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Published in:
Journal of the Acoustical Society of America

Link to article, DOI:
[10.1121/1.4988327](https://doi.org/10.1121/1.4988327)

Publication date:
2017

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):
Pind Jörgensson, F. K., Jeong, C-H., Engsig-Karup, A. P., & Strømmandersen, J. (2017). Finite volume method room acoustic simulations integrated into the architectural design process. Journal of the Acoustical Society of America, 141(5), 3783. DOI: 10.1121/1.4988327

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Finite volume method room acoustic simulations integrated into the architectural design process

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In many cases, room acoustics are neglected during the early stage of building design. This can result in serious acoustical problems that could have been easily avoided and can be difficult or expensive to remedy at later stages. Ideally, the room acoustic design should interact with the architectural design from the earliest design stage, as a part of a holistic design process. A new procedure to integrate room acoustics into architectural design is being developed in a Ph.D. project, with the aim of promoting this early stage holistic design process. This project aims to develop a new hybrid simulation tool combining wave-based and geometrical acoustics methods. One of the important aspects is the flexibility to represent realistic geometric shapes, for which the finite volume method (FVM) is chosen for the wave-based part of the tool. As a starting point, the computational efficiency of high-order two-dimensional FVM for defining an efficient wave-based simulation tool is investigated. Preliminary two-dimensional FVM simulation results are presented, which illuminate the suitability for handling complex geometries compared to other wave based simulation methods.