Ballistic Simulation

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Simulation of Ballistic Impacts in Steel Plates
Proceedings of the SCS Simulation Multi Conference on Ballistics Simulation and Simulation Work and Progress, 1-5 April 1991, New Orleans, Louisiana ; Ballistics Simulation
Computational Aspects of VLSI Design with an Emphasis on Semiconductor Device Simulation
Dynamics of Fractal Surfaces
Wound Ballistic Simulation
Theory and Simulation Methods for Electronic and Phononic Transport in Thermoelectric Materials
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Material Modeling for Terminal Ballistic Simulation
Experimental Investigation of the Simulation of Atmospheric Entry of Ballistic Missiles
Ballistic Materials and Penetration Mechanics
Simulation of Ballistic Phenomena in Conceptual Two-piece Ammunition
Proceedings of a Conference held at the Mathematisches Forschungsinstitut, Oberwolfach, November 25-December 1, 2001
Advanced Fibrous Composite Materials for Ballistic Protection
18th Space Simulation Conference
Determination of Aerodynamic Drag and Exterior Ballistic Trajectory Simulation for the 155mm, DPICM, M864 Base-Burn Projectile
Coarse Grained Simulation and Turbulent Mixing

Ballistic Simulation

STEIN CORDOVA

Interior Ballistic Simulations of the Bulk-loaded Liquid Propellant Gun Springer Nature The third Conference on Mathematical Models and Numerical Simulation in Electronic Industry brought together researchers in mathematics, electrical engineering and scientists working in industry. The

contributions to this volume try to bridge the gap between basic and applied mathematics, research in electrical engineering and the needs of industry.

Three-Dimensional Modelling and Simulation of Ballistic Impact DEStech Publications, Inc

A three-dimensional mortar interior ballistic (3D-MIB) model and code have been developed and stage-wise validated with multiple sets of experimental data in close collaboration between The Pennsylvania State Univ. (PSU) and Army Research and Development Engineering Center. This newly developed MIB model and numerical code realistically simulates the combustion and pressurization processes in various components of the 120mm mortar system. Due to the complexity of the overall interior ballistic processes in the mortar propulsion system, the overall problem has been solved in a modular fashion, i.e., simulating each component of the mortar propulsion system separately. The physical processes in the mortar system are two-phase and were simulated by considering both phases as an interpenetrating continuum. Mass and energy fluxes from the flash tube into the granular bed of M1020 ignition cartridge were determined from a semiempirical technique. For the tail-boom section, a transient one-dimensional two phase numerical code based on method of characteristics (MOC) was developed and

validated by experimental test results. The mortar tube combustion processes were modeled and solved by using a two-phase Roe-Pike method with van Leer flux limiter, a fourth order Runge-Kutta scheme, and an adaptive mesh generator to account for the projectile motion. For each component, the predicted pressure-time traces showed significant pressure wave phenomena, which closely simulated the measured pressure-time traces. The experimental data for the flash tube and ignition cartridge were obtained at PSU whereas the pressure-time traces at the breech-end of the mortar tube were obtained from the tests conducted at Yuma Proving Ground (YPG). The 3D-MIB code was also used to simulate the effect of flash tube vent-hole pattern on the pressure-wave phenomenon in the ignition cartridge. A comparison of the pressure difference between primer-end and projectile-end locations of the original and mo.

The Electrochemical Society

This book features most of the papers presented at the International Conference on Computational Ballistics 2005. The contents stress the importance and possibilities of numerical simulation on internal, external and terminal ballistics, to describe, analyse, predict and subsequently reduce the experimental requirements in ballistics.

