Coupling of curved virtual element with boundary element methods for exterior wave propagation problems

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We consider the wave equation defined on the exterior of a bounded 2D space domain, endowed with a Dirichlet condition on the boundary. We propose a numerical method that approximates the solution using computations only in an interior finite domain. This is obtained by introducing a curved smooth artificial boundary on which a non-reflecting boundary condition, defined by a boundary integral equation, is imposed. The approach we consider allows for solving the original problem by means of the coupling of an interior domain method with a boundary element one associated with the artificial boundary.
For the space discretization in the interior computational domain, we propose a Galerkin approach based on the Curvilinear Virtual Element Method (CVEM), and for the time discretization we use the classical Crank-Nicolson method. For the approximation of the non-reflecting condition on the artificial boundary, we apply a standard collocation Boundary Element Method (BEM) combined with a Lubich time convolution quadrature formula. Some numerical results are presented to test the performance of the proposed approach and to highlight its effectiveness.

References

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