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SPECTRAL FINITE ELEMENTS FOR ACOUSTIC FIELD COMPUTATION



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Shaker Verlag Dez 2013, 2013. Buch. Condition: Neu. Neuware - This thesis focuses on the numerical simulation of acoustic field problems utilizing the spectral finite element method (s-FEM). The reduction of computational time constitutes a big challenge in the field of computational acoustics and higher order methods such as s-FEM improve the quality of the solution by increasing the order of ansatz functions . In this way it is possible to obtain a better accuracy with the same number of unknowns. Applied to the conservation equations of linear acoustics, the mixed variational ansatz leads to a numerical scheme which is implemented in a very efficient way. This formulation can be seen as a basis for the novel approaches developed within this thesis. With volume discretization methods like the FEM, it is crucial to provide free field radiation boundary conditions for frequency and time domain computations. Therefore, the afore mentioned scheme is extended by a perfectly matched layers (PML) formulation for frequency and time domain computations. Time domain PML formulations often suffer from instabilities or the occurrence of higher order time derivatives. With the proposed PML it is possible to avoid both by introducing an auxiliary variable which vanishes inside the propagation domain, thus limiting the additional computational effort. It is possible to show stability of the PML by analysing the associated Cauchy problem and to demonstrate its accuracy by means of numerical test cases. 187 pp. Englisch.

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