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Spatially-Anisotropic Parallel Adaptive Wavelet Collocation Method[1] OLEG V. VASILYEV, ERIC BROWN-DYMKOSKI, University of Colorado Boulder — Despite latest advancements in development of robust wavelet-based adaptive numerical methodologies to solve partial differential equations, they all suffer from two major "curses": 1) the reliance on rectangular domain and 2) the "curse of anisotropy" (i.e. homogeneous wavelet refinement and inability to have spatially varying aspect ratio of the mesh elements). The new method addresses both of these challenges by utilizing an adaptive anisotropic wavelet transform on curvilinear meshes that can be either algebraically prescribed or calculated on the fly using PDE-based mesh generation. In order to ensure accurate representation of spatial operators in physical space, an additional adaptation on spatial physical coordinates is also performed. It is important to note that when new nodes are added in computational space, the physical coordinates can be approximated by interpolation of the existing solution and additional local iterations to ensure that the solution of coordinate mapping PDEs is converged on the new mesh. In contrast to traditional mesh generation approaches, the cost of adding additional nodes is minimal, mainly due to localized nature of iterative mesh generation PDE solver requiring local iterations in the vicinity of newly introduced points.

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