Interior Ballistic Simulations of the

Bulk-loaded Liquid Propellant Gun LAP Lambert Academic Publishing
Original research from around the world on weapons-grade projectiles, warheads, missiles, guns and their effects on target materialsNew information on shaped charges, fire, control strategies, simulation, blast resistance, non-lethal systems and more190 original presentations in two printed volumes, plus searchable CD The first part of this 2-volume set, part of an ongoing series, presents previously unpublished research on the design and modeling of ballistic devices ranging from shells to missiles, including explosives, propellants and internal components. The second part investigates the effects of ballistic penetrants on a variety of targets, including human models, as well as hard targets and diverse armors made from engineered fibers, ceramics, metal alloys and concrete. Data is included on the modeling and testing of novel devices, explosives and shielding strategies. Papers in this text were presented at a symposium organized by the National Defense Industrial Association with the International Ballistics Society. The CD-ROM displays figures and illustrations in articles in full color along with a title screen and main menu screen. Each user can link to all papers from the Table of Contents and Author Index and also link to papers and front matter by using the global

bookmarks which allow navigation of the entire CD-ROM from every article. Search features on the CD-ROM can be by full text including all key words, article title, author name, and session title. The CD-ROM has Autorun feature for Windows 2000 with Service Pack 4 or higher products along with the program for Adobe Acrobat Reader with Search 11.0. One year of technical support is included with your purchase of this product.

Ballistics Simulation and Simulation Work and Progress World Scientific

TRANSFER MATRIX METHOD FOR MULTIBODY SYSTEMS: THEORY AND APPLICATIONS Xiaoting Rui, Guoping Wang and Jianshu Zhang - Nanjing University of Science and Technology, China Featuring a new method of multibody system dynamics, this book introduces the transfer matrix method systematically for the first time. First developed by the lead author and his research team, this method has found numerous engineering and technological applications. Readers are first introduced to fundamental concepts like the body dynamics equation, augmented operator and augmented eigenvector before going in depth into precision analysis and computations of eigenvalue problems as well as dynamic responses. The book also covers a combination of mixed methods and practical applications in multiple rocket launch systems, self-propelled

artillery as well as launch dynamics of on-ship weaponry. • Comprehensively introduces a new method of analyzing multibody dynamics for engineers • Provides a logical development of the transfer matrix method as applied to the dynamics of multibody systems that consist of interconnected bodies • Features varied applications in weaponry, aeronautics, astronautics, vehicles and robotics Written by an internationally renowned author and research team with many years' experience in multibody systems Transfer Matrix Method of Multibody System and Its Applications is an advanced level text for researchers and engineers in mechanical system dynamics. It is a comprehensive reference for advanced students and researchers in the related fields of aerospace, vehicle, robotics and weaponry engineering.

Semi-physical Verification Technology for Dynamic Performance of Internet of Things System Material Modeling for Terminal Ballistic SimulationNumerical simulation of terminal ballistic events requires quantitative modeling of the complex material responses which are observed to occur experimentally. This report discusses current deficiencies and future needs for material modeling in this context and suggests some specific efforts which, in the opinion of the authors,

could substantially improve the utility of simulation as a design and analysis tool for armor/anti-armor systems. terminal ballistics, armor, anti-armor ammunition, numerical methods, material modeling.Theory, Methodology, Tools and Applications for Modeling and Simulation of Complex Systems16th Asia Simulation Conference and SCS Autumn Simulation Multi-Conference, AsiaSim/SCS AutumnSim 2016, Beijing, China, October 8-11, 2016, Proceedings, Part II Numerical simulation is rapidly becoming an important part of the VLSI design process, allowing the engineer to test, evaluate, and optimize various aspects of chip design without resorting to the costly and time-consuming process of fabricating prototypes. This procedure not only accelerates the design process, but also improves the end product, since it is economically feasible to numerically simulate many more options than might otherwise be considered. With the enhanced computing power of today's computers, more sophisticated models are now being developed. This volume contains the proceedings of the AMS-SIAM Summer Seminar on Computational Aspects of VLSI Design, held at the Institute for Mathematics and Its Applications at the University of Minnesota, in the spring of 1987. The seminar featured presentations by some of the top experts working in this area. Their contributions to this

volume form an excellent overview of the mathematical and computational problems arising in this area.

