

Acoustic musical instruments as sound sources with dynamic directivity

David Ackermann¹, Fabian Brinkmann², Stefan Weinzierl³

Audio Communication Group, TU Berlin, Einsteinufer 17c, 10587 Berlin, Germany

ABSTRACT

Acoustic musical instruments, unlike technical sound sources, have a dynamic directivity. This varies not only with the movement of musicians during a musical performance, but also with the played tone (pitch), which excites different vibration patterns and activates different sound radiating parts of the instrument. The present contribution determines the pitch-related modulations of the instrument sound both in the free field and in a reverberant environment on the basis of a measurement of the directivity for all important orchestral instruments and for the entire playable range. The bandwidth of spectral fluctuations and the change of room acoustic parameters according to ISO 3382 due to the modulation of the directional characteristic are used as measures for the strength of the variation. Thus, the analysis shows the variation of both groups of parameters due to the dynamic behavior of the source, i.e., the error resulting from using a static directivity. At the same time a way is shown, how the time-variant behavior can be considered by a suitable parameterization in the spatially oriented format for acoustics (SOFA) in room acoustic simulations.

¹david.ackermann@tu-berlin.de

²fabian.brinkmann@tu-berlin.de

³stefan.weinzierl@tu-berlin.de