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associated with free-surface flows, which satisfy the shallow-water type assumption (including shallow water flows, dense gases and mixtures of materials as special samples).

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volume method, based on Riemann problem ' s resolution using shock capturing schemes. Application tests for steady and unsteady flows confirm the capacity of these schemes to maintain stability and precision. KEYWORDS: Free surface flow simulation, Shallow water equations, Saint-Venant, Finite volume, Riemann problem, Godunov ' s scheme, Limiters.

Application of Shock Capturing Method for Free Surface ...
Some of the well-known classical shock-capturing methods include the

MacCormack method (uses a discretization scheme for the numerical solution of hyperbolic partial differential equations), Lax–Wendroff method (based on finite differences, uses a numerical method for the solution of hyperbolic partial differential equations), and

Beam–Warming method.

Shock-capturing method - Wikipedia
I have been reading very carefully the book by E. Toro on shock capturing methods for shallow water flows and cannot understand why it uses the criteria h*>hL (or h*>hR) to define the

situation when a shock will occur. Shouldn't it be labmda*>lambdaL [where lambda is the eigenvalue of the Jacobian matrix, e.g. u+sqrt(gh)].

Shock-capturing methods for free-surface shallow water ...

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Shock-capturing methods for free-surface shallow flows ...

Sep 01, 2020 shock capturing methods for free surface shallow flows Posted By Eiji YoshikawaLtd TEXT ID 054f2dd0 Online PDF Ebook Epub Library last version shock capturing methods for free surface shallow flows uploaded by wilbur smith the first of its kind in the field this title examines the use of modern shock capturing finite volume numerical

30+ Shock Capturing Methods For

Free Surface Shallow Flows ...
In this paper, NHWAVE, a shock-capturing non-hydrostatic model for nonlinear free-surface wave processes is presented. The governing equations are solved in a σ coordinate system and discretized by a combined finite volume and finite difference scheme

with a Godunov-type method. In order to apply Godunov-type scheme, the velocities are collocated at the cell center.

Shock-capturing non-hydrostatic model for fully dispersive ...
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The first of its kind in the field, this title examines the use of modern, shock-capturing finite volume numerical methods, in the solution of partial differential equations associated with free-surface flows, which satisfy the shallow-water type assumption (including shallow water flows, dense gases and mixtures of materials as special samples). Starting with a general presentation of the governing equations for free-surface shallow flows and a discussion of their physical applicability, the book goes on to analyse the mathematical properties of the equations, in preparation for the presentation of the exact solution of the Riemann problem for wet and dry beds. After a general introduction to the finite volume approach, several chapters are then devoted to describing a variety of modern shock-capturing finite volume numerical methods, including Godunov methods of the upwind and centred type. Approximate Riemann solvers following various approaches are studied in detail as is their use in the Godunov approach for constructing low and high-order upwind TVD methods. Centred TVD schemes are also presented. Two chapters are then devoted to practical applications. The book finishes with an overview of potential practical applications of the methods studied, along with appropriate reference to sources of further information. Features include: * Algorithmic and practical presentation of the methods * Practical applications such as dambreak modelling and the study of bore reflection patterns in two space dimensions * Sample computer programs and accompanying numerical software (details available at www.numeritek.com) The book is suitable for teaching postgraduate students of civil, mechanical, hydraulic and environmental engineering, meteorology, oceanography, fluid mechanics and applied mathematics. Selected portions of the material may also be useful in teaching final year undergraduate students in the above disciplines. The contents will also be of interest to research scientists and engineers in academia and research and consultancy laboratories.

This book presents the theory and computation of open channel flows, using detailed analytical, numerical and experimental results. The fundamental equations of open channel flows are derived by means of a rigorous vertical integration of the RANS equations for turbulent flow. In turn, the hydrostatic pressure hypothesis, which forms the core of many shallow water hydraulic models, is scrutinized by analyzing its underlying assumptions. The book ' s main focus is on one-dimensional models, including detailed treatments of unsteady and steady flows. The use of modern shock capturing finite difference and finite volume methods is described in detail, and the quality of solutions is carefully assessed on the basis of analytical and experimental results. The book ’ s unique features include: • Rigorous derivation of the hydrostatic-based shallow water hydraulic models • Detailed treatment of steady open channel flows, including the computation of transcritical flow profiles • General analysis of gate maneuvers as the solution of a Riemann problem • Presents modern shock capturing finite volume methods for the computation of unsteady free surface flows • Introduces readers to movable bed and sediment transport in shallow water models • Includes numerical solutions of shallow water hydraulic models for non-hydrostatic steady and unsteady free surface flows This book is suitable for both undergraduate and graduate level students, given that the theory and numerical methods are progressively introduced starting with the basics. As supporting material, a collection of source codes written in Visual Basic and inserted as macros in Microsoft Excel® is available. The theory is implemented step-by-step in the codes, and the resulting programs are used throughout the book to produce the respective solutions.

This book provides essential information on the higher mathematical level of approximation over the gradually varied flow theory, also referred to as the Boussinesq-type theory. In this context, it presents higher order flow equations, together with their applications in a broad range of pertinent engineering and environmental problems, including open channel, groundwater, and granular material flows.

