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Legal Ontology Engineering Systems Engineering Models Modelling and Simulation of Integrated Systems in Engineering Model Engineering for Simulation The Engineering Design of Systems Water Engineering Modeling and Mathematic Tools Numerical Methods and Modelling for Engineering Knowledge Engineering and Knowledge Management. Methods, Models, and Tools Multiphysics Modeling: Numerical Methods and Engineering Applications Ontology Modeling in Physical Asset Integrity Management Modeling, Control and Optimization of Water Systems Software Engineering Methodologies for Modelling Complex Real-time Systems Multi-Paradigm Modelling Approaches for Cyber-Physical Systems Concepts and Methodologies for Modeling and Simulation Modeling and Simulation Support for System of Systems Engineering Applications Graph Transformation for Software Engineers Methodology of Complex Activity System Analysis and Modeling. Languages, Methods, and Tools for Systems Engineering Modelling Techniques for Business Process Re-engineering and Benchmarking Rock Characterisation, Modelling and Engineering Design Methods Systems and Software Variability Management Numerical Methods for Nonlinear Engineering Models Predictive Modelling for Energy Management and Power Systems Engineering Methodology of Complex Activity Environment Modeling-Based Requirements Engineering for Software Intensive Systems Model-based System and Architecture Engineering with the Arcadia Method Software Reliability Modelling Practical Model-Based Systems Engineering Modeling and Simulation Techniques in Structural Engineering Modelling and Methodologies for Enterprise Integration Modeling in Geotechnical Engineering Modeling Engineering Systems Environmental Modelling Structural Modeling and Experimental Techniques, Second Edition Enterprise Engineering and Integration: Building International Consensus Conceptual Modelling of Multi-Agent Systems Similarity Methods in Engineering Dynamics Turbulent Flows Smart Modelling for Engineering Systems Model-Based Engineering of Embedded Systems

Enterprise integration and enterprise engineering has become a focal point of discussions during the past few years with active contribution of many disciplines... The evolution from the concept of CAD/CAM, through CIM to the Integrated Enterprise is based on the assumption that the integrated enterprise can (and should) be engineered just as any complex system can. This book presents ARCADIA—a tooled method devoted to systems and architecture engineering, especially for those dealing with strong constraints to be reconciled (cost, performance, safety, security, reuse, consumption, weight). The book describes the detailed reasoning necessary to: understand the real customer need; define and share the product architecture among all engineering stakeholders; early validate its design and justify it; and ease and master integration, validation, verification and qualification (IVVQ). Offers a comprehensive examination of systems engineering, including the use of models to support it Not only yet another book on modeling, but rather a journey in systems engineering, enlightening the use of models to support it. Focuses on solitary modeling tasks while also covering prime collaborations between engineering stakeholders Examines modeling techniques to capture and share architecture and to early verify it against need and non-functional constraints Addresses subjects not usually covered by model-based system engineering (MBSE) methods, such as co-engineering with specialties, system/sub-system co-engineering, integration verification and validation Features a powerful, dedicated tool (Capella) Covers a range of topics, including an introduction to system engineering issues, an introduction to MBSE, a presentation of the method for beginners and a handy reference manual for advanced users This book constitutes the refereed proceedings of the 10th International Conference on System Analysis and Modeling, SAM 2018, held in Copenhagen Denmark, in October 2018. The 12 full papers and 2 short papers presented were carefully reviewed and selected from 24 submissions. The papers describe innovations, trends, and experiences in modeling and analysis of complex systems using ITU-T's Specification and Description Language (SDL-2010) and Message Sequence Chart (MSC) notations, as well as related system design languages — including UML, ASN.1, TTCN, SysML and the User Requirements Notation (URN). This year's edition of SAM will be under the theme "Languages, Methods, and Tools for Systems Engineering", including languages and methods standardized by the ITU-T, and domain-specific languages. Also included are software engineering technologies, such as for requirements engineering, software verification and validation, and automated code generation. This book places particular emphasis on issues of model quality and ideas of model testing and validation. Mathematical and computer-based models provide a foundation for explaining complex behaviour, decision-making, engineering design and for real-time simulators for research and training. Many engineering design techniques depend on suitable models, assessment of the adequacy of a given model for an intended application is therefore critically important. Generic model structures and dependable libraries of sub-models that can be applied repeatedly are increasingly important. Applications are drawn from the fields of mechanical, aeronautical and control engineering, and involve non-linear lumped-parameter models described by ordinary differential equations. Focuses on issues of model quality and the suitability of a given model for a specific application Multidisciplinary problems within engineering feature strongly in the applications The development and testing of nonlinear dynamic models is given very strong emphasis There are many books on the use of numerical methods for solving engineering problems and for modeling of engineering artifacts. In