Numerical Simulation Of Heat Transfer Enhancement Due To A

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Numerical Simulation of Heat Transfer in the Separated and Reattached Flow on a Blunt Flat Plate
Direct Numerical Simulation of Heat Transfer to Supercritical Carbon Dioxide in Pipe Flows
Numerical Simulation of Radiative Heat Transfer
Seminar: Numerical Simulation of Heat Transfer
2-D Numerical Simulation of Heat Transfer in a Stirling Micro-refrigerator Model
Heat Transfer in Cryogenic Vessels
Numerical Simulation of Heat Transfer in Friction Stir Welding
Numerical Simulation of Heat Transfer and Stress Analysis of Continuous Casting
Heat Transfer XIII

CAREY JOSEPH

Numerical Simulation of Heat Transfer and Fluid Flow in Additively Manufactured Plate-Fin Heat Exchangers with Wavy Fins CRC Press
Abstract : In the area of heat transfer, like other fields of science and engineering, full- and semi-analytical solutions of elementary problems are regarded as invaluable resources that can be used to identify relevant dimensionless parameters, to obtain basic insights into the phenomena under consideration, to quickly quantify the effects of key factors, and, ultimately, to pave the way for understanding more complex problems arising in practice. These solutions can also serve as excellent benchmarks for calibrating experimental setups and validating numerical techniques. In this dissertation, we theoretically study three classical heat transfer problems, with the ultimate goal of deriving analytical or approximate expressions for the Nusselt number (denoted by Nu), which is a key dimensionless parameter that quantifies the transfer of heat to and from a surface. First, we consider heat transfer by conduction from oblate spheroidal and bispherical surfaces into a stationary, infinite medium. The surfaces are presumed to maintain a constant heat ux. Assuming steady-state condition and uniform thermal conductivity, we analytically solve the Laplace equation for the temperature distribution and discuss the challenge of dealing with the Neumann (uniform flux) versus more convenient Dirichlet (isothermal) boundary condition. The solutions are obtained in boundary-fitting coordinate systems using the method of separation of variables and eigenfunction expansion. And, exact expressions for the average Nusselt number are presented along with their approximations. Next, we examine forced convection heat transfer from a single particle in uniform laminar flows. Asymptotic limits of small and large Peclet numbers (denoted by Pe) are considered. For Pe 1 and small or moderate Reynolds numbers. Specific results are given for the heat transfer from spheroidal particles in Stokes ow. Finally, we revisit the problem of steady-state heat transfer from a single particle in a uniform laminar ow with the assumption that the thermal conductivity of the fluid changes linearly with the temperature. We use a combination of asymptotic and scaling analyses to derive approximate expressions for the Nusselt number of arbitrarily shaped particles. The results cover the entire range of the Peclet number. We find that, for a constant temperature boundary condition and fixed geometry, the Nusselt number is essentially equal to the product of two terms, one of which is only a function of Pe while the other one is nearly independent of Pe and mainly depends on the proportionality constant of the conductivity-temperature relation. We also show that, in contrast, when a uniform heat flux is imposed on the surface of the particle, the Nusselt number can be estimated as a summation of a Pe-dependent piece and one that solely varies with the proportionality constant.

Heat Transfer Phenomena and Applications Springer
This book describes methodologies for performing numerical simulations of transport processes in heat transfer and fluid flow. The reader is guided to make the proper selection of simulation techniques and to interpret the acquired results based on the flow physics involved. Computer programs which are used to solve heat transfer and fluid flow problems are integrated into the text. Illustrative examples of thermo-fluid phenomena are provided in every chapter to enhance understanding of the subjects by offering the reader hands-on experience of numerical simulations. Most of the fundamental transport processes in heat transfer and fluid flow, e.g. heat conduction in a solid body, convection heat transfer of a fin, laminar and turbulent heat transfer and flow in a duct or tube, and boundary layers over a flat plate are covered. A strong emphasis is placed on examinations of the thermo-fluid phenomena inside a flow passage (such as tube and a channel). The book contains detailed discussions on the formulation of the boundary conditions which is often the key issue in making successful numerical simulations of the physical phenomena of interest. Simulations are carefully designed so that conventional 16-bit personal computers, such as IBM PC® or Apple Macintosh® can be used. Visualizing the simulated results in graphic form (plotting charts and line contours of physical variables) significantly enhances the reader's understanding of the important transport processes. The book is intended as an introductory text for numerical simulations of heat transfer and fluid flow phenomena. Description is simple and self-contained so that beginners can easily understand the material, yet it will also serve as a useful reference work for the practitioner. Exercise problems are supplied by which the reader can consolidate knowledge of simulation techniques described and gain further insight in the physical processes of interest. The book contains two 31⁄2 inch floppy disks, each of which stores a complete set of simulation source codes discussed in the text. These programs are recorded in ASCII format and can be run either on IBM PC® or Macintosh® using QuickBasic®. The programs are well-documented within the text as well as in the codes themselves with a number of comment statements. This helps the reader understand the flow of program runs and, if the reader so wishes, modifying the original source codes. To facilitate prescription of the physical conditions for simulations, these programs run in a highly interactive mode. In addition, the diskettes contain a number of compiled programs which can be executed without the QuickBasic® program.

