The 8th European Congress on Computational Methods in Applied Sciences and Engineering
ECCOMAS Congress 2022
5-9 June 2022, Oslo, Norway

An automatic PML for convex domains of general shape in time-harmonic acoustics

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Keywords: *Finite elements, Helmholtz equation, Non-reflecting boundary condition, Wave propagation*

We address the efficient finite element solution of exterior acoustic problems with truncated computational domains surrounded by *perfectly matched layers* (PMLs). The PML is a popular non-reflecting technique that combines accuracy, computational efficiency and geometric flexibility (see *e.g.* [2, 3]). Unfortunately, the effective implementation of the PML for convex domains of general shape is tricky because of the geometric parameters that are required to define the PML medium.

In a recent work [1], we proposed a comprehensive implementation strategy for time-harmonic problems written with the Helmholtz equation. This approach, which we called the *automatically matched layer* (AML) implementation, is versatile and fully automatic for the end-user. The mesh of the layer is extruded, the required geometric parameters are automatically obtained during the extrusion step, and the practical implementation relies on a simple modification of the Jacobian matrix in the element-wise integrals.

In this talk, we present the key aspects of the PMLs for convex domains of general shape, and the principles of the AML implementation. The AML implementation is validated and compared to other implementation strategies using numerical benchmarks in two and three dimensions, considering computational domains with regular and non-regular boundaries. A three-dimensional application with a domain generated using a convex hull is proposed to illustrate the interest of our approach for realistic industrial cases.

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