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The Method of Fundamental Solutions for Solving Elliptic Partial Differential

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Summary

We extend the method of fundamental solutions to solve general elliptic partial differential equations with variable coefficients through a new formulation that resembles both the dual reciprocity method (DRM) and Kansa's method. Similar to the DRM, the new proposed method keeps Laplacian as the major differential operator. Unlike the Kansa's method using MQ as the sole basis function, we employed two basis functions which contain the particular solution of a radial basis function and the fundamental solution of Laplacian. In contrast to the traditional formulation using a two-stage process to find the particular solution and homogeneous solution separately, the new approach only requires one matrix system. The particular solution and homogeneous solution can be obtained simultaneously.
Numerical results show the proposed approach is more stable and accurate using truncated singular value decomposition than LU decomposition. In particular, the results of the approximate derivatives are also excellent.