Numerical Simulations of Heat Transfer and Fluid Flow on a Personal Computer Elsevier Publishing Company
This book deals with certain aspects of material science, particularly with the release of thermal energy associated with bond breaking. It clearly establishes the connection between heat transfer rates and product quality. The editors then sharply draw the thermal distinctions between the various categories of welding processes, and demonstrate how these distinctions are translated into simulation model uniqueness. The book discusses the incorporation of radiative heat transfer processes into the simulation model.

Numerical Simulation of Convective-Radiative Heat Transfer Elsevier Science Limited
The time-dependent heat transfer process in the region of a turbulent separation bubble at the leading edge of an isothermal square leading edge plate 18 modelled numerically. A discrete-vortex model is used to determine the velocity field and a third-order upwind differencing technique 18 used to calculate the thermal field. The prediction of the mean Nusselt numbers 18 compared with experiment. The model predicts the instantaneous streamlines, isotherms and local Nusselt numbers at the plate surface. The influence of the large-scale vortex structures on the local heat transfer 18 determined.

Numerical Simulation of Reactive Flow in Hot Aquifers CRC Press
Presenting contributions from renowned experts in the field, this book covers research and development in fundamental areas of heat exchangers, which include: design and theoretical development, experiments, numerical modeling and simulations. This book is intended to be a useful reference source and guide to researchers, postgraduate students, and engineers in the fields of heat exchangers, cooling, and thermal management.

Numerical Simulation of Heat Transfer Process During Glass Container Forming BoD – Books on Demand
The book comprises the fundamentals of the numerical simulation of fluid flows as well as the modelling of a power plant and plant components. The fundamental equations for heat and mass transfer will be prepared for the application in the numerical simulation. Selected numerical methods will be discussed in detail. The book will deal with the gas as well as with the water/steam flow. Regulation and controller, simplified models and hybrid models as well as the validation of measurement data are also included in the book.

Numerical Simulation of Power Plants and Firing Systems IntechOpen
Definitive Treatment of the Numerical Simulation of Bioheat Transfer and Fluid Flow Motivated by the upwelling of current

interest in subjects critical to human health, Advances in Numerical Heat Transfer, Volume 3 presents the latest information on bioheat and biofluid flow. Like its predecessors, this volume assembles a team of renowned international researchers who cover both fundamentals and applications. It explores ingenious modeling techniques and innovative numerical simulation for solving problems in biomedical engineering. The text begins with the modeling of thermal transport by perfusion within the framework of the porous-media theory. It goes on to review other perfusion models, different forms of the bioheat equation for several thermal therapies, and thermal transport in individual blood vessels. The book then describes thermal methods of tumor detection and treatment as well as issues of blood heating and cooling during lengthy surgeries. It also discusses how the enhancement of heat conduction in tumor tissue by intruded nanoparticles improves the efficacy of thermal destruction of the tumor. The final chapters focus on whole-body thermal models, issues concerning the thermal treatment of cancer, and a case study on the thermal ablation of an enlarged prostate.

Numerical Simulation of Heat Transfer in Materials with Anisotropic Thermal Conductivity WIT Press

Heat transfer calculations in different aspects of engineering applications are essential to aid engineering design of heat exchanging equipment. Minimizing of computational time is a challenging task faced by researchers and users. Methodology of calculations in some application areas are incorporated in this book, such as differential analysis of heat recoveries with CFD in a tube bank, heating and ventilation of equipment and methods for analytical solution of nonlinear problems. Numerical analysis is the prerequisite of design and for the manufacture of heat exchanging equipment. Some numerical and experimental information are presented with utmost skill. Similarly, the analytical solution of heat transfer is touched in this book. Study of heat transfer phenomena and applications are equally emphasized in this issue.

