kind of brain activity (steady state responses). Furthermore, the synchrony across EEG channels and the location of strong activity are precisely understood by sonification: Our evaluation test showed that subjective judgments with sonification were in agreement with the results of statistical analysis. These studies suggest that sonification can be an intuitive alternative for EEG data analysis to meticulous computational methods.