Development Of Modelica Library For Dynamics Simulation Of Chp Plant Modelica Library Structure Design And Modeling For Transient Simulation Of Combined Heat And Power Chp Plant

This book illustrates numerical simulation of fluid power systems by LMS Amesim Platform covering hydrostatic transmissions, electro hydraulic servo valves, hydraulic servomechanisms for aerospace engineering, speed governors for power machines, fuel injection systems, and automotive servo systems.

Fritzson covers the Modelica language in impressive depth from the basic concepts such as cyber-physical, equation-base, object-oriented, system, model, and simulation, while also incorporating over a hundred exercises and their solutions for a tutorial, easy-to-read experience. The only book with complete Modelica 3.3 coverage Over one hundred exercises and solutions Examines basic concepts such as cyber-physical, equation-based, object-oriented, system, model, and simulation

Complex artificial dynamic systems require advanced modeling techniques that can accommodate their asynchronous, concurrent, and highly non-linear nature. Discrete Event systems Specification (DEVS) provides a formal framework for hierarchical construction of discrete-event models in a modular manner, allowing for model re-use and reduced development time. Discrete Event Modeling and Simulation presents a practical approach focused on the creation of discrete-event applications. The book introduces the CD++ tool, an open-source framework that enables the simulation of discrete-event models. After setting up the basic theory of DEVS and Cell-DEVS, the author focuses on how to use the CD++ tool to define a variety of models in biology, physics, chemistry, and artificial systems. They also demonstrate how to map different modeling techniques, such as Finite State Machines and VHDL, to DEVS. The in-depth coverage elaborates on the creation of simulation software for DEVS models and the 3D visualization environments associated with these tools. A much-needed practical approach to creating discrete-event applications, this book offers world-class instruction on the field's most useful modeling tools.

Meeting today's energy and climate challenges require not only technological advancement but also a good understanding of stakeholders' perceptions, political sensitivity, well-informed policy analyses and innovative interdisciplinary solutions. This book will fill this gap. This is an interdisciplinary informative book to provide a holistic and integrated understanding of the technology-stakeholder-policy interactions of smart grid technologies. The unique features of the book include the following: (a) interdisciplinary approach – by bringing in the policy dimensions to smart grid technologies; (b) global and Asian perspective and (c) learning from national case studies. This book is organised into five sections. Part 1 discusses the historical and conceptual aspects of smart grids. Part 2 introduces the technological aspects and showcase the state of the art of the technologies. Part 3 explores the policy and governance dimensions by bringing in a stakeholder perspective. Part 4 presents a collection of national case studies. Part 5 shares insights and lesson learnt and provide policy recommendations. This book showcases the state-of-the-art R&D developments and policy experiences. This book contributes to a better understanding of governance institution and policy challenges and helps formulate policy recommendations for successful smart grid deployment.

When used appropriately, building performance simulation has the potential to reduce the environmental impact of the built environment, to improve indoor quality and productivity, as well as to facilitate future innovation and technological progress in construction. Since publication of the first edition of Building Performance Simulation for Design and Operation, the discussion has shifted from a focus on software features to a new agenda, which centres on the effectiveness of building performance simulation in building life cycle processes. This new edition provides a unique and comprehensive overview of building performance simulation for the complete building life cycle from conception to demolition, and from a single building to district level. It contains new chapters on building information modelling, occupant behaviour modelling, urban physics modelling, urban building energy modelling and renewable energy systems modelling. This new edition keeps the same chapter structure throughout including learning objectives, chapter summaries and assignments. Moreover, the book: • Provides unique insights into the techniques of building performance modelling and simulation and their application to performance-based design and operation of buildings and the systems which service them. • Provides readers with the essential concepts of computational support of performance-based design and operation. • Provides examples of how to use building simulation techniques for practical design, management and operation, their limitations and future direction. It is primarily intended for building and systems designers and operators, and postgraduate architectural, environmental or mechanical engineering students.