Numerical Simulation of Heat Exchangers Springer Science & Business Media

Heat Transfer XIII: Simulation and Experiments in Heat and Mass Transfer contains the proceedings of the thirteenth conference in the well established series on Simulation and Experiments in Heat Transfer and its applications. Advances in computational methods for solving and understanding heat transfer problems continue to be important because heat transfer topics and related phenomena are commonly of a complex nature and different mechanisms like heat conduction, convection, turbulence, thermal radiation and phase change as well as chemical reactions may occur simultaneously. Typically, applications are found in heat exchangers, gas turbine cooling, turbulent combustion and fires, fuel cells, batteries, micro- and mini- channels, electronics cooling, melting and solidification, chemical processing etc. Heat Transfer might be regarded as an established and mature scientific discipline, but it has played a major role in new emerging areas such as sustainable development and reduction of greenhouse gases as well as for micro- and nano- scale structures and bioengineering. Non-linear phenomena other than momentum transfer may occur due to temperature-dependent thermophysical properties. In engineering design and development, reliable and accurate computational methods are requested to replace or complement expensive and time consuming experimental trial an error work. Tremendous advancements have been achieved during recent years due to improved numerical solution methods for non-linear partial differential equations, turbulence modelling advancements and developments of computers and computing algorithms to achieve efficient and rapid simulations. Nevertheless, to further progress in computational methods requires developments in theoretical and predictive procedures – both basic and innovative – and in applied research. Accurate experimental investigations are needed to validate the numerical calculations. Topics covered include: Heat transfer in energy producing devices; Heat transfer enhancements; Heat exchangers; Natural and forced convection and radiation; Multiphase flow heat transfer; Modelling and experiments; Heat recovery; Heat and mass transfer problems; Environmental heat transfer; Experimental and measuring technologies; Thermal convert studies.

Numerical Simulation of Heat Transfer in the Drive Plate of a Nutating Engine Springer Science & Business Media

This book describes methodologies for performing numerical simulations of transport processes in heat transfer and fluid flow. The reader is guided to make the proper selection of simulation techniques and to interpret the acquired results based on the flow physics involved. Computer programs which are used to solve heat transfer and fluid flow problems are integrated into the text. Illustrative examples of thermo-fluid phenomena are provided in every chapter to enhance understanding of the subjects by offering the reader hands-on experience of numerical simulations. Most of the fundamental transport processes in heat transfer and fluid flow, e.g. heat conduction in a solid body, convection heat transfer of a fin, laminar and turbulent heat transfer and flow in a duct or tube, and boundary layers over a flat plate are covered. A strong emphasis is placed on examinations of the thermo-fluid phenomena inside a flow passage (such as tube and a channel). The book contains detailed discussions on the formulation of the boundary conditions which is often the key issue in making successful numerical simulations of the physical phenomena of interest. Simulations are carefully designed so that conventional 16-bit personal computers, such as IBM PCreg; or Apple Macintoshreg; can be used. Visualizing the simulated results in graphic form (plotting charts and line contours of physical variables) significantly enhances the reader's understanding of the important transport processes. The book is intended as an introductory text for numerical simulations of heat transfer and fluid flow phenomena. Description is simple and self-contained so that beginners can easily understand the material, yet it will also serve as a useful reference work for the practitioner. Exercise problems are supplied by which the reader can consolidate knowledge of simulation techniques described and gain further insight in the physical processes of interest. The book contains two 3frac12; inch floppy disks, each of which stores a complete set of simulation source codes discussed in the text. These programs are recorded in ASCII format and can be run either on IBM PCreg; or Macintoshreg; using QuickBasicreg;. The programs are well-documented within the text as well as in the codes themselves with a number of comment statements. This helps the reader understand the flow of program runs and, if the reader so wishes, modifying the original source codes. To facilitate prescription of the physical conditions for simulations, these programs run in a highly interactive mode. In addition, the diskettes contain a number of compiled programs which can be executed without the QuickBasicreg; program.

