Computational Hydraulics Numerical Methods And Modelling

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Numerical Simulation in Hydraulic Fracturing: Multiphysics Theory and Applications World Scientific
This is the updated new edition from the founder and inventor of the subject. It provides an account of the principles and a survey of modelling in hydraulic, coastal and offshore engineering.
Numerical Modeling in Open Channel Hydraulics CRC Press
The expansion of unconventional petroleum resources in the recent decade and the rapid development of computational technology have provided the opportunity to develop and apply 3D numerical modeling technology to simulate the hydraulic fracturing of shale and tight sand formations. This book presents 3D numerical modeling technologies for hydraulic fracturing developed in recent years, and introduces solutions to various 3D geomechanical problems related to hydraulic fracturing. In the solution processes of the case studies included in the book, fully coupled multi-physics modeling has been adopted, along with innovative computational techniques, such as submodeling. In practice, hydraulic fracturing is an essential project component in shale gas/oil development and tight sand oil, and provides an essential measure in the process of drilling cuttings reinjection (CRI). It is also an essential measure for widened mud weight window (MWW) when drilling through naturally fractured formations; the process of hydraulic plugging is a typical application of hydraulic fracturing. 3D modeling and numerical analysis of hydraulic fracturing is essential for the successful development of tight oil/gas formations: it provides accurate solutions for optimized stage intervals in a multistage fracking job. It also provides optimized well-spacing for the design of zipper-frac wells. Numerical estimation of casing integrity under stimulation injection in the hydraulic fracturing process is one of major concerns in the successful development of unconventional resources. This topic is also investigated numerically in this book. Numerical solutions to several other typical geomechanics problems related to hydraulic fracturing, such as fluid migration caused by fault reactivation and seismic activities, are also presented. This book can be used as a reference textbook to petroleum, geotechnical and geothermal engineers, to senior undergraduate, graduate and postgraduate students, and to geologists, hydrogeologists, geophysicists and applied mathematicians working in this field. This book is also a synthetic compendium of both the fundamentals and some of the most advanced aspects of hydraulic fracturing technology.
Proceedings of the VII International Conference, MIT, USA, June 1988 Springer Science & Business Media
High resolution upwind and centered methods are today a mature generation of computational techniques applicable to a wide range of engineering and scientific disciplines, Computational Fluid Dynamics (CFD) being the most prominent up to now. This textbook gives a comprehensive, coherent and practical presentation of this class of techniques. The book is designed to provide readers with an understanding of the basic concepts, some of the underlying theory, the ability to critically use the current research papers on the subject, and, above all, with the required information for the practical implementation of the methods. Applications include: compressible, steady, unsteady, reactive, viscous, non-viscous and free surface flows.
Computational Hydraulics and Hydrology CRC Press
Free-Surface Flow: Computational Methods presents a detailed analysis of numerical schemes for shallow-water waves. It includes practical applications for the numerical simulation of flow and transport in rivers and estuaries, the dam-break problem and overland flow. Closure models for turbulence, such as Reynolds-Averaged Navier-Stokes and Large Eddy Simulation are presented, coupling the aforementioned surface tracking techniques with environmental fluid dynamics. While many computer programs can solve the partial differential equations describing the dynamics of fluids, many are not capable of including free surfaces in their simulations. Provides numerical solutions of the turbulent Navier-Stokes equations in three space dimensions Includes closure models for turbulence, such as Reynolds-Averaged Navier-Stokes, and Large Eddy Simulation Practical applications are presented for the numerical simulation of flow and transport in rivers and estuaries, the dam-break problem and overland flow
Computational Fluid Dynamics Butterworth-Heinemann
Comprehensive text on the fundamentals of modeling flow and sediment transport in rivers treating both physical principles and numerical methods for various degrees of complexity. Includes 1-D, 2-D (both depth- and width-averaged) and 3-D models, as well as the integration and coupling of these models. Contains a broad selection
Hydraulic Modelling: An Introduction Springer Science & Business Media
Numerical methods provide a powerful and essential tool for the solution of problems of water resources. This book gives an elementary introduction to the methods in current use. Their application to surface and subsurface flow and to water quality modelling are described in this useful volume, which contains many helpful references to the literature.
Summary Statements of Research Activities by the Water Resources Division Springer Nature
An account of principles and survey modelling in hydraulic, coastal and offshore engineering. Amongst the topics covered are discrete forms of conservation laws, numerical methods, the foundations of computational hydraulics, and applications of computational hydraulics.
An Advanced Introduction with OpenFOAM® and Matlab John Wiley & Sons
Computational Hydraulics introduces the concept of modeling and the contribution of numerical methods and numerical analysis to modeling. It provides a concise and comprehensive description of the basic hydraulic principles, and the problems addressed by these principles in the aquatic environment. Flow equations, numerical and analytical solutions are included. The necessary steps for building and applying numerical methods in hydraulics comprise the core of the book and this is followed by a report of different example applications of computational hydraulics: river training effects on flood propagation, water quality modelling of lakes and coastal applications. The theory and exercises included in the book promote learning of concepts within academic environments. Sample codes are made available online for purchasers of the book. Computational Hydraulics is intended for under-graduate and graduate students, researchers, members of governmental and non-governmental agencies and professionals involved in management of the water related problems. Author: Ioana Popescu, Hydroinformatics group, UNESCO-IHE Institute for Water Education, Delft , The Netherlands.
Elements of Computational Hydraulics CRC Press
Combines More Than 40 Years of Expert Experience Computational modelling and simulation methods have a wide range of applications in hydraulic and coastal engineering. Computational Modelling in Hydraulic and Coastal Engineering provides an introductory but comprehensive coverage of these methods. It emphasizes the use of the finite differences method with applications in reservoir management, closed-conduit hydraulics, free-surface channel and coastal domain flows, surface gravity waves, groundwater movement, and pollutant and sediment transport processes. It focuses on applications rather than lengthy theories or derivations of complex formulas and is supported by a wealth of hands-on numerical examples and computer codes written in MATLAB but available also in BASIC. PowerPoint presentations and learning assignment projects/quizzes, along with learning assessment rubrics, are included. A comprehensive study highlighting the infinite differences method, this book: Covers the fundamentals of flow in pressurized conduits Contains solutions for the classical Hardy Cross pipe network problem Designates the mathematical