Predictive Modeling of Dynamic Processes Wit Pr/Computational Mechanics

Recently the development of a PC-based, end to end electrothermal chemical (ETC) gun ballistic simulation code called the pulsed power plasma interior ballistics (PPIB) was completed. PPIB is a time dependent, lumped parameter, electrothermal chemical gun ballistic simulator which has a one dimensional plasma submodel. The PPIB code is used to simulate the three main subsystems of the overall ETC gun system, including the pulse power subsystem, the plasma cartridge, and the interior ballistic process. PPIB is a linkage of three well-established systems models: (1) P2SIM for pulse power, developed by PCRL to model electric gun pulse power supplies, (2) the plasma cartridge code of Powell and Zielinski from the U.S. Army Research Laboratory (ARL), and (3) the latest version of the interior ballistics code IBHVG2 from ARL. PPIB is written in American National Standards Institute (ANSI) standard formula translator (FORTRAN) and is designed to run on any 386, 486 or Pentium-based PC platform. The code has been validated against a 4-MJ pulsed power system, 30-mm ETC plasma experiments, and plasma capillary calculations from the stand alone Powell code, all of which are presented

here. In addition, results obtained for high energy plasma simulations are provided. Included in this study are (1) the electrical behavior and transfer efficiencies of various plasma capillary tubes; (2) the amount of energy partitioned to each of the constituents within the plasma such as internal, kinetic, and work energy; and (3) the radiant energy partitioning of the plasma inside the capillary tube during the electrical discharge. The study is concluded with an estimate of the overall energy delivered for the entire process of power supply discharge to electrical plasma generation and radiation for a given test case.

28th International Symposium on Ballistics

Woodhead Publishing

This book combines semi-physical simulation technology with an Internet of Things (IOT) application system based on novel mathematical methods such as the Fisher matrix, artificial neural networks, thermodynamic analysis, support vector machines, and image processing algorithms. The dynamic testing and semi-physical verification of the theory and application were conducted for typical IOT systems such as RFID systems, Internet of Vehicles systems, and two-dimensional barcode recognition systems. The findings presented are of great scientific significance and have wide application potential for solving bottlenecks in the development of RFID technology and IOT engineering. The book is a valuable resource for

postgraduate students in fields such as computer science and technology, control science and engineering, and information science. Moreover, it is a useful reference resource for researchers in IOT and RFID-related industries, logistics practitioners, and system integrators.
Modeling, Simulation, and Optimization of Integrated Circuits Springer
The overarching theme of the work originally proposed concerned the development of three-dimensional computational capability enabling the lagrangian simulation of armor penetration. The principal objectives of the work, as stated in the proposal, were: (1) The development of three-dimensional computational capability including adaptive meshing, direct simulation of fracture and fragmentation by cohesive elements, nonsmooth contact and friction. (2) Verification and validation of the unit algorithms. (3) The demonstration of the predictive ability of the integrated facility in problems of ballistic penetration of interest to the Army. All the unit algorithms required to carry out the simulations of interest in three dimensions have been developed and successfully tested. The degree of difficulty involved in the development of these algorithms vanes from low (e.g., the extension of the constitutive updates to three dimensions) to exceptional high (most notably, the development

of automatic 3D meshing capability for arbitrary domains). Some of the main accomplishments are summarized next. *Terminal Ballistics* John Wiley & Sons
HAWK Doppler radar data collected at Yuma Proving Ground, Az, for the 155mm, DPICM, M864 base-burn projectile have been reduced for the purpose of determining the aerodynamic drag. The estimated base drag reduction during base-burn motor functioning showed a very good correlation with time of flight and to a lesser degree with local atmospheric air pressure. No correlation was evident with flight Mach number, provided an effective base drag coefficient is assumed which is just a function of Mach number. This result suggests a simple addition to the Modified Point Mass Trajectory Model for the exterior ballistic simulation of the M864 base-burn projectile. Keywords: Projectile trajectories; DPICM (Dual-purpose Improved Conventional Munitions); Propelling charges; Ballistic trajectory modeling.
A Feasibility Investigation Concerning the Simulation of Sonic Boom by Ballistic Models John Wiley & Sons
Material Modeling for Terminal Ballistic Simulation
Military, Government and Aerospace Simulation Cambridge University Press
Numerical simulation of terminal ballistic events requires quantitative