addition there are many styles of such presentations ranging from books with a major emphasis on theory to books with an emphasis on applications. The purpose of this book is hopefully to present a somewhat different approach to the use of numerical methods for - gineering applications. Engineering models are in general nonlinear models where the response of some appropriate engineering variable depends in a nonlinear manner on the - plication of some independent parameter. It is certainly true that for many types of engineering models it is sufficient to approximate the real physical world by some linear model. However, when engineering environments are pushed to - treme conditions, nonlinear effects are always encountered. It is also such - treme conditions that are of major importance in determining the reliability or failure limits of engineering systems. Hence it is essential than engineers have a toolbox of modeling techniques that can be used to model nonlinear engineering systems. Such a set of basic numerical methods is the topic of this book. For each subject area treated, nonlinear models are incorporated into the discussion from the very beginning and linear models are simply treated as special cases of more general nonlinear models. This is a basic and fundamental difference in this book from most books on numerical methods. Multiphysics Modeling: Numerical Methods and Engineering Applications: Tsinghua University Press Computational Mechanics Series describes the basic principles and methods for multiphysics modeling, covering related areas of physics such as structure mechanics, fluid dynamics, heat transfer, electromagnetic field, and noise. The book provides the latest information on basic numerical methods, also considering coupled problems spanning fluid-solid interaction, thermal-stress coupling, fluid-solid-thermal coupling, electromagnetic solid thermal fluid coupling, and structure-noise coupling. Users will find a comprehensive book that covers background theory, algorithms, key technologies, and applications for each coupling method. Presents a wealth of multiphysics modeling methods, issues, and worked examples in a single volume Provides a go-to resource for coupling and multiphysics problems Covers the multiphysics details not touched upon in broader numerical methods references, including load transfer between physics, element level strong coupling, and interface strong coupling, amongst others Discusses practical applications throughout and tackles real-life multiphysics problems across areas such as automotive, aerospace, and biomedical engineering Simulation models are an established method used to investigate processes and solve practical problems in a wide variety of disciplines. Central to the concept of this second edition is the idea that environmental systems are complex, open systems. The authors present the diversity of approaches to dealing with environmental complexity and then encourage readers to make comparisons between these approaches and between different disciplines. Environmental Modelling: Finding Simplicity in Complexity 2nd edition is divided into four main sections: An overview of methods and approaches to modelling. State of the art for modelling environmental processes Tools used and models for management Current and future developments. The second edition evolves from the first by providing additional emphasis and material for those students wishing to specialize in environmental modelling. This edition: Focuses on simplifying complex environmental systems. Reviews current software, tools and techniques for modelling. Gives practical examples from a wide variety of disciplines, e.g. climatology, ecology, hydrology, geomorphology and engineering. Has an associated website containing colour images, links to WWW resources and chapter support pages, including data sets relating to case studies, exercises and model animations. This book is suitable for final year undergraduates and postgraduates in environmental modelling, environmental science, civil engineering and biology who will already be familiar with the subject and are moving on to specialize in the field. It is also designed to appeal to professionals interested in the environmental sciences, including environmental consultants, government employees, civil engineers, geographers, ecologists, meteorologists, and geochemists. This book presents a comprehensive compilation of practical systems engineering models. The application and recognition of systems engineering is spreading rapidly, however there is no book that addresses the availability and usability of systems engineering models. Notable among the models to be included are the V-Model, DEJI Model, and Waterfall Model. There are other models developed for specific organizational needs, which will be identified and presented in a practical template so that other organizations can learn and use them. A better understanding of the models, through a comprehensive book, will make these models more visible, embraced, and applied across the spectrum. Visit www.DEJImodel.com for model details. Features Covers applications to both small and large problems Displays decomposition of complex problems into smaller manageable chunks Discusses direct considerations of the pertinent constraints that exist in the problem domain Presents systematic linking of inputs to goals and outputs Environment Modeling-Based Requirements Engineering for Software Intensive Systems provides a new and promising approach for engineering the requirements of software-intensive systems, presenting a systematic, promising approach to identifying, clarifying, modeling, deriving, and validating the requirements of software-intensive systems from well-modeled environment simulations. In addition, the book presents a new view of software capability, i.e. the effect-based software capability in terms of environment modeling. Provides novel and systematic methodologies for engineering the requirements of software-intensive