



Multiscale Methods for Fredholm Integral Equations (Cambridge Monographs on Applied and Computational Mathematics)

By Zhongying Chen, Charles A. Micchelli, Yuesheng Xu

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The recent appearance of wavelets as a new computational tool in applied mathematics has given a new impetus to the field of numerical analysis of Fredholm integral equations. This book gives an account of the state of the art in the study of fast multiscale methods for solving these equations based on wavelets. The authors begin by introducing essential concepts and describing conventional numerical methods. They then develop fast algorithms and apply these to solving linear, nonlinear Fredholm integral equations of the second kind, ill-posed integral equations of the first kind and eigen-problems of compact integral operators. Theorems of functional analysis used throughout the book are summarised in the appendix. The book is an essential reference for practitioners wishing to use the new techniques. It may also be used as a text, with the first five chapters forming the basis of a one-semester course for advanced undergraduates or beginning graduates.

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Editorial Review

About the Author

Zhongying Chen is a professor of computational mathematics at Sun Yat-Sen University, China. He is the author or co-author of more than 70 professional publications, including the books *Generalized Difference Methods for Differential Equations* and *Approximate Solutions of Operator Equations*. He has served on the editorial board of four journals including *Advances in Computational Mathematics*, and two book series including the *Series in Information and Computational Science*, China.

Charles A. Micchelli is a distinguished research professor of mathematics at SUNY Albany and an international leader of approximation theory and wavelet analysis. His research interests cover approximation theory, wavelet analysis, computer aided geometric design, multiscale methods for Fredholm integral equations, speech recognition and mathematical learning theory. Prior to his current position, he was employed by IBM T. J. Watson Research Center as a senior research staff member for over 30 years. Honors he has received include the Senior Alexander von Humboldt Prize and an invitation to speak at the International Congress of Mathematicians (1983). Micchelli is an editor of several leading journals in approximation theory and computational mathematics and also the founding editor of *Advances in Computational Mathematics*, for which he served as editor-in-chief from 1994 to 2011. He is the author or co-author of over 300 research publications and an owner of several patents. His research has been supported by the US National Science Foundation and the Office of Science of the US Air Force.

Yuesheng Xu is a professor emeritus of mathematics at Syracuse University, USA and Guohua Chair Professor at Sun Yat-Sen University, China. He is a National Scholar of China, the director of Guangdong Province Key Laboratory of Computational Science, and the president of the Guangdong Province Association of Computational Mathematics. Xu is also a member of the executive committee of the Association of Computational Mathematics of China and an Adjunct Professor of radiology at SUNY Upstate Medical University, USA. His research interests include approximation theory and wavelet analysis, the numerical solution of integral equations and PDEs, and image and signal processing. He currently serves on the editorial board of seven academic journals, including *Advances in Computational Mathematics*, where he was the managing editor from 1999 to 2011, and the *Journal of Integral Equations and Applications*. He has published over 150 research papers. His research has been supported by the US National Science Foundation, the Office of Science of the US Air Force, NASA and the National Natural Science Foundation of China, Guangdong Province Government of China.

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