Coupled simulation of vibration and sound radiation of Stradivari in large space

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Key Words: Violin, Time evolution, Vibration, Acoustics, Numerical simulation

The vibration and the sound field around the body of an old violin made by Stradivari are studied in this paper, where the highly precise geometry of the violin is scanned using a micro-CT scanner. After the noise in the scanned data is eliminated using a CAD software for post-processing, the geometry data are saved in the simulation software\[1\]. Assuming the orthotropic properties of woods (spruce and maple), the major vibration modes of the violin\[2\], such as A0, center bout rotation, B1-, B1+, and the acoustic pressure level at the surface of the violin body are calculated using the finite element method. Next, using the sound pressure distribution at the surface of the instrument, the sound pressure spreading in a rectangular box simulating a concert hall is calculated with the open-source parallel acoustic analysis software: ADVENTURE Sound \cite{3}\cite{4}. It is concluded that the sound pressure in the hall radiated from the violin is successfully simulated.

REFERENCES

\cite{1} Yokoyama, M. "Coupled numerical simulations of the structure and acoustics of a violin body." The Journal of the Acoustical Society of America 150.3 (2021): 2058-2064.


\cite{3} ADVENTURE Project home page: https://adventure.sys.t.u-tokyo.ac.jp/ (Access on 15 Nov. 2021)