systems Describes ontologies and easily-understandable notations for modeling software-intensive systems Analyzes the functional and non-functional requirements based on the properties of the software surroundings Provides an essential, practical guide and formalization tools for the task of identifying the requirements of software-intensive systems Gives system analysts and requirements engineers insight into how to recognize and structure the problems of developing software-intensive systems This book is a collection of research papers selected for presentation at the International Conference on Smart Computational Methods in Continuum Mechanics 2021, organized by Moscow Institute of Physics and Technology and the Institute for Computer Aided Design of Russian Academy of Sciences. The work is presented in two volumes. The primary objective of the book is to report the state-of-the-art on smart computational paradigms in continuum mechanics and explore the use of artificial intelligence paradigms such as neural nets and machine learning for improving the performance of the designed engineering systems. The book includes up-to-date smart computational methods which are used to solve problems in continuum mechanics, engineering, seismic prospecting, non-destructive testing, and so on. The main features of the book are the research papers on the application of novel smart methods including neural nets and machine learning, computational algorithms, smart software systems, and high-performance computer systems for solving complex engineering problems. The case studies pertaining to the real-world applications in the above fields are included. The book presents a collection of best research papers in English language from some of the world leaders in the field of smart system modelling and design of engineering systems. New for the third edition, chapters on: Complete Exercise of the SE Process, System Science and Analytics and The Value of Systems Engineering The book takes a model-based approach to key systems engineering design activities and introduces methods and models used in the real world. This book is divided into three major parts: (1) Introduction, Overview and Basic Knowledge, (2) Design and Integration Topics, (3) Supplemental Topics. The first part provides an introduction to the issues associated with the engineering of a system. The second part covers the critical material required to understand the major elements needed in the engineering design of any system: requirements, architectures (functional, physical, and allocated), interfaces, and qualification. The final part reviews methods for data, process, and behavior modeling, decision analysis, system science and analytics, and the value of systems engineering. Chapter 1 has been rewritten to integrate the new chapters and updates were made throughout the original chapters. Provides an overview of modeling, modeling methods associated with SysML, and IDEF0 Includes a new Chapter 12 that provides a comprehensive review of the topics discussed in Chapters 6 through 11 via a simple system – an automated soda machine Features a new Chapter 15 that reviews General System Theory, systems science, natural systems, cybernetics, systems thinking, quantitative characterization of systems, system dynamics, constraint theory, and Fermi problems and guesstimation Includes a new Chapter 16 on the value of systems engineering with five primary value propositions: systems as a goal-seeking system, systems engineering as a communications interface, systems engineering to avert showstoppers, systems engineering to find and fix errors, and systems engineering as risk mitigation The Engineering Design of Systems: Models and Methods, Third Edition is designed to be an introductory reference for professionals as well as a textbook for senior undergraduate and graduate students in systems engineering. The development of new and effective analytical and numerical models is essential to understanding the performance of a variety of structures. As computational methods continue to advance, so too do their applications in structural performance modeling and analysis. Modeling and Simulation Techniques in Structural Engineering presents emerging research on computational techniques and applications within the field of structural engineering. This timely publication features practical applications as well as new research insights and is ideally designed for use by engineers, IT professionals, researchers, and graduate-level students. This comprehensive text presents cutting-edge advances in the theory and methodology of modeling and simulation (M&S) and reveals how this work has been influenced by the fundamental contributions of Prof. Tuncer Ören to this field. Exploring the synergies among the domains of M&S and systems engineering (SE), the book describes how M&S and SE can help to address the complex problems identified as "Grand Challenges" more effectively under a model-driven and simulation-directed systems engineering framework. Features: examines frameworks for the development of advanced simulation methodologies; presents a focus on advanced modeling methodologies; reviews the reliability and quality assurance of models; discusses the specification and simulation of human and social behavior, including models of personality, emotions, conflict management, perception and anticipation; provides a survey of the body of knowledge in M&S; highlights the foundations established by the pioneering work of Prof. Tuncer Ören. This book is an introduction to graph transformation as a foundation to model-based software engineering at the level of both individual systems and domain-specific modelling languages. The first part of the book presents the fundamentals in a precise, yet largely informal way. Besides serving as prerequisite for describing the applications in the second part, it also provides a comprehensive and systematic survey of the concepts, notations and techniques of graph transformation. The