Comparisons of Fundamental Solutions and Particular Solutions for Trefftz Methods

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Abstract

In the Trefftz method (TM), the admissible functions satisfying the governed equation are chosen, then only the boundary conditions are deal with. Both fundamental solutions (FS) and particular solutions (PS) satisfy the equation. The TM using FS leads to the method of fundamental solutions (MFS), and the TM using PS to the method of particular solutions (MPS). Since the MFS is one of TM, we may follow our recent book [20], to provide the argorithms and analysis. Since the MFS and the MPS are mashless, they have attracted a great attention of researchers. In this paper numerical experiments are provided to support the error analysis of MFS in Li [5] for Laplace's equation in annular shaped domains. More importantly, comparisons are made in analysis and computation for MFS and MPS. From accuracy and stability, the MPS is superior to the MFS, the same conclusion as given in Schaback [24]. On the other hand, the uniform FS is simpler and the algorithms of MFS are easier to carry out, so that the computational efforts using MFS are much saved. Since today, the manpower saving is the most important criterion for choosing numerical methods, the MFS is also benefical to engineering applications. Hence, both MFS and MPS may serve as modern numerical methods for PDE.

Keyword：Method of Fundamental Solutions, Method of Particular Solutions, Collocation Trefftz Method, Particular Solutions Error Analysis, Stability Analysis, Algorithm Comparisons.