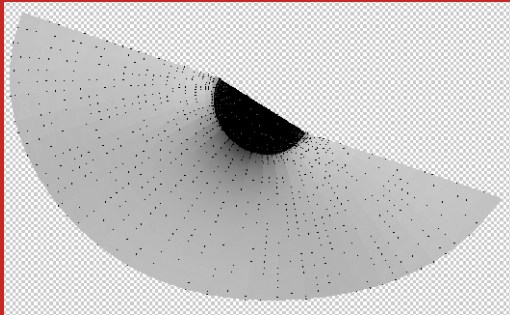


THE MESHLESS METHOD (MLPG) FOR DOMAIN & BIE DISCRETIZATIONS

Satya N. Atluri



This monograph is a sequel to: "The Meshless Local Petrov-Galerkin (MLPG) Method", by S. N. Atluri, and S. Shen, published in 2002. In the intervening two years, much has been accomplished by a number of researchers world-wide, in the further development & application of the meshless method (MLPG) to problems in three-dimensional solid mechanics, beams, plates and shells; and in the seamless modeling of multi-scale phenomena in nano and micro engineering. In addition to providing a summary of these accomplishments, an important feature of the current comprehensive monograph is the presentation of meshless methods to discretize the boundary-integral-equations in mechanics. Thus, the present monograph presents, for the first time, a detailed summary of research on the next generation of computational methods in engineering & the sciences, that go beyond the mesh-based finite-element & boundary-element methods that were so successfully developed in the final two decades of the last century.

Contents: Chapter I Global Weak Forms, Weighted Residuals, Finite Elements, Boundary Elements, & Local Weak Forms: Global weak forms and the weighted residual method (WRM); The Galerkin finite element method; The boundary element method; Local weak-forms over overlapping sub-domains. **Chapter II Meshless Interpolations of Trial & Test Functions:** Interpolations with a local-support; The moving least-squares Approximation scheme; Shepard functions; The partition of unity (PU) methods; Reproducing kernel particle interpolation (RKPM); Radial basis functions (RBF) with compact support; Smoothed particle hydrodynamics; Interpolation errors in meshless interpolations. **Chapter III MLPG Method for Domain Discretization:** Numerical implementation of the MLPG method; The imposition of essential boundary conditions in the MLPG approach; Numerical integration of the various local weak-forms; Computational costs; The MLPG approach to nonlinear problems; **Chapter IV The**

MLPG Method for the Discretization of Boundary Integral Equations (BIE): Simple formulations of weakly-singular traction & displacement BIE; MLPG approaches for solving the weakly-singular BIEs; MLPG/BIE for acoustic radiation & scattering problems. **Chapter V The MLPG in Solid Mechanics: 3-D Singular Problems and Material Discontinuities; Locking-Free Beam, Plate, & Shell Formulations;** Formulation for the 2D elasto-static problem; Discretization and numerical implementation; Application of the MLPG method to problems with singularities, and material discontinuities, in 3-D elasticity; The MLPG6 method for solving 3D Problems in elasto-statics; The MLPG approach for 3-Dimensional elastodynamics; The MLPG method for beams, plates and shells through a 3-D elasticity formulation, and the locking phenomenon; Analysis of beams using GMLS; MLPG1 and MLPG5 for thin beam problems (4th order formulation); Analysis of shear flexible beams based on locking-free formulation: seamless analysis from thick to thin beams; MLPG method for solving the bending problem of a thin plate (4th order formulation). **Chapter VI Application of the MLPG in Fluid Mechanics:** Upwinding schemes for MLPG; Convection-diffusion problems; Burgers' equations; Incompressible Navier-Stokes equations. **Chapter VII Application of the MLPG in Strain Gradient Theories of Material Behavior, Nanotechnology, and Multi-Scale Modeling:** Analysis of materials with strain-gradient effects; Numerical simulations in nano- and micro-mechanics of materials; Multiscale simulation based on the MLPG method; MLPG/BIE method for multiscale simulation. *About 700 pages.*

A very comprehensive list of more than 300 references to the literature is included.