second part presents and discusses a range of applications to both model-based software engineering and domain-specific language engineering. The variety of these applications demonstrates how broadly graphs and graph transformations can be used to model, analyse and implement complex software systems and languages. This is the first textbook that explains the most commonly used concepts, notations, techniques and applications of graph transformation without focusing on one particular mathematical representation or implementation approach. Emphasising the research and engineering methodologies used, it will be a valuable resource for graduate students, practitioners and researchers in software engineering, foundations of programming and formal methods. This book develops and describes a general methodology that can be applied to any complex human activity (activity with a non-trivial, multi-level internal structure). The structural components of complex activities are considered, and their logical, cause-and-effect, and process structures are functionally described. Considerable attention is paid to organization and management, uncertainties, and the lifecycles of activities, as well as the actors, subject matter, resources, knowledge, and methods involved. Several typical examples are used throughout the text to illustrate the implementation

of common approaches involving the functioning of work groups, organizational units, projects, and organizations in general: a retail bank, an aircraft manufacturer, a fire department, and a nuclear power plant. In addition, the book employs a system of connected technical models, in order to ensure that the results are of practical applicability for both experts on the ground and scholars engaged in research on the general principles of how activities (practical, scientific, etc.) are organized or on the management of socio-technical systems. This book constitutes the refereed proceedings of the 12th International Conference on Knowledge Engineering and Knowledge Management, EKAW 2000, held in Juan-les-Pins, France in October 2000. The 28 revised full papers and six revised short papers presented were carefully reviewed and selected from a high number of high-quality submissions. The book offers topical sections on knowledge modeling languages and tools, ontologies, knowledge acquisition from texts, machine learning, knowledge management and electronic commerce, problem solving methods, knowledge representation, validation, evaluation and certification, and methodologies. “...a much-needed handbook with contributions from well-chosen practitioners. A primary accomplishment is to provide guidance for those involved in modeling and simulation in support of Systems of Systems development, more particularly guidance that draws on well-conceived academic research to define concepts and terms, that identifies primary challenges for developers, and that suggests fruitful approaches grounded in theory and successful examples.” Paul Davis, The RAND Corporation Modeling and Simulation Support for System of Systems Engineering Applications provides a comprehensive overview of the underlying theory, methods, and solutions in modeling and simulation support for system of systems engineering. Highlighting plentiful multidisciplinary applications of modeling and simulation, the book uniquely addresses the criteria and challenges found within the field. Beginning with a foundation of concepts, terms, and categories, a theoretical and generalized approach to system of systems engineering is introduced, and real-world applications via case studies and examples are presented. A unified approach is maintained in an effort to understand the complexity of a single system as well as the context among other proximate systems. In addition, the book features: Cutting edge coverage of modeling and simulation within the field of system of systems, including transportation, system health management, space mission analysis, systems engineering methodology, and energy State-of-the-art advances within multiple domains to instantiate theoretic insights, applicable methods, and lessons learned from real-world applications of modeling and simulation The challenges of system of systems engineering using a systematic and holistic approach Key concepts, terms, and activities to provide a comprehensive, unified, and concise representation of the field A collection of chapters written by over 40 recognized international experts from academia, government, and industry A research agenda derived from the contribution of experts that guides scholars and researchers towards open questions Modeling and Simulation Support for System of Systems Engineering Applications is an ideal reference and resource for academics and practitioners in operations research, engineering, statistics, mathematics, modeling and simulation, and computer science. The book is also an excellent course book for graduate and PhD-level courses in modeling and simulation, engineering, and computer science. This comprehensive resource provides systems engineers and practitioners with the analytic, design and modeling tools of the Model-Based Systems Engineering (MBSE) methodology of Integrated Systems Engineering (ISE) and Pipelines of Processes in Object Oriented Architectures (PPOOA) methodology. This methodology integrates model based systems and software engineering approaches for the development of complex products, including aerospace, robotics and energy domains applications. Readers learn how to synthesize physical architectures using design heuristics and trade-off analysis. The book provides information about how to identify, classify and specify the system requirements of a new product or service. Using Systems Modeling Language (SysML) constructs, readers will be able to apply ISE & PPOOA methodology in the engineering activities of their own systems. Model Engineering for Simulation provides a systematic introduction to the implementation of generic, normalized