EAA Summer School on Acoustics 2016

NMA — NUMERICAL METHODS IN ACOUSTICS

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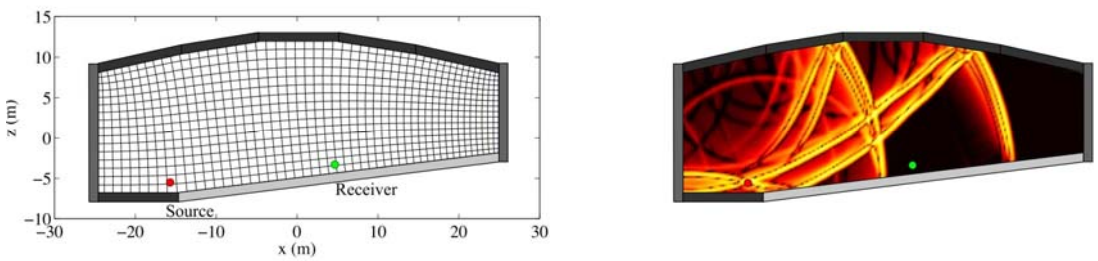
(Half day, June 11th)

Abstract

The first lecture on numerical methods will deal with finite and boundary element methods for solution of the Helmholtz equation. For that, it will be briefly shown how the Helmholtz equation is derived from the fundamental relations of continuum mechanics. A weak formulation and integration by parts will provide the basis for the finite and the boundary element formulation. These basis formulations are used in the discretization process which are the continuous Galerkin approach for FEM and the collocation and the Galerkin approaches for BEM. Thereafter, some features of FEM and BEM will be discussed in the context of numerical examples. The second lecture deals with an overview of volume-discretization time-domain methods for propagation of sound propagation in air. Fields of application are outdoor sound propagation and room acoustics. The lecture starts with the governing equations that are solved by time-domain methods. The different spatial discretization techniques are briefly presented, as well as time iteration schemes. The performance of time-domain methods in terms of dissipation and dispersion errors is discussed, as well as numerical stability. Time-domain formulations for impedance boundaries and source functions are shown. It is presented how an impulse response and frequency response are obtained from a time-domain method. The lectures contain numerical examples.



Discretization schematic view and sound propagation instantaneous picture.