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Safety Certificate: an audification performance of high-speed trains

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Abstract *Safety Certificate* is a musical performance based on sensor data from high-speed trains. The original purpose of this data is to provide a basis for the assessments of the mechanical aspects of train safety. In this performance, the data, which represents dynamical processes below the audible range, are converted into sound through audification. The sound that is generated live during the performance is manipulated through the *Manta* control interface, which allows for the convenient layering of 48 different timbres. *Safety Certificate* was premiered at Seconde Nature in Aix-en-Provence in March 2010 during the *Sonification symposium–What, Where, How, Why*, organized by Locus Sonus. The following short article gives details about the data, the audification technique, use of the control interface, and the musical structure of the performance.

Keywords Audification · Performance

1 Introduction

Traveling with trains is an experience that has always had a strong acoustic dimension. Sonic associations of trains can be as old fashioned as the steam blow from a nineteenth century train, or more subtle like the characteristic repetitive sound of the wheel hitting the gap between two joint rails. Today, the comfort of traveling in the acoustically well-insulated wagons of high-speed trains has deprived us of many of those sonic experiences.

In the sonification discourse, it has often been argued that listening is a powerful way of assessing the proper functioning of mechanical devices. In practice, technicians often use their listening skills as a diagnostic device before disassembling an engine. This inference based on acoustic cues is also similar to medical diagnosis that is done by listening to a patient's chest.

High-speed trains need to undergo intensive testing during the homologation process, before they are approved for public service. This process entails the collection of data from measurements of the mechanical parts of the train. Interestingly, it is not only the train passengers who hear little of the vehicle transporting them; technicians who measure and maintain the trains also rely almost exclusively on vision. Assessment of the wear of mechanical parts of the train, such as wheels and axles, is an involved process, and the interpretation of results relies on the visual representation of charts and numbers. Listening to measurement data, however, can reveal a great deal about the forces that act onto the mechanical parts and their dynamic response. In the data used in this performance, the slow rocking movement of a wagon going at constant speed or the harsh force of the brakes, when the train decelerates, can be clearly heard. This suggests that an auditory display of these data might have benefits for monitoring purposes.

2 The data

Data used in this performance are measurements from sensors, which are attached to mechanical parts of high-speed trains. These data are usually used as the basis of subsequent sophisticated simulations, which allow

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