and quantifiable modeling and simulation using DEVS formalism. It describes key technologies relating to model lifecycle management, including model description languages, complexity analysis, model management, service-oriented model composition, quantitative measurement of model credibility, and model validation and verification. The book clearly demonstrates how to construct computationally efficient, object-oriented simulations of DEVS models on parallel and distributed environments. Guides systems and control engineers in the practical creation and delivery of simulation models using DEVS formalism Provides practical methods to improve credibility of models and manage the model lifecycle Helps readers gain an overall understanding of model lifecycle management and analysis Supported by an online ancillary package that includes an instructors and student solutions manual Conceptual Modelling of Multi-Agent Systems proposes the methodology and engineering environment CoMoMAS for the development of multi-agent systems. CoMoMAS is among the most elaborated and most often cited multi-agent development approaches available in the field. Its originality is to address the issue of the development of multi-agent systems (MAS) from a knowledge engineering perspective, which means that agents are seen as interacting entities having different kinds of knowledge, which is to be identified during development. Knowledge has played an important role for MAS development in the past, but CoMoMAS makes a step further in proposing a complete set of conceptual models and a solid methodology to guide the overall development process of a MAS-from design to validation. Conceptual Modelling of Multi-Agent Systems is an excellent reference for both researchers and practitioners in the broad area of distributed systems development. This book is of particular value from the point of view of computer science, including knowledge engineering, artificial intelligence, agent and multi-agent technology, and software engineering. Rock Characterisation, Modelling and Engineering Design Methods contains the contributions presented at the 3rd ISRM SINOROCK Symposium (Shanghai, China, 1820 June 2013). The papers contribute to the further development of the overall rock engineering design process through the sequential linkage of the three themes of rock characterisation, model This book provides essential background knowledge on the development of model-based real-world solutions in the field of control and decision making for water systems. It presents system engineering methods for modelling surface water and groundwater resources as well as water transportation systems (rivers, channels and pipelines). The models in turn provide information on both the water quantity (flow rates, water levels) of surface water and groundwater and on water quality. In addition, methods for modelling and predicting water demand are described. Sample applications of the models are presented, such as a water allocation decision support system for semi-arid regions, a multiple-criteria control model for run-of-river hydropower plants, and a supply network simulation for public services. Modeling Engineering Systems goes right to the heart of engineering, teaching you how to: understand and use the three basic types of engineering building blocks recognize the analogies that can be drawn between the fundamental elements of electrical, mechanical, fluid, and thermal systems develop math models for first- and higher-order systems using four fundamental methods analyze the models you develop perform frequency analysis and plot frequency responses Educated at the U.S. Coast Guard Academy and MIT, Jack W. Lewis is a registered professional engineer, his specialty is the design of automatic control and instrumental systems, especially as related to the marine industry. He is the author of numerous technical papers and articles, including national award-winning papers for the American Society of Naval Engineers (ASNE) and the Society of Naval Architects and Marine Engineers (SNAME). Lewis is a member of SNAME, ASNE, and the American Society of Mechanical Engineers (ASME). -understand and use the three basic types of engineering building blocks -recognize the analogies that can be drawn between the fundamental elements of electrical, mechanical, fluid, and thermal systems -develop math models for first- and higher-order systems using four fundamental methods Today enterprises must strive to improve their competitiveness in a changing environment. To reach this objective it is necessary for companies to evaluate their performances and to combine modelling, business process re-engineering and benchmarking techniques. This book demonstrates the successful combination and implementation of these various techniques. This book presents cutting-edge applications of, and up-to-date research on, ontology engineering techniques in the physical asset integrity domain. Though a survey of state-of-the-art theory and methods on ontology engineering, the authors emphasize essential topics including data integration modeling, knowledge representation, and semantic interpretation. The book also reflects novel topics dealing with the advanced problems of physical asset integrity applications such as heterogeneity, data inconsistency, and interoperability existing in design and utilization. With a distinctive focus on applications relevant in heavy industry, Ontology Modeling in Physical Asset Integrity Management is ideal for practicing industrial and mechanical engineers working in the field, as well as researchers and graduate concerned with ontology engineering in physical systems life cycles. Water Engineering Modeling and Mathematic Tools provides an informative resource for practitioners who want to learn more about different techniques and models in water engineering and their practical applications and case studies. The book provides modelling theories in an easy-to-read format verified with on-site models for