Title: Applicability and optimality of the method of fundamental solutions

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The condition number of a matrix is commonly used for investigating the stability of solutions to linear algebraic systems. Recent meshless techniques for solving partial differential equations have been known to give rise to ill-conditioned matrices, yet are still able to produce results that are close to machine accuracy. In the first half of this talk, we consider the method of fundamental solutions (MFS), which is known to solve, with extremely high accuracy, certain partial differential equations, namely those for which a fundamental solution is known. The effective condition number (ECN) is a sensitivity measure for a linear system; it differs from the traditional condition-number in the sense that the ECN is also right-hand side vector dependent. We revealed the close connection between the ECN and the accuracy of the Method of Fundamental Solutions (MFS) for each given problem. In the second half, we show how the ECN can help achieve the problem-dependent quasi-optimal settings for MFS calculations-that is, determining the position and density of the source points. A series of examples on Dirichlet and mixed boundary conditions shows the reliability of the proposed scheme; whenever the MFS fails, the corresponding value of the ECN strongly indicates to the user to switch to other numerical methods.