This book is dedicated to Prof. Dr. Heinz Gerhäuser on the occasion of his retirement both from the position of Executive Director of the Fraunhofer Institute for Integrated Circuits IIS and from the Endowed Chair of Information Technologies with a Focus on Communication Electronics (LIKE) at the Friedrich-Alexander-Universität Erlangen-Nürnberg. Heinz Gerhäuser's vision and entrepreneurial spirit have made the Fraunhofer IIS one of the most successful and renowned German research institutions. He has been Director of the Fraunhofer IIS since 1993, and under his leadership it has grown to become the largest of Germany's 60 Fraunhofer Institutes, a position it retains to this day, currently employing over 730 staff. Likely his most important scientific as well as application-related contribution was his pivotal role in the development of the mp3 format, which would later become a worldwide success. The contributions to this Festschrift were written by both Fraunhofer IIS staff and external project team members in appreciation of Prof. Dr. Gerhäuser's lifetime academic achievements and his inspiring leadership at the Fraunhofer IIS. The papers reflect the broad spectrum of the institute's research activities and are grouped into sections on circuits, information systems, visual computing, and audio and multimedia. They provide academic and industrial researchers in fields like signal processing, sensor networks, microelectronics, and integrated circuits with an up-to-date overview of research results that have a huge potential for cutting-edge industrial applications.

Bachelor Thesis from the year 2013 in the subject Electrotechnology, grade: A, Islamic University of Gaza, language: English, abstract: Modelica is an object-oriented, declarative, multi-domain language for component-oriented modeling of complex systems, e.g., systems containing mechanical, electrical, electronic, hydraulic, thermal, control, electric power or process-oriented subcomponents. Modelica language is a textual description to define all parts of a model and to structure model components in libraries, called packages. Basically, all Modelica language elements are mapped to differential, algebraic and discrete equations. Using Modelica in design process for complex systems is very efficient and provide several benefits results. In Modelica we can model and simulate all types of components such as electrical, mechanical, hydraulic etc. Furthermore, Modelica Association provide standard library which contains a lot of different components.

The world of artificial systems is reaching complexity levels that es cape human understanding. Surface traffic, electricity distribution, air planes, mobile communications, etc. , are examples that demonstrate that we are running into problems that are beyond classical scientific or engi neering knowledge. There is an ongoing world-wide effort to understand these systems and develop models that can capture its behavior. The reason for this work is clear, if our lack of understanding deepens, we will lose our capability to control these systems and make they behave as we want. Researchers from many different fields are trying to understand and develop theories for complex man-made systems. This book presents re search from the perspective of control and systems theory. The book has grown out of activities in the research program Control of Complex Systems (COSY). The program has been sponsored by the Eu ropean Science

Foundation (ESF) which for 25 years has been one of the leading players in stimulating scientific research. ESF is a European asso ciation of more than 60 leading national science agencies spanning more than 20 countries. ESF covers has standing committees in Medical Sci ences, Life and Environmental Sciences, Physical and Engineering Sci ences, Humanities and Social Sciences. The COSY program was ESF's first activity in the Engineering Sciences. The program run for a period of five years starting January 1995.

Introduces the concept of combined cycles for next generation nuclear power plants, explaining how recent advances in gas turbines have made these systems increasingly desirable for efficiency gains and cost-of-ownership reduction. Promulgates modelling and analysis techniques to identify opportunities for increased thermodynamic efficiency and decreased water usage over current Light Water Reactor (LWR) systems. Examines all power conversion aspects, from the fluid exiting the reactor to energy releases into the environment, with special focus on heat exchangers and turbo-machinery. Provides examples of small projects to facilitate nuanced understanding of the theories and implementation of combined-cycle nuclear plants. This book explores combined cycle driven efficiency of new nuclear power plants and describes how to model and analyze a nuclear heated multi-turbine power conversion system operating with atmospheric air as the working fluid. The included studies are intended to identify paths for future work on next generation nuclear power plants (GEN-IV), leveraging advances in natural-gas-fired turbines that enable coupling salt-cooled, helium-cooled, and sodium-cooled reactors to a Nuclear Air-Brayton Combined Cycle (NACC). These reactors provide the option of operating base-load nuclear plants with variable electricity output to the grid using natural gas or stored heat to produce peak power. The author describes overall system architecture, components and detailed modelling results of Brayton-Rankine Combined Cycle power conversion systems and Recuperated Brayton Cycle systems, since they offer the highest overall energy conversion efficiencies. With ever-higher temperatures predicted in GEN-IV plants, this book's investigation of potential avenues for thermodynamic efficiency gains will be of great interest to nuclear engineers and researchers, as well as power plant operators and students.

Over the last few decades, both the aeronautics and space disciplines have greatly influenced advances in controls, sensors, data fusion and navigation. Many of those achievements that made the word "aerospace" synonymous with "high–tech" were enabled by innovations in guidance, navigation and control. Europe has seen a strong trans-national consolidation process in aerospace over the last few decades. Most of the visible products, like commercial aircraft, fighters, helicopters, satellites, launchers or missiles, are not made by a single country – they are the fruits of cooperation. No European country by itself hosts a specialized guidance, navigation and controls community large enough to cover the whole spectrum of disciplines. However, on a European scale, mutual exchange of ideas, concepts and solutions is enriching for all. The 1st CEAS Specialist Conference on Guidance, Navigation and Control is an attempt to bring this community together. This book is a selection of papers presented at the conference. All submitted papers have gone through a formal review process in compliance with good journal practices. The best papers have been recommended by the reviewers to be published in this book.

