

Application of Finite-Difference Time Domain Method to the Study of Practical Solutions in Room Acoustics

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ABSTRACT

The use of wave-based methods for the simulation of the acoustical field inside rooms is still very far away from the widespread use of ray-tracing/image source algorithms. The difficulties in its implementation range from computational cost to missing data on material acoustical characteristics, amongst many other factors. However, it is undeniable that current research on this field has allowed this methodology to become more accessible, not only to researchers but also to practitioners like acoustical consultants.

In this paper, this numerical method is applied to the study of the sound waves interaction with objects as usually present in concert halls or other types of auditoria. These objects include fixed or suspended balconies, reflectors or volume diffusers. The study focuses on parametric changes in the characteristic dimensions and shape of these elements and in their relationship with the boundaries of the room.

The results show how variations on these geometrical characteristics influence the temporal and spatial distribution of sound wave reflections, which are difficult to accurately predict using ray-tracing algorithms, due to diffraction phenomena.

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