specific regions and scenarios. Users will find this to be a significant contribution to the development of mathematical tools, experimental techniques, and data-driven models that support modern-day water engineering applications. Civil engineers, industrialists, and water management experts should be familiar with advanced techniques that can be used to improve existing systems in water engineering. This book provides key ideas on recently developed machine learning methods and AI modelling. It will serve as a common platform for practitioners who need to become familiar with the latest developments of computational techniques in water engineering. Includes firsthand experience about artificial intelligence models, utilizing case studies Describes biological, physical and chemical techniques for the treatment of surface water, groundwater, sea water and rain/snow Presents the application of new instruments in water engineering Structural Modeling and Experimental Techniques presents a current treatment of structural modeling for applications in design, research, education, and product development. Providing numerous case studies throughout, the book emphasizes modeling the behavior of reinforced and prestressed concrete and masonry structures. Structural Modeling and Experimental Techniques: Concentrates on the modeling of the true inelastic behavior of structures Provides case histories detailing applications of the modeling techniques to real structures Discusses the historical background of model analysis and similitude principles governing the design, testing, and interpretation of models Evaluates the limitations and benefits of elastic models Analyzes materials for reinforced concrete masonry and steel models Assesses the critical nature of scale effects of model testing Describes selected laboratory techniques and loading methods Contains material on errors as well as the accuracy and reliability of physical modeling Examines dynamic similitude and modeling techniques for studying dynamic loading of structures Covers actual applications of structural modeling This book serves students in model analysis and experimental methods, professionals manufacturing and testing structural models, as well as professionals testing large or full-scale structures - since the instrumentation techniques and overall approaches for testing large structures are very similar to those used in small-scale modeling work. Embedded systems have long become essential in application areas in which human control is impossible or infeasible. The development of modern embedded systems is becoming increasingly difficult and challenging because of their overall system complexity, their tighter and cross-functional integration, the increasing requirements concerning safety and real-time behavior, and the need to reduce development and operation costs. This book provides a comprehensive overview of the Software Platform Embedded Systems (SPES) modeling framework and demonstrates its applicability in embedded system development in various industry domains such as automation, automotive, avionics, energy, and healthcare. In SPES 2020, twenty-one partners from academia and industry have joined forces in order to develop and evaluate in different industrial domains a modeling framework that reflects the current state of the art in embedded systems engineering. The content of this book is structured in four parts. Part I “Starting Point” discusses the status quo of embedded systems development and model-based engineering, and summarizes the key requirements faced when developing embedded systems in different application domains. Part II “The SPES Modeling Framework” describes the SPES modeling framework. Part III “Application and Evaluation of the SPES Modeling Framework” reports on the validation steps taken to ensure that the framework met the requirements discussed in Part I. Finally, Part IV “Impact of the SPES Modeling Framework” summarizes the results achieved and provides an outlook on future work. The book is mainly aimed at professionals and practitioners who deal with the development of embedded systems on a daily basis. Researchers in academia and industry may use it as a compendium for the requirements and state-of-the-art solution concepts for embedded systems development. Here is the second revised and updated edition of probably the most practical sourcebook on similarity methods and modeling techniques available. Written by leading authorities who incorporate many of the latest advances in the field, this new work maps out techniques for modeling as well as instrumentation and data analysis for an extremely wide array of problems in engineering dynamics. This practical reference uses experimental test data on various engineering problems demonstrating exactly how and why these similarity methods work. The problems involve spread of oil slicks, explosive cratering, car crashes, space vehicle heat exchange, explosive forming, and more. The spectrum of topics covered and number of examples are far greater than in other texts. Of particular importance are the dissimilar material modeling techniques which bring new versatility and freedom to the modeler in structural dynamics. The book also contains a clear, in-depth discussion of the theory underlying modeling and includes alternate methods for developing model laws. The work will undoubtedly prove invaluable to every professional involved in testing or design of dynamic experiments. ICEIMT '97 is the second International Conference on Enterprise Integration and Modeling Technology. Like the first, it is the main event of a European-US initiative on building consensus in enterprise engineering and integration - supported in Europe by Esprit and in the USA by DOC/NIST. These proceedings contain papers presented at the conference and at five international workshops preceding the conference. The workshops addressed integration issues related to people and organization, metrics and standardization, applications, fundamentals