modeling of the complex material responses which are observed to occur experimentally. This report discusses current deficiencies and future needs for material modeling in this context and suggests some specific efforts which, in the opinion of the authors, could substantially improve the utility of simulation as a design and analysis tool for armor/anti-armor systems. terminal ballistics, armor, anti-armor ammunition, numerical methods, material modeling.

Theory, Methodology, Tools and Applications for Modeling and Simulation of Complex Systems John Wiley & Sons

Reviews our current understanding of the subject. For graduate students and researchers in computational fluid dynamics and turbulence.

Performance Improvement Using High-k Gate Stack Woodhead Publishing

With the proliferation of hostile theater ballistic missiles (TBMs), the Department of Defense has focused on attack operations as a means of ballistic missile defense (BMD). This thesis develops a stochastic simulation of a network for analyzing and comparing BMD strike operations. Applying knowledge of mobile launch site procedures, we construct a TBM left-of-launch network (LLN) model using discrete-event simulation software. This comprehensive network models system components from the storage phase, transportation phase, and

launch phase. The simulation model integrates congestion effects after strikes are executed on the LLN. We conduct simulation experiments representing various strike combinations to quantify and compare system metrics focused on increasing the delay of TBM launches. We demonstrate BMD strike effectiveness by analyzing time-valued metrics such as the mean TBM time in system and mean time to complete launches. Increasing the delay in TBM launches grants more time for strategic decision making and prepositioning of retaliatory forces. We present this notional model and experimentation method as a guide for determining the best locations for BMD strike operations.

The Development of a General Ballistic Trajectory Simulation Algorithm Springer Science & Business Media In this thesis, a numerical study of normal perforation of 12mm thick steel plates impacted by 20mm diameter conical shaped projectiles is reported. A thorough analysis on specific experimental data results serves as basis for the numerical simulations of the problem, which has been performed using a finite element code, ABAQUS-Explicit with a fixed mesh for the bullet and plate. To define the thermoviscoplastic behaviour of the material constituting the plate, the Johnson–Cook model has been used. This homogeneous behaviour has been coupled with the

Johnson–Cook fracture criterion to predict completely the perforation process. The simulations cover a range of impact velocities from 200 to 500m/s. Both qualitative and quantitative predictions of projectile-plate behaviour are compared to the experimental ones from the literature, and good agreement is obtained in general. The analysis considers the influence of adaptive meshing of the plate, interaction and damage of the target plate among others. A specific discussion about damage is reported highlighting its influence on the model. The final results and discussion can be of interest for the design of an optimised version of the model.

Assessment of the Legitimacy of Law Enforcement Firearms Ammunition by Means of Wound Ballistic Simulation

Springer Science & Business Media

Predictive Modeling of Dynamic Processes provides an overview of hydrocode technology, applicable to a variety of industries and areas of engineering design. Covering automotive crash, blast impact, and hypervelocity impact phenomena, this volume offers readers an in-depth explanation of the fundamental code components. Chapters include informative introductions to each topic, and explain the specific requirements pertaining to each predictive hydrocode. Successfully blending crash simulation, hydrocode technology and impact engineering, this

volume fills a gap in the current competing literature available.

