

# Product Sound Design Using Transfer Path Techniques

Roland Sottek

HEAD acoustics GmbH, Ebertstr. 30a, D-52134 Herzogenrath, Germany  
E-Mail: roland.sottek@head-acoustics.de

Many products and applications include disturbing noise sources, for example Information Technology (IT) devices and products, household appliances, air-conditioning systems and automotive applications. Low-noise design is a key purchase requirement in all of these fields, where often the main noise source is a cooler fan. Additional sources are for instance hard disk drives in a PC, a compressor in a refrigerator or the combustion engine in a vehicle. The characterization of the sources and the corresponding transfer paths are a challenge in virtual product sound design.

The **B**inaural **T**ransfer **P**ath **A**nalysis and **S**ynthesis (BTPA/BTPS) techniques have been developed for the prediction of sound quality in vehicles not only in terms of numbers and graphs, but also for binaural auralisation. These techniques have successfully been used for efficient sound design engineering and troubleshooting of vehicle noise.

Within the European research project NABUCCO a Noise Synthesis Technology for stationary sounds has been applied mainly to domestic products. This technology addresses specific objectives. The most important is the acoustical matching of the component(s) and the product mainframe.

The paper presents trends and recent developments regarding transfer path analysis and synthesis techniques based on comprehensive selection of measurement inputs and/or simple analytical computations.