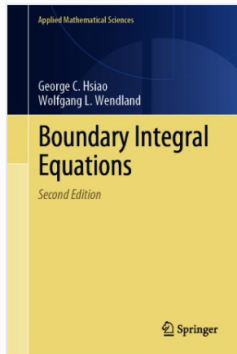# Research Monograph published in 2021

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Boundary Integral Equations

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This book contains two parts: The first six chapters present the modern mathematical theory of boundary integral equations with applications on fundamental problems in continuum mechanics and electromagnetics, while the second six chapters present an introduction to the basic theory of classical pseudo-differential operators so that the particular boundary integral equations arising in the aforementioned applications can be recast as pseudo-differential equations which serve as concrete examples illustrating the basic ideas how one may apply the theory of pseudo-differential operators and their calculus to obtain basic properties for the corresponding boundary integral operators. The book is unique in the sense that no existing books provided these two complimentary features simultaneously

The two new chapters on Maxwell's equations summarizing the most up-to-date results in the literature. The book is unique in the sense that these two chapters are sufficiently enough to serve as an introduction to the modern mathematical theory of boundary integral equations in electromagnetics and provide the mathematical foundation of boundary element methods for computational electromagnetics

This book is unique in the sense that it includes theory and applications of boundary integral equations arising in potential flow, acoustics, elasticity, Stokes flow and electromagnetics. Because of the breadth of these applications, it will attract a broader readership than any of the exiting books

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Boundary Integral Equations

Second Edition

Springer

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Boundary Integral Equations

This is the second edition of the book which has two additional new chapters on Maxwell's equations as well as a section on properties of solution spaces of Maxwell's equations and their trace spaces. These two new chapters, which summarize the most up-to-date results in the literature for the Maxwell's equations, are sufficient enough to serve as a self-contained introductory book on the modern mathematical theory of boundary integral equations in electromagnetics.

The book now contains 12 chapters and is divided into two parts. The first six chapters present modern mathematical theory of boundary integral equations that arise in fundamental problems in continuum mechanics and electromagnetics based on the approach of variational formulations of the equations. The second six chapters present an introduction to basic classical theory of the pseudo-differential operators. The afore-mentioned corresponding boundary integral operators can now be recast as pseudodif-ferential operators. These serve as concrete examples that illustrate the basic ideas of how one may apply the theory of pseudo-differential operators and their calculus to obtain additional properties for the corresponding boundary integral operators. These two different approaches are complementary to each other. Both serve as the mathematical foundation of the boundary element methods, which have become extremely popular and efficient computational tools for boundary problems in applications.

This book contains a wide spectrum of boundary integral equations arising in funda-mental problems in continuum mechanics and electromagnetics. The book is a major scholarly contribution to the modern approaches of boundary integral equations, and should be accessible and useful to a large community of advanced graduate students and researchers in mathematics, physics, and engineering.