description of groundwater flow in confined and unconfined aquifers Provides numerical examples for one- and two-dimensional applications including saltwater intrusion Presents examples of transport of pollutants, sediment and air bubbles using Eulerian and Lagrangian solution methodologies Includes information on weighted residuals, the finite elements method, and the boundary integral method Computational Modelling in Hydraulic and Coastal Engineering suits senior-level undergraduates and graduate students as well as practitioners such as coastal and maritime engineers, environmental engineers, civil engineers, computer modellers, and hydro-geologists.

Computational Modelling in Hydraulic and Coastal Engineering Computational Hydraulics Modelling forms a vital part of all engineering design, yet many hydraulic engineers are not fully aware of the assumptions they make. These assumptions can have important consequences when choosing the best model to inform design decisions. Considering the advantages and limitations of both physical and mathematical methods, this book will help you identify the most appropriate form of analysis for the hydraulic engineering application in question. All models require the knowledge of their background, good data and careful interpretation and so this book also provides guidance on the range of accuracy to be expected of the model simulations and how they should be related to the prototype. Applications to models include: open channel systems closed conduit flows storm drainage systems estuaries coastal and nearshore structures hydraulic structures. This an invaluable guide for students and professionals.

Numerical Methods and Computer Applications Elsevier

A comprehensive treatment of open channel flow, Open Channel Flow: Numerical Methods and Computer Applications starts with basic principles and gradually advances to complete problems involving systems of channels with branches, controls, and outflows/ inflows that require the simultaneous solutions of systems of nonlinear algebraic equations coupl

Computational Hydraulics CRC Press

Now includes Worked Examples for lectutrers in a companion pdf! The fourth edition of this volume presents design principles and practical guidance for key hydraulic structures. Fully revised and updated, this new edition contains enhanced texts and sections on: environmental issues and the World Commission on Dams partially saturated soils, small amenity dams, tailing dams, upstream dam face protection and the rehabilitation of embankment dams RCC dams and the upgrading of masonry and concrete dams flow over stepped spillways and scour in plunge pools cavitation, aeration and vibration of gates risk analysis and contingency planning in dam safety small hydroelectric power development and tidal and wave power wave statistics, pipeline stability, wave–structure interaction and coastal modelling computational models in hydraulic engineering. The book's key topics are explored in two parts - dam engineering and other hydraulic structures – and the text concludes with a chapter on models in hydraulic engineering. Worked numerical examples supplement the main text and extensive lists of references conclude each chapter. Hydraulic Structures provides advanced students with a solid foundation in the subject and is a useful reference source for researchers, designers and other professionals.