The present book includes a set of selected papers from the eighth "International Conference on Informatics in Control Automation and Robotics" (ICINCO 2011), held in Noordwijkerhout, The Netherlands, from 28 to 31 July 2011. The conference was organized in four simultaneous tracks: "Intelligent Control Systems and Optimization", "Robotics and Automation", "Signal Processing, Sensors, Systems Modeling and Control" and "Industrial Engineering, Production and Management". The book is based on the same structure. ICINCO received 322 paper submissions, not including those of workshops or special sessions, from 52 countries, in all continents. After a double blind paper review performed by the Program Committee only 33 submissions were accepted as full papers and thus selected for oral presentation, leading to a full paper acceptance ratio of 10%. Additional papers were accepted as short papers and posters. A further refinement was made after the conference, based also on the assessment of presentation quality, so that this book includes the extended and revised versions of the very best papers of ICINCO 2011. Commitment to high quality standards is a major concern of ICINCO that will be maintained in the next editions of this conference, including not only the stringent paper acceptance ratios but also the quality of the program committee, keynote lectures, workshops and logistics.

Nowadays, engineering systems are of ever-increasing complexity and must be c- sidered asmultidisciplinary systems composed of interacting subsystems or system components from different engineering disciplines. Thus, an integration of various engineering disciplines, e.g, mechanical, electrical and control engineering in ac- current design approach is required. With regard to the systematic development and analysis of system models,interdisciplinary computer aided methodologies are - coming more and more important. A graphical description formalism particularly suited for multidisciplinary s- tems arebondgraphs devised by Professor Henry Paynter in as early as 1959 at the Massachusetts Institute of Technology (MIT) in Cambridge, Massachusetts, USA and in use since then all over the world. This monograph is devoted exclusively to the bond graph methodology. It gives a comprehensive, in-depth, state-of-the-art presentation including recent results sc- tered over research articles and dissertations and research contributions by the - thor to a number of topics. The book systematically covers the fundamentals of developing bond graphs and deriving mathematical models from them, the recent developments in meth- ology, symbolic and numerical processing of mathematical models derived from bond graphs. Additionally it discusses modern modelling languages, the paradigm of object-oriented modelling, modern software that can be used for building and for processing of bond graph models, and provides a chapter with small case studies illustrating various applications of the methodology.

The 19th European Symposium on Computer Aided Process Engineering contains papers presented at the 19th European Symposium of Computer Aided Process Engineering (ESCAPE 19) held in Cracow, Poland, June 14-17, 2009. The ESCAPE series serves as a forum for scientists and engineers from academia and industry to discuss progress achieved in the area of CAPE. * CD-ROM that accompanies the book contains all research papers and contributions * International in scope with guest speeches and keynote talks from leaders in science and industry * Presents papers covering the latest research, key top areas and developments in computer aided process engineering (CAPE)

Organic Rankine Cycle (ORC) Power Systems: Technologies and Applications provides a systematic and detailed description of organic Rankine cycle technologies and the way they are increasingly of interest for cost-effective sustainable energy generation. Popular applications include cogeneration from biomass and electricity generation from geothermal reservoirs and concentrating solar power installations, as well as waste heat recovery from gas turbines, internal combustion engines and medium- and low-temperature industrial processes. With hundreds of ORC power systems already in operation and the market growing at a fast pace, this is an active and engaging area of scientific research and technical development. The book is structured

in three main parts: (i) Introduction to ORC Power Systems, Design and Optimization, (ii) ORC Plant Components, and (iii) Fields of Application. Provides a thorough introduction to ORC power systems Contains detailed chapters on ORC plant components Includes a section focusing on ORC design and optimization Reviews key applications of ORC technologies, including cogeneration from biomass, electricity generation from geothermal reservoirs and concentrating solar power installations, waste heat recovery from gas turbines, internal combustion engines and medium- and low-temperature industrial processes Various chapters are authored by well-known specialists from Academia and ORC manufacturers

In this book, various aspects of heating, ventilation, and air-conditioning (HVAC) systems are investigated. HVAC systems are milestones of building mechanical systems that provide thermal comfort for occupants accompanied with indoor air quality. HVAC systems can be classified into central and local systems according to multiple zones, location, and distribution. Primary HVAC equipment includes heating equipment, ventilation equipment, and cooling or air-conditioning equipment. Central HVAC systems are located away from buildings in a central equipment room and deliver the conditioned air by a delivery ductwork system. Central HVAC systems contain all-air, air-water, or all-water systems. Two systems should be considered as central such as heating and cooling panels and water-source heat pumps.

