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The Least-Squares RBF-FD Method †

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Abstract: The radial basis function generated finite difference method (RBF-FD) aims to combine the simplicity of finite difference methods and the flexibility of finite element methods. The approximations are based on scattered data and do not require a grid or a mesh. Stencil weights for approximation of function values and derivatives are computed based on interpolation of local data. The RBF-FD method was first introduced as a collocation method, where partial differential equations (PDEs) and boundary conditions are enforced at the stencil points. Here, we introduce the least-squares RBF-FD method, where the PDE and boundary conditions are enforced at M>N points, where N is the number of stencil points. The introduction of oversampling improves the stability of the approximation and its behavior close to boundaries with Neumann conditions. This new method formulation also proved theoretical convergence results for a Poisson problem with mixed boundary conditions. In the talk, we discuss the principles behind the convergence results; we show numerical experiments that support the theory and results from some non-trivial application problems.

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Conflicts of Interest

The authors declare no conflict of interest.