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Sommario/riassunto

The fundamental solutions (FS) satisfy the governing equations in a solution domain S, and then the numerical solutions can be found from the exterior and the interior boundary conditions on S. The resource nodes of FS are chosen outside S, distinctly from the case of the boundary element method (BEM). This method is called the method of fundamental solutions (MFS), which originated from Kupradze in 1963. The Laplace and the Helmholtz equations are studied in detail, and biharmonic equations and the Cauchy-Navier equation of linear elastostatics are also discussed. Moreover, better choices of source nodes are explored. The simplicity of numerical algorithms and high accuracy of numerical solutions are two remarkable advantages of the MFS. However, the ill-conditioning of the MFS is notorious, and the condition number (Cond) grows exponentially via the number of the unknowns used. In this book, the numerical algorithms are introduced and their characteristics are addressed. The main efforts are made to establish the theoretical analysis in errors and stability. The strict analysis (as well as choices of source nodes) in this book has provided the solid theoretical basis of the MFS, to grant it to become an effective and competent numerical method for partial differential equations (PDE). Based on some of our works published as journal papers, this book presents essential and important elements of the MFS. It is intended for researchers, graduated students, university students, computational experts, mathematicians and engineers.