Meeting abstract. No PDF available.

SEPTEMBER 01 2015

Non-impulsive signal deconvolution for computation of violin sound radiation patterns and applications in sound synthesis

Alfonso Perez Carrillo; Jordi Bonada; Vesa Valimaki; Andres Bucci; Jukka Patynen

+ Author & Article Information

J. Acoust. Soc. Am. 138, 1785 (2015)

https://doi.org/10.1121/1.4933657

This work presents a method to compute violin body impulse responses (BIR) based on deconvolution of non-impulsive signals. This newly conceived approach is based on a frame-weighted deconvolution of excitation and response signals. The excitation, consisting of bowed glissandi, is measured with piezoelectric transducers built into the violin bridge and the response is measured as sound pressure with microphones. Based on this method, several research works have been carried out in the areas of acoustics and sound synthesis. First, by placing multiple microphones at different angles around the violin, we were able to compute a dense grid of 3D sound radiation patterns without restrictions in the frequency range. Second, the computed BIRs can be convolved with a source signal (captured with the same bridge-transducer and using the same violin), obtaining a highly realistic violin sound very similar to that of a microphone recording. The multiple impulse responses at different directions make has been used to enhance sound synthesis with spatialization effects. Finally, a bowing machine was built to perform repeatable glissandi and therefore be able to compute BIRs across different violins. The bowing machine has been used to compute cross-BIRs that map the pickup signal of electric violins to the radiated acoustic sound of acoustic violins, which allows to imitate the sound of any measured acoustic violin with an electric counterpart.

Topics

Acoustical properties, Microphones, Musical instruments, Musical sound synthesis, Acoustic phenomena, Signal processing, Transducers, Radiation patterns