The topic of dynamic models tends to be splintered across various disciplines, making it difficult to uniformly study the subject. Moreover, the models have a variety of representations, from traditional mathematical notations to diagrammatic and immersive depictions. Collecting all of these expressions of dynamic models, the Handbook of Dynamic System Modeling explores a panoply of different types of modeling methods available for dynamical systems. Featuring an interdisciplinary, balanced approach, the handbook focuses on both generalized dynamic knowledge and specific models. It first introduces the general concepts, representations, and philosophy of dynamic models, followed by a section on modeling methodologies that explains how to portray designed models on a computer. After addressing scale, heterogeneity, and composition issues, the book covers specific model types that are often characterized by specific visual- or text-based grammars. It concludes with case studies that employ two well-known commercial packages to construct, simulate, and analyze dynamic models. A complete guide to the fundamentals, types, and applications of dynamic models, this handbook shows how systems function and are represented over time and space and illustrates how to select a particular model based on a specific area of interest.

This book constitutes the refereed proceedings of the 12th European Conference on Object-Oriented Programming, ECOOP'98, held in Brussels, Belgium, in July 1998. The book presents 24 revised full technical papers selected for inclusion from a total of 124 submissions; also presented are two invited papers. The papers are organized in topical sections on modelling ideas and experiences; design patterns and frameworks; language problems and solutions; distributed memory systems; reuse, adaption and hardware support; reflection; extensible objects and types; and mixins, inheritance and type analysis complexity.

Maritime-Port Technology and Development contains the latest research results and innovations as presented at the 2014 International Maritime and Port Technology and Development Conference (Trondheim, Norway, 27- 29 October 2014). The volume is divided into a wide range of topics: Efficient and environmentally friendly energy use in ships and port

Master modeling and simulation using Modelica, the new powerful,highly versatile object-based modeling language Modelica, the new object-based software/hardware modelinglanguage that is quickly gaining popularity around the world,offers an almost universal approach to high-level computationalmodeling and simulation. It handles a broad range of applicationdomains, for example mechanics, electrical systems, control, andthermodynamics, and facilitates general notation as well aspowerful abstractions and efficient implementations. Using theversatile Modelica language and its associated technology, thistext presents an object-oriented, component-based approach thatmakes it possible for readers to quickly master the basics ofcomputer-supported equation-based object-oriented (EOO)mathematical modeling and simulation. Throughout the text, Modelica is used to illustrate the variousaspects of modeling and simulation. At the same time, a number ofkey concepts underlying the Modelica language are explained withthe use of modeling and simulation examples. This book: Examines basic concepts such as systems, models, andsimulations Guides readers through the Modelica language with the aid ofseveral step-by-step examples Introduces the Modelica class concept and its use in graphicaland textual modeling Explores modeling methodology for continuous, discrete, andhybrid systems Presents an overview of the Modelica Standard Library and keyModelica model libraries Readers will find plenty of examples of models that simulatedistinct application domains as well as examples that combineseveral domains. All the examples and exercises in the text areavailable via DrModelica. This electronic self-teaching program,freely available on the text's companion website, guides readersfrom simple, introductory examples and exercises to more advancedones. Written by the Director of the Open Source Modelica Consortium,Introduction to Modeling and Simulation of Technical andPhysical Systems with Modelica is recommended for engineers andstudents interested in computer-aided design, modeling, simulation,and analysis of technical and natural systems. By building on basicconcepts, the text is ideal for students who want to learnmodeling, simulation, and object orientation.

This book presents theory and latest application work in Bond Graph methodology with a focus on: • Hybrid dynamical system models, • Model-based fault diagnosis, model-based fault tolerant control, fault prognosis • and also addresses • Open thermodynamic systems with compressible fluid flow, • Distributed parameter models of mechanical subsystems. In addition, the book covers various applications of current interest ranging from motorised wheelchairs, in-vivo surgery robots, walking machines to wind-turbines.The up-to-date presentation has been made possible by experts who are active members of the worldwide bond graph modelling community. This book is the completely revised 2nd edition of the 2011 Springer compilation text titled Bond Graph Modelling of Engineering Systems – Theory, Applications and Software Support. It extends the presentation of theory and applications of graph methodology by new developments and latest research results. Like the first edition, this book addresses readers in academia as well as practitioners in industry and invites experts in related fields to consider the potential and the state-of-the-art of bond graph modelling.

