A Practical Guide to Boundary Element Methods with the Software Library BEMLIB

By C. Pozrikidis

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The boundary-element method is a powerful numerical technique for solving partial differential equations encountered in applied mathematics, science, and engineering. The strength of the method derives from its ability to solve with notable efficiency problems in domains with complex and possibly evolving geometry where traditional methods can be demanding, cumbersome, or unreliable. This dual-purpose text provides a concise introduction to the theory and implementation of boundary-element methods, while simultaneously offering hands-on experience based on the software library BEMLIB.

BEMLIB contains four directories comprising a collection of FORTRAN 77 programs and codes on Green's functions and boundary-element methods for Laplace, Helmholtz, and Stokes flow problems. The software is freely available from the Internet site: http://bemlib.ucsd.edu

The first seven chapters of the text discuss the theoretical foundation and practical implementation of the boundary-element method. The material includes both classical topics and recent developments, such as methods for solving inhomogeneous, nonlinear, and time-dependent equations. The last five chapters comprise the BEMLIB user guide, which discusses the mathematical formulation of the problems considered, outlines the numerical methods, and describes the structure of the boundary-element codes.

A Practical Guide to Boundary Element Methods with the Software Library BEMLIB is ideal for self-study and as a text for an introductory course on boundary-element methods, computational mechanics, computational science, and numerical differential equations.

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