

1. Record Nr.	UNINA9910767513303321
Autore	Banjai Lehel
Titolo	Integral Equation Methods for Evolutionary PDE : A Convolution Quadrature Approach // by Lehel Banjai, Francisco-Javier Sayas
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2022
ISBN	3-031-13220-3
Edizione	[1st ed. 2022.]
Descrizione fisica	1 online resource (283 pages)
Collana	Springer Series in Computational Mathematics, , 2198-3712 ; ; 59
Disciplina	929.605
Soggetti	Numerical analysis Integral equations Differential equations Numerical Analysis Integral Equations Differential Equations
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	1 Some examples of causal convolutions -- 2 Convolution quadrature for hyperbolic symbols -- 3 Algorithms for CQ: linear multistep methods -- 4 Acoustic scattering in the time domain -- 5 Runge-Kutta CQ -- 6 Transient electromagnetism -- 7 Boundary-field formulations -- 8 Parabolic problems -- 9 Data sparse methods and other topics.
Sommario/riassunto	This book provides a comprehensive analysis of time domain boundary integral equations and their discretisation by convolution quadrature and the boundary element method. Properties of convolution quadrature, based on both linear multistep and Runge–Kutta methods, are explained in detail, always with wave propagation problems in mind. Main algorithms for implementing the discrete schemes are described and illustrated by short Matlab codes; translation to other languages can be found on the accompanying GitHub page. The codes are used to present numerous numerical examples to give the reader a feeling for the qualitative behaviour of the discrete schemes in practice. Applications to acoustic and electromagnetic scattering are described with an emphasis on the acoustic case where the fully discrete schemes

for sound-soft and sound-hard scattering are developed and analysed in detail. A strength of the book is that more advanced applications such as linear and non-linear impedance boundary conditions and FEM/BEM coupling are also covered. While the focus is on wave scattering, a chapter on parabolic problems is included which also covers the relevant fast and oblivious algorithms. Finally, a brief description of data sparse techniques and modified convolution quadrature methods completes the book. Suitable for graduate students and above, this book is essentially self-contained, with background in mathematical analysis listed in the appendix along with other useful facts. Although not strictly necessary, some familiarity with boundary integral equations for steady state problems is desirable.