Wound Ballistic Simulation Springer

This monograph covers all important issues of terminal ballistics in a comprehensive way combining experimental data, numerical simulations and analytical modeling. It uses a unique approach to numerical simulations as sensitivity measure for the major physical parameters. In the first chapter, the book includes necessary details about the experimental equipment which are used for ballistic tests. The second chapter covers essential features of the codes which are used in recent years all over the world, the Euler vs. Lagrange schemes, meshing techniques etc. The third chapter, devoted to the penetration mechanics of rigid rods, brings the update of modeling in this field. The fourth chapter deals with plate perforation and the fifth chapter deals with the penetration of shaped charge jets and eroding long rods. The last chapter includes several techniques for the disruption and defeating of the main threats in armor design. Throughout the book the authors demonstrate the advantages of the simulation approach in understanding the basis physics behind the investigated phenomena.

Index of Limited Documents Releasable to DTIC Users Birkhäuser

Ballistic Materials and Penetration Mechanics deals with ballistically protective materials and

penetration mechanics. The book discusses historical and practical considerations of ballistic protection, including metallic armor, as well as ballistic testing methodology, the ability of a protective material to stop or slow down a particular projectile, and the theoretical aspects of penetration mechanics. It also highlights the importance of stress wave analysis in the penetration and spalling phenomena. Organized into 12 chapters, this volume begins with an overview of the history of the armor and the modern helmet. It proceeds with a discussion of variations in ballistic test methods, errors in test methods, and the importance of the hardness and geometry of both the target and the projectile. The next chapters focus on the importance of fibrous armor, materials that are visually transparent and resistant to penetration by high-energy projectiles and fragments, and transparent armor and ceramic composite armor. The reader is also introduced to materials used in the design of metallic armor, the role of stress waves in the penetration problem, and the use of computer simulation to analyze ballistic impact experiments. The book looks at numerical techniques for modeling hypervelocity impact and concludes with a chapter on the penetration mechanics of textile structures. This book is a valuable resource for scientists working at government, industrial, and university

laboratories, as well as law enforcement officers and others who want information on materials that provide the best protection against damage from impacts, explosions, and bullets.
Quantum Ballistic Simulation of Nanoscale Double Gate MOSFET
Elsevier
Advanced Fibrous Composite Materials for Ballistic Protection provides the latest information on ballistic protection, a topic that remains an important issue in modern times due to ever increasing threats coming from regional conflicts, terrorism, and anti-social behavior. The basic requirements for ballistic protection equipment are first and foremost, the prevention of a projectile from perforating, the reduction of blunt trauma to the human body caused by ballistic impact, the necessity that they are thermal and provide moisture comfort, and that they are lightweight and flexible to guarantee wearer's mobility. The main aim of this book is to present some of the most recent developments in the design and engineering of woven fabrics and their use as layering materials to form composite structures for ballistic personal protection. Chapter topics include High Performance Ballistic Fibres, Ultra-High Molecular Weight Polyethylene (UHMWPE), Ballistic Damage of Hybrid Composite Materials, Analysis of Ballistic Fabrics and Layered Composite Materials, and Multi-Scale Modeling of Polymeric Composite

Materials for Ballistic Protection. Contributions from leading experts in the field Cutting edge developments on the engineering of ballistic materials Comprehensive analysis of the development and uses of advanced fibrous composite materials

Theory and Applications American Mathematical Soc.

In the last few years there has been an explosion of activity in the field of the dynamics of fractal surfaces, which, through the convergence of important new results from computer simulations, analytical theories and experiments, has led to significant advances in our understanding of nonequilibrium surface growth phenomena. This interest in surface growth phenomena has been motivated largely by the fact that a wide variety of natural and industrial processes lead to the formation of rough surfaces and interfaces. This book presents these developments in a single volume by bringing together the works containing the most important results in the field.The material is divided into chapters consisting of reprints related to a single major topic. Each chapter has a general introduction to a particular aspect of growing fractal surfaces. These introductory parts are included in order to provide a scientific background to the papers reproduced in the main part of the chapters. They are written in a pedagogical style and contain only the most

essential information. The contents of the reprints are made more accessible to the reader as they are preceded by a short description of what the editors find to be the most significant results in the paper.

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