and principles, and users and vendors. The conference papers present points of view of users, vendors, and researchers, the current state of research and development worldwide, and the needs to be identified and summarized in project proposals. This book develops and describes a general methodology that can be applied to any complex human activity (activity with a non-trivial, multi-level internal structure). The structural components of complex activities are considered, and their logical, cause-and-effect, and process structures are functionally described. Considerable attention is paid to organization and management, uncertainties, and the lifecycles of activities, as well as the actors, subject matter, resources, knowledge, and methods involved. Several typical examples are used throughout the text to illustrate the implementation of common approaches involving the functioning of work groups, organizational units, projects, and organizations in general: a retail bank, an aircraft manufacturer, a fire department, and a nuclear power plant. In addition, the book employs a system of connected technical models, in order to ensure that the results are of practical applicability for both experts on the ground and scholars engaged in research on the general principles of how activities (practical, scientific, etc.) are organized or on the management of socio-technical systems. Enabling information interoperability, fostering legal knowledge usability and reuse, enhancing legal information search, in short, formalizing the complexity of legal knowledge to enhance legal knowledge management are challenging tasks, for which different solutions and lines of research have been proposed. During the last decade, research and applications based on the use of legal ontologies as a technique to represent legal knowledge has raised a very interesting debate about their capacity and limitations to represent conceptual structures in the legal domain. Making conceptual legal knowledge explicit would support the development of a web of legal knowledge, improve communication, create trust and enable and support open data, e-government and e-democracy activities. Moreover, this explicit knowledge is also relevant to the formalization of software agents and the shaping of virtual institutions and multi-agent systems or environments. This book explores the use of ontologism in legal knowledge representation for semantically-enhanced legal knowledge systems or web-based applications. In it, current methodologies, tools and languages used for ontology development are revised, and the book includes an exhaustive revision of existing ontologies in the legal domain. The development of the Ontology of Professional Judicial Knowledge (OPJK) is presented as a case study. Predictive Modeling for Energy Management and Power Systems Engineering introduces readers to the cutting-edge use of big data and large computational infrastructures in energy demand estimation and power management systems. The book supports engineers and scientists who seek to become familiar with advanced optimization techniques for power systems designs, optimization techniques and algorithms for consumer power management, and potential applications of machine learning and artificial intelligence in this field. The book provides modeling theory in an easy-to-read format, verified with on-site models and case studies for specific geographic regions and complex consumer markets. Presents advanced optimization techniques to improve existing energy demand system Provides data-analytic models and their practical relevance in proven case studies Explores novel developments in machine-learning and artificial intelligence applied in energy management Provides modeling theory in an easy-to-read format obtained are still severely limited to low Reynolds numbers (about only one decade better than direct numerical simulations), and the interpretation of such calculations for complex, curved geometries is still unclear. It is evident that a lot of work (and a very significant increase in available computing power) is required before such methods can be adopted in daily's engineering practice. I hope to l"Cport on all these topics in a near future. The book is divided into six chapters, each· chapter in subchapters, sections and subsections. The first part is introduced by Chapter 1 which summarizes the equations of fluid mechanies, it is developed in C~apters 2 to 4 devoted to the construction of turbulence models. What has been called "engineering methods" is considered in Chapter 2 where the Reynolds averaged equations al"C established and the closure problem studied (§1-3). A first detailed study of homogeneous turbulent flows follows (§4). It includes a review of available experimental data and their modeling. The eddy viscosity concept is analyzed

in §5 with the l"Csulting ~alar-transport equation models such as the famous K-e model. Reynolds stl"Css models (Chapter 4) require a preliminary consideration of two-point turbulence concepts which are developed in Chapter 3 devoted to homogeneous turbulence. We review the two-point moments of velocity fields and their spectral transforms (§ 1), their general dynamics (§2) with the particular case of homogeneous, isotropie turbulence (§3) whel"C the so-called Kolmogorov's assumptions are discussed at length. Modeling in Geotechnical Engineering is a one stop reference for a range of computational models, the theory explaining how they work, and case studies describing how to apply them. Drawing on the expertise of contributors from a range of disciplines including geomechanics, optimization, and computational engineering, this book provides an interdisciplinary guide to this subject which is suitable for readers from a range of backgrounds. Before tackling the computational approaches, a theoretical understanding of the physical systems is provided that helps readers to fully grasp the significance of the numerical methods. The various models are presented in