Numerical Simulation of Heat Transfer in Heating, Cooling, Drying, Freezing, Solidifying and Melting Processes CRC Press

Computational fluid flow is not an easy subject. Not only is the mathematical representation of physico-chemical hydrodynamics complex, but the accurate numerical solution of the resulting equations has challenged many numerate scientists and engineers over the past two decades. The modelling of physical phenomena and testing of new numerical schemes has been aided in the last 10 years or so by a number of basic fluid flow programs (MAC, TEACH, 2-E-FIX, GENMIX, etc). However, in 1981 a program (perhaps more precisely, a software product) called PHOENICS was released that was then (and still remains) arguably, the most powerful computational tool in the whole area of endeavour surrounding fluid dynamics. The aim of PHOENICS is to provide a framework for the modelling of complex processes involving fluid flow, heat transfer and chemical reactions. PHOENICS has now been is use for four years by a wide range of users across the world. It was thus perceived as useful to provide a forum for PHOENICS users to share their experiences in trying to address a wide range of problems. So it was that the First International PHOENICS Users Conference was conceived and planned for September 1985. The location, at the Dartford Campus of Thames Polytechnic, in the event, proved to be an ideal site, encouraging substantial interaction between the participants.

MATHEMATICAL MODELING AND NUMERICAL SIMULATION OF HEAT TRANSFER FROM ISOLATED OBJECTS Elsevier

This book deals with certain aspects of material science, particularly with the release of thermal energy associated with bond breaking. It clearly establishes the connection between heat transfer rates and product quality. The editors then sharply draw the thermal distinctions between the various categories of welding processes, and demonstrate how these distinctions are translated into simulation model uniqueness. The book discusses the incorporation of radiative heat transfer processes into the simulation model.

A Numerical Simulation of Heat Transfer in Evaporative Cooling Towers

This product, consisting of a CD-ROM and a book, deals with the numerical simulation of reactive transport in porous media using the simulation package SHEMAT/Processing SHEMAT. SHEMAT (Simulator for HEat and MAss Transport) is an easy-to-use, general-purpose reactive transport simulation code for a wide variety of thermal and hydrogeological problems in two or three dimensions. The book is a richly documented manual for users of this software which discusses in detail the coded physical and chemical equations. Thus, it provides the in-depth background required by those who want to apply the code for solving advanced technical and scientific problems. The enclosed companion CD-ROM contains the software and data for all of the case studies. The software includes user-friendly pre- and post-processors which make it very easy to set up a model, run it and view the results, all from one platform. Therefore, the software is also very suitable for academic or technical "hands-on" courses for simulating flow, transport of heat and mass, and chemical reactions in porous media. You can find a link to the updated software on springer.com .

Numerical Simulation of Mass and Heat Transfer Processes in a Micro Heat Engine

This book presents numerical, experimental, and analytical analysis of convective and radiative heat transfer in various engineering and natural systems, including transport phenomena in heat exchangers and furnaces, cooling of electronic heat-generating elements, and thin-film flows in various technical systems. It is well known that such heat transfer mechanisms are dominant in the systems under consideration. Therefore, in-depth study of these regimes is vital for both the growth of industry and the preservation of natural resources. The authors included in this book present insightful and provocative studies on convective and radiative heat transfer using modern analytical techniques. This book will be very useful for academics, engineers, and advanced students.

Numerical Simulation of Heat Exchangers

Nanofluid in Heat Exchanges for Mechanical Systems: Numerical Simulation shows how the finite volume method is used to simulate various applications of heat exchanges. Heat transfer enhancement methods are introduced in detail, along with a hydrothermal analysis and second law approaches for heat exchanges. The melting process in heat exchanges is also covered, as is the influence of variable magnetic fields on the performance of heat exchange. This is an important reference source for materials scientists and mechanical engineers who are looking to understand the main ways that nanofluid flow is simulated and applied in industry. Provides detailed coverage of major models used in nanofluid analysis, including the finite volume method, governing equations for turbulent flow, and equations of nanofluid in presence of variable magnetic field Offers detailed coverage of swirling flow devices and melting processes Assesses which models should be applied in which situations

Numerical Simulations of Heat Transfer and Fluid Flow on a Personal Computer

Numerical Simulation of Heat Transfer in Turbulent Pipe Flow with Structured Wall Surfaces

Nanofluid in Heat Exchangers for Mechanical Systems

Numerical Simulation of Heat Exchangers

Numerical Simulation and Heat Transfer