Hot Topics in Infection and Immunity in Children II Elsevier

Numerical Methods for Transport and Hydraulic Processes

Computational Methods in Water Resources CRC Press

Find out more about Hydraulics in Civil and Environmental Engineering Fifth Edition on CRC Press at http://www.crcpress.com/product/isbn/9780415672450

Hydraulics in Civil and Environmental Engineering, Fourth Edition Butterworth-Heinemann

Within the eld of hydraulics there is a growing trend towards the use of computer based models, which have proven to be an invaluable tool in engineering. A range of commercial packages is available which encompass different mathematical models and a variety of solution strategies. A number of problems can be identified with the software currently available, and as a result, research continues into developing better numerical techniques for computational hydraulics. The issues most often addressed by researchers consider the application of faster and more accurate numerical methods, many of which were originally developed for gas dynamics problems. There has been a growing trend in favour of Riemann based methods constructed within the finite volume framework. Such methods are noted for their good conservation and shock capturing capabilities. However, the computational cost of employing theses algorithms can lead to excessively long run times, particularly when higher order mathematical models are used. This often is as a result of stability constraints placed upon explicit schemes, which require the smallest possible time step permitted throughout the grid, to be applied globally. One possibility for improving this situation is to use local time stepping, whereby individual cells are advanced by their own maximum allowable time steps. To incorporate this concept into a transient model requires the development of a suitable integration strategy, to ensure that the solution remains accurate in time. Two such strategies developed for the Euler equations are considered within this thesis for application to the Saint Venant equations of open channel flow. Both techniques have been demonstrated to reduce run times and improve the quality of solutions in the regions of discontinuities. The investigation considers the the first order scheme of Roe, together with a second order extension constructed using a ux limiter approach. he eects of using an upwind based source term treatment, specifically developed for Roe s scheme, are also considered, and the source term calculations are incorporated into the LTS framework. Results are presented for a series of steady state and transient test cases, which illustrate how local time stepping can lead to reduced run times and improved solution accuracy. The results also highlight the benets of using an upwind source term treatment, particularly when variations in the channel geometry occur.

Recent Advances in Numerical Methods and Applications II Routledge

This book addresses computational hydraulics (or computational fluid dynamics). The purpose is to give non-specialist readers sufficient insight to handle real-life problems. It is not directed to specialist developers of computer software for such problems, although it will be a good starting point for them. It describes numerical methods for solving flow and transport problems to a sufficient level to understand other methods as well. In contrast with most other books in this field, a great deal of attention is given to judging and predicting the performance of the methods. The material is not new, but organized in a new way to provide simple but realistic examples from hydraulic, environmental, river and coastal engineering. This will enable the reader to recognize the numerical effects in more complicated applications in his own practice. The benefit is not that one can write (or even copy) ready-made computer programs, but that one knows how to work reliably with existing software.

Open Channel Flow Springer

Computational HydraulicsIWA Publishing

Numerical Methods CRC Press

An introduction to the Large-Eddy-Simulation (LES) method, geared primarily toward hydraulic and environmental engineers, the book covers special features of flows in water bodies and summarizes the experience gained with LES for calculating such flows. It can also be a valuable entry to the subject of LES for researchers and students in all fields of fluids engineering, and the applications part will be useful to researchers interested in the physics of flows governed by the dynamics of coherent structures.

Introduction to the Numerical Analysis of Incompressible Viscous Flows CRC Press

Open channel hydraulics has always been a very interesting domain of scienti c and engineering activity because of the great importance of water for human l- ing. The free surface ow, which takes place in the oceans, seas and rivers, can be still regarded as one of the most complex physical processes in the environment. The rst source of dif culties is the proper recognition of physical ow processes and their mathematical description. The second one is related to the solution of the derived equations. The equations arising in hydrodynamics are rather comp- cated and, except some much idealized cases, their solution requires application of the numerical methods. For this reason the great progress in open channel ow modeling that took place during last 40 years paralleled the progress in computer technique, informatics and numerical methods. It is well known that even ty- cal hydraulic engineering problems need applications of computer codes. Thus, we witness a rapid development of ready-made packages, which are widely d- seminated and offered for engineers. However, it seems necessary for their users to be familiar with some fundamentals of numerical methods and computational techniques applied for solving the problems of interest. This is helpful for many r- sons. The ready-made packages can be effectively and safely applied on condition that the users know their possibilities and limitations. For instance, such knowledge is indispensable to distinguish in the obtained solutions the effects coming from the considered physical processes and those caused by numerical artifacts.

Modeling Shallow Water Flows Using the Discontinuous Galerkin Method CRC Press

A study in the development of flow adaptive numerical schemes in computational hydraulics directed to enhancing modelling capabilities. Examples covered include additional flow resistance due to flexible vegetation; one-dimensional supercritical flow; and flow in networks of channels.