detail, and advice is provided on how to select the correct model for your application. Provides detailed descriptions of different computational modelling methods for geotechnical applications, including the finite element method, the finite difference method, and the boundary element method Gives readers the latest advice on the use of big data analytics and artificial intelligence in geotechnical engineering Includes case studies to help readers apply the methods described in their own work This book summarizes the recent advances in software reliability modelling. Almost all the existing models are classified and the most interesting models are described in detail.Because of the application of software in many industrial, military and commercial systems, software reliability has become an important research area. Although there are many models and results appeared in different journals and conference proceedings, there is a lack of systematic publications on this subject. The aim of this book is to provide an overview of this area and provide software reliability researchers and analysts with a systematic study of the existing results. This book can also be used as a reference book for other software engineers and reliability theoreticians interested in this area. This textbook provides a step-by-step approach to numerical methods in engineering modelling. The authors provide a consistent treatment of the topic, from the ground up, to reinforce for students that numerical methods are a set of mathematical modelling tools which allow engineers to represent real-world systems and compute features of these systems with a predictable error rate. Each method presented addresses a specific type of problem, namely root-finding, optimization, integral, derivative, initial value problem, or boundary value problem, and each one encompasses a set of algorithms to solve the problem given some information and to a known error bound. The authors demonstrate that after developing a proper model and understanding of the engineering situation they are working on, engineers can break down a model into a set of specific mathematical problems, and then implement the appropriate numerical methods to solve these problems. The success of product line engineering techniques in the last 15 years has popularized the use of software variability as a key modeling approach for describing the commonality and variability of systems at all stages of the software lifecycle. Software product lines enable a family of products to share a common core platform, while allowing for product specific functionality being built on top of the platform. Many companies have exploited the concept of software product lines to increase the resources that focus on highly differentiating functionality and thus improve their competitiveness with higher quality and reusable products and decreasing the time-to-market condition. Many books on product line engineering either introduce specific product line techniques or include brief summaries of industrial cases. From these sources, it is difficult to gain a comprehensive understanding of the various dimensions and aspects of software variability. Here the editors address this gap by providing a comprehensive reference on the notion of variability modeling in the context of software product line engineering, presenting an overview of the techniques proposed for variability modeling and giving a detailed perspective on software variability management. Their book is organized in four main parts, which guide the reader through the various aspects and dimensions of software variability. Part 1 which is mostly written by the editors themselves introduces the major topics related to software variability modeling, thus providing a multi-faceted view of both technological and management issues. Next, part 2 of the book comprises four separate chapters dedicated to research and commercial tools. Part 3 then continues with the most practical viewpoint of the book presenting three different industry cases on how variability is managed in real industry projects. Finally, part 4 concludes the book and encompasses six different chapters on emerging research topics in software variability like e.g. service-oriented or dynamic software product lines, or variability and aspect orientation. Each chapter briefly summarizes “What you will learn in this chapter”, so both expert and novice readers can easily locate the topics dealt with. Overall, the book captures the current state of the art and best practices, and indicates important open research challenges as well as possible pitfalls. Thus it serves as a reference for researchers and practitioners in software variability management, allowing them to develop the next set of solutions, techniques and methods in this complicated and yet fascinating field of software engineering. Multi-Paradigm Modelling for Cyber-Physical Systems explores modeling and analysis as crucial activities in the development of Cyber-Physical Systems, which are inherently cross-disciplinary in nature and require distinct modeling techniques related to different disciplines, as well as a common background knowledge. This book will serve as a reference for anyone starting in the field of CPS who needs a solid foundation of modeling, including a comprehensive introduction to existing techniques and a clear explanation of their advantages and limitations. This book is aimed at both researchers and practitioners who are interested in various modeling paradigms across computer science and engineering. Identifies key problems and offers solution approaches as well as tools which have been developed or are necessary for modeling paradigms across cyber physical systems Explores basic theory and current research topics, related challenges, and research directions for multi-paradigm modeling Provides a complete, conceptual overview and framework of the research done by the MPM4CPS working groups and the different types of modeling paradigms developed