About the author

Satya N. Atluri, is the Henry Samueli/von Karman Chair in Aerospace Engineering at the University of California, Irvine. He is a Member of the U.S. National Academy of Engineering, a Foreign Fellow of the Indian National Academy of Engineering, a Fellow of the Third World Academy of Sciences, a Member of the European Academy of Sciences,

an Honorary Member of the World Innovation Foundation, an Honorary Fellow of the International Congress on Fracture, and a Fellow of several learned societies, including the American Academy of Mechanics, American Institute of Aeronautics & Astronautics, The Aero. Society of India, ASME, and others.

He is the recipient of several awards in recent years: "The Distinguished Alumnus Award, 2002", Indian Institute of Science, Bangalore; The HILBERT MEDAL of ICCES; "Highly Cited Researcher" (one of the 100 most highly cited researchers in all branches of engineering, over the last 20 years (Institute of Scientific Information,)); the Excellence in Aviation Award, from the FAA; President's National Medal of Technology Distinguished Service Award, from the Secretary of Commerce; Pendray Aerospace Literature Award from AIAA; Structures, Structural Dynamics, and Materials Medal from the AIAA; The SDM Lecture Award from the AIAA; The Cemal Eringen Medal in Engineering Science; "Excellence in Computational Mechanics" Medals from Greece and Japan; The ICES Gold Medal; Doctor of Science (Honoris Causa) from Ireland and others. He is an honorary professor at many universities, including the Tsinghua University in China.

He is the Founder & Editor-in-Chief of "CMES: Computer Modeling in Engineering & Sciences", and "MCB: Mechanics & Chemistry of Biosystems"; and the Honorary Editor of "CMC: Computers, Materials, & Continua". He has authored/edited over 35 monographs and books; and is an author of over 650 articles in the archival literature.



**CREST Monograph Series...
A Better, Faster Way to Publish**

Research in science and technology is progressing at lightning speed. Globalization of matters of mind and intellect can dramatically reduce the time required to exploit emerging sciences and technologies. There remains a gap, however, in the ability to bring this knowledge to the world's end-users quickly, efficiently and effectively.

This paradigm calls for radically new ways of disseminating knowledge in the emerging sciences and technologies. The most common vehicle, peer-reviewed academic journals, often publish highly abbreviated versions of research solely for the benefit of the authors' peers and specialist readers. What's more, the publication cycle of a typical journal often exceeds 18 months or more. The other leading option, monographs, often deal with pedagogical accounts of mature research, generally only in mature or maturing disciplines.

Enter Contemporary Research in Emerging Sciences & Technologies, or CREST. The mission of the CREST series is to identify pioneers and visionaries in emerging sciences and technologies, and quickly publish their accounts of these disciplines. These approximately 200-page accounts will not only be read by specialists in the field, but will also serve as catalysts for the global growth of these disciplines. The aim of CREST is to quicken the pace of research in the emerging disciplines all over the world, and thus assure a quick translation of research into an engine for global economic growth.

Orderform

Name _____ Institution _____

Address _____

City _____ State/Province _____ Zip/Postal Code _____ Country _____

Phone _____ Fax _____ Email _____

The Meshless Method (MLPG) for Domain & BIE Discretizations		
[ISBN:0-9657001-8-6]: S. N. Atluri		
Price	Quantity	Total
\$195.00	_____	_____
California residents add 8% sales tax		
Shipping (\$3.00 per monograph)		

Check enclosed. **Make check payable in U.S. Funds to Tech Science Press.**

Credit card information enclosed in below.

Monograph Total

Credit card information: Visa MasterCard Discover AMEX

Card No. _____ Security Code _____

A 3 digit code on back of card (Visa, Discover, Mastercard);
A 4 digit code on front of card (AMEX)

Billing Address of the card _____

Card Holder _____ Expiration Date _____ Signature _____ Date _____

Mail complete orderform and payment to:

Tech Science Press
4924 Balboa Blvd, #488
Encino, CA 91316, USA

Phone (661) 947-2228 Fax (661)420-8080
Email: sale@techscience.com
[http:// www.techscience.com](http://www.techscience.com)