THE SHIFTED BOUNDARY METHOD FOR HYPERBOLIC SYSTEMS: EMBEDDED DOMAIN COMPUTATIONS OF ACOUSTIC WAVES AND SHALLOW WATER FLOWS.

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We present a new embedded boundary method for wave equation problems in time domain. Embedded boundary methods obviate the need for continual re-meshing in many applications involving rapid prototyping and design. Unfortunately, many finite element embedded boundary methods for incompressible flow are also difficult to implement due to the need to perform complex cell cutting operations at boundaries, and the consequences that these operations may have on the overall conditioning of the ensuing algebraic problems. We present a new, stable, and simple embedded boundary method, which we call "shifted boundary method" (SBM), that eliminates the need to perform cell cutting. Boundary conditions are imposed on a surrogate discrete boundary, lying on the interior of the true boundary interface. We then construct appropriate field extension operators, with the purpose of preserving accuracy when imposing the boundary conditions. We demonstrate the performance of the proposed method in simulations of problems in acoustics and shallow water flows.

REFERENCES

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