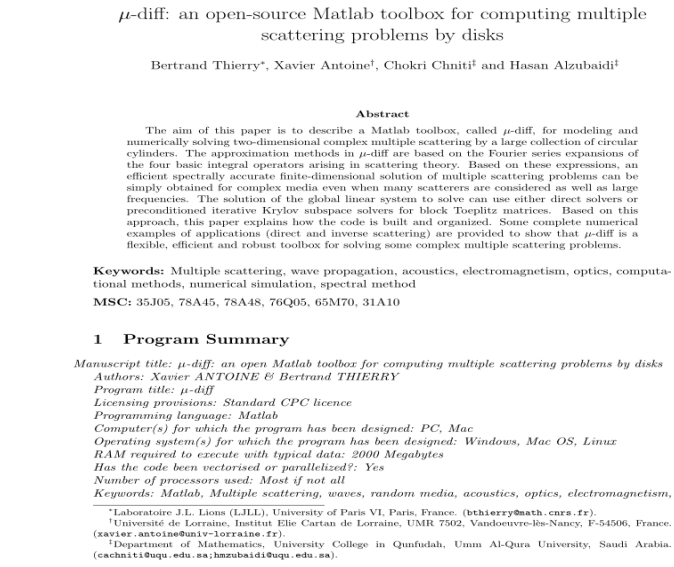
Computational Methods for Acoustics Problems (Saxe-Coburg Publications on Computational Engineering)



μ-diff: an open-source Matlab toolbox for computing multiple scattering problems by disks

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Abstract

The aim of this paper is to describe a Matlab toolbox, called μ-diff, for modeling and numerically solving two-dimensional complex multiple scattering by a large collection of circular cylinders. The approximation methods in μ-diff are based on the Fourier series expansions of the four basic integral operators arising in scattering theory. Based on these expressions, an efficient spectrally accurate finite-dimensional solution of multiple scattering problems can be simply obtained for complex media even when many scatterers are considered as well as large frequencies. The solution of the global linear system to solve can use either direct solvers or preconditioned iterative Krylov subspace solvers for block Toeplitz matrices. Based on this approach, this paper explains how the code is built and organized. Some complete numerical examples of applications (direct and inverse scattering) are provided to show that μ-diff is a flexible, efficient and robust toolbox for solving some complex multiple scattering problems.

Keywords: Multiple scattering, wave propagation, acoustics, electromagnetism, optics, computational methods, numerical simulation, spectral method

MSC: 35J05, 78A45, 78A48, 76Q05, 65M70, 31A10

1 Program Summary

Manuscript title: μ-diff: an open Matlab toolbox for computing multiple scattering problems by disks
Authors: Xavier ANTOINE & Bertrand THIERRY
Program title: μ-diff
Licensing provisions: Standard CPC licence
Programming language: Matlab
Computer(s) for which the program has been designed: PC, Mac
Operating system(s) for which the program has been designed: Windows, Mac OS, Linux
RAM required to execute with typical data: 2000 Megabytes
Has the code been vectorised or parallelized?: Yes
Number of processors used: Most if not all
Keywords: Matlab, Multiple scattering, waves, random media, acoustics, optics, electromagnetism,

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Saxe-Coburg Publications, Computer Methods in Applied Mechanics and Engineering, (), June , pp.Archives of Computational Methods in Engineering. .. order model technique to solve medium frequency broad band problems on complex acoustical systems.Duplication of this publication or parts . Problem Decomposition Methods in Computational Science and Engineer- ing, SIAM Saxe-Coburg Publication, Dun Eaglais, blanktitlemusic.com .. Acoustic Streaming on Microfluidic Biochips.Institute of Computational Civil Engineering, Cracow University of Technology. Verified email Auto-tuned Krylov methods on cluster of graphics processing unit.Computer Methods in Applied Mechanics and Engineering archive structures, Civil and structural engineering computing: , Saxe-Coburg Publications, . problems using coupled field adjoint sensitivity analysis method, Finite noise reduction based on topology optimization and acoustic contribution analysis.aDepartment of Mechanical Engineering, University of Texas at very promising platform to solve high-frequency acoustic problems. the scattering problem leads to computing the wave field u, solution to Various numerical methods have been developed to accurately Saxe-Coburg Publications.A. Vaziri and M.N. Guddati (), Efficient computation of dispersion curves for problem, International Journal for Numerical Methods in Engineering. in Computational Methods for Acoustics, Ed. F. Mogoules, Saxe-Coburg, London.Professor Bathe's research focuses on advancing computational procedures for the analysis of solids and K. J. Bathe and E. L. Wilson, Numerical Methods in Finite Element Analysis, Prentice- . Plastic and Creep Problems, Acoustics and Vibration Laboratory, Report No. Saxe-Coburg Publications, K.C. Park is professor at the Department of Aerospace Engineering Sciences, Boulder, and Structural Acoustics Interaction Problems and Smart Structural Systems. Methods for Distributed Computing (Saxe-Coburg Publications on.eBooks for kindle for free Computational Methods for Acoustics Problems (Saxe- Coburg Publications on Computational Engineering) PDF Read More.