This comprehensive and up-to-date volume contains 367 papers presented at the 29th International Conference on Coastal Engineering, held in Lisbon, Portugal, 19-24 September 2004. It is divided into five parts: waves; long waves, nearshore currents, and swash; sediment transport and morphology; coastal management, beach nourishment, and dredging; coastal structures. The contributions cover a broad range of topics including theory, numerical and physical modeling, field measurements, case studies, design, and management. Coastal Engineering 2004 provides engineers, scientists, and planners state-of-the-art information on coastal engineering and coastal processes.The proceedings have been selected for coverage in:Index to Scientific & Technical Proceedings (ISTP CDROM version / ISI Proceedings)CC Proceedings - Engineering & Physical Sciences

The aim of the present book is to show, in a broad and yet deep way, the state of the art in computational science and engineering. Examples of topics addressed are: fast and accurate numerical algorithms, model-order reduction, grid computing, immersed-boundary methods, and specific computational methods for simulating a wide variety of challenging problems, problems such as: fluid-structure interaction, turbulent flames, bone-fracture healing, micro-electro-mechanical systems, failure of composite materials, storm surges, particulate flows, and so on. The main benefit offered to readers of the book is a well-balanced, up-to-date overview over the field of computational science and engineering, through in-depth articles by specialists from the separate disciplines.

This review volume is divided into two parts. The first part includes five review papers on various numerical models. Pedersen provides a brief but thorough review of the theoretical background for depth-integrated wave equations, which are employed to simulate tsunami runup. LeVeque and George describe high-resolution finite volume methods for solving the nonlinear shallow water equations. The focus of their discussion is on the applications of these methods to tsunami runup.In recent years, several advanced 3D numerical models have been introduced to the field of coastal engineering to calculate breaking waves and wave-structure interactions. These models are still under development and are at different stages of maturity. Rogers and Dalrymple discuss the Smooth Particles Hydrodynamics (SPH) method, which is a meshless method. Wu and Liu present their Large Eddy Simulation (LES) model for simulating the landslide-generated waves. Finally, Frandsen introduces the lattice Boltzmann method with the consideration of a free surface.The second part of the review volume contains the descriptions of the benchmark problems with eleven extended abstracts submitted by the workshop participants. All these papers are compared with their numerical results with benchmark solutions.

Together with turbulence, multiphase flow remains one of the most challenging areas of computational mechanics and experimental methods and numerous problems remain unsolved to date. Multiphase flows are found in all areas of technology, at all length scales and flow regimes. The fluids involved can be compressible or incompressible, linear or nonlinear. Because of the complexity of the problems, it is often essential to utilize advanced computational and experimental methods to solve the complex equations that describe them. Challenges in these simulations include modelling and tracking interfaces, dealing with multiple length scales, modelling nonlinear fluids, treating drop breakup and coalescence, characterizing phase structures, and many others.

Experimental techniques, although expensive and difficult to perform, are essential to validate models. This book contains papers presented at the Fifth International Conference on Computational Methods in Multiphase Flow, which are grouped into the following topics: Multiphase Flow

Simulation; Interaction of Gas, Liquids and Solids; Turbulent Flow; Environmental Multiphase Flow; Bubble and Drop Dynamics; Flow in Porous Media; Heat Transfer; Image Processing; Interfacial Behaviour.

Handbook of Numerical Methods for

Hyperbolic Problems explores the changes that have taken place in the past few decades regarding literature in the design, analysis and application of various numerical algorithms for solving hyperbolic equations. This volume provides concise summaries from experts in different types of algorithms, so that readers can find a variety of algorithms under different situations and readily understand their relative advantages and limitations. Provides detailed, cutting-edge background explanations of existing algorithms and their analysis Ideal for readers working on the theoretical aspects of algorithm development and its numerical analysis Presents a method of different algorithms for specific applications and the relative advantages and limitations of different algorithms for engineers or readers involved in applications Written by leading subject experts in each field who provide breadth and depth of content coverage

The Special Issue on Advances in Modeling and Management of Urban Water Networks (UWNs) explores four important topics of research in the context of UWNs: asset management, modeling of demand and hydraulics, energy recovery, and pipe burst identification and leakage reduction. In the first topic, the multi-objective optimization of interventions on the network is presented to find trade-off solutions between costs and efficiency. In the second topic, methodologies are presented to simulate and predict demand and to simulate network behavior in emergency scenarios. In the third topic, a methodology is presented for the multi-objective optimization of pump-as-turbine (PAT) installation sites in transmission mains. In the fourth topic, methodologies for pipe burst identification and leakage reduction are presented. As for the urban drainage systems (UDSs), the two explored topics are asset management, with a system upgrade to reduce flooding, and modeling of flow and water quality, with analyses on the transition from surface to pressurized flow, impact of water use reduction on the operation of UDSs, and sediment transport in pressurized pipes. The Special Issue also includes one paper dealing with the hydraulic modeling of an urban river with a complex cross-section.