Volume is indexed by Thomson Reuters CPCI-S (WoS). The German Academic Society for Production Engineering is an association of leading German professors of production engineering. The „WGP Jahreskongress" has the aim to foster young researchers by giving the opportunity to publish their research results under their own name exclusively and discuss these results with each other during the

meeting. The 46 peer reviewed papers are grouped as follows: Chapter 1: Assembly; Chapter 2: Cutting and Grinding; Chapter 3: Forming; Chapter 4: Machines; Chapter 5: Organization.

This book on organic Rankine cycle technology presents nine chapters on research activities covering the wide range of current issues on the organic Rankine cycle. The first section deals with working fluid selection and component design. The second section is related to dynamic modeling, starting from internal combustion engines to industrial power plants. The third section discusses industrial applications of waste heat recovery, including internal combustion engines, LNG, and waste water. A comprehensive analysis of the technology and application of organic Rankine cycle systems is beyond the aim of the book. However, the content of this volume can be useful for scientists and students to broaden their knowledge of technologies and applications of organic Rankine cycle systems.

This Special Issue covers a wide range of areas—including building orientation, service life, use of photocatalytically active structures and PV facades, implications of transportation system, building types (i.e., high rise, multilevel, commercial, residential), life cycle assessment, and structural engineering—that need to be considered in the environmental impact assessment of buildings, and the chapters include case studies across the globe. Consideration of these strategies would help reduce energy and material consumption, environmental emissions, and waste generation associated with all phases of a building's life cycle. Chapter 1 demonstrates that green star concrete exhibits the same structural properties as conventional concrete in Australia. Chapter 2 showed that the use of TiO2 as a photocatalyst on the surface of construction materials with a suitable stable binding agent, such as aggregates, would enable building walls to absorb NOx from air. This study found that TiO2 has the potential to reduce ambient concentrations of NOx from areas where this pollutant becomes concentrated under solar irradiation. Chapter 3 presents the life cycle assessment of architecturally integrated glass–glass photovoltaics in building facades to find the appropriate material composition for a multicolored PV façade offering improved environmental performance. Chapter 4 shows that urban office buildings lacking appropriate orientation experienced indoor overheating. Chapter 5 details four modeling approaches that were implemented to estimate buildings' response towards load shedding. Chapter 6 covers the life cycle GHG emissions of high-rise residential housing block to discover opportunities for environmental improvement. Chapter 7 discusses an LCA framework that took into account variation in the service life of buildings associated with the use of different types of materials. Chapter 8 presents a useful data mining algorithm to conduct life cycle asset management in residential developments built on transport systems.

This book explains the modelling and simulation of thermal power plants, and introduces readers to the equations needed to model a wide range of industrial energy processes. Also featuring a wealth of illustrative, real-world examples, it covers all types of power plants, including nuclear, fossil-fuel, solar and biomass. The book is based on the authors' expertise and experience in the theory of power plant modelling and simulation, developed over many years of service with EDF. In more than forty examples, they demonstrate the component elements involved in a broad range of energy production systems, with detailed test cases for each chemical, thermodynamic and thermo-hydraulic model. Each of the test cases includes the following information: • component description and parameterization data; • modelling hypotheses and simulation results; • fundamental equations and correlations, with their validity domains; • model validation, and in some cases, experimental validation; and • single-phase flow and two-phase flow modelling equations, which cover all water and steam phases. A practical volume that is intended for a broad readership, from students and researchers, to professional engineers, this book offers the ideal handbook for the modelling and simulation of thermal power plants. It is also a valuable aid in understanding the physical and chemical phenomena that govern the operation of power plants and energy processes.

Explores and brings together the existent body of knowledge on building performance analysis Building performance is an important yet surprisingly complex concept. This book presents a comprehensive and systematic overview of the subject. It provides a working definition of building performance, and an in-depth discussion of the role building performance plays throughout the building life cycle. The book also explores the perspectives of various stakeholders, the functions of buildings, performance requirements, performance quantification (both predicted and measured), criteria for success, and the challenges of using performance analysis in practice. Building Performance Analysis starts by introducing the subject of building performance: its key terms, definitions, history, and challenges. It then develops a theoretical foundation for the subject, explores the complexity of performance assessment, and the way that performance analysis impacts on actual buildings. In doing so, it attempts to answer the following questions: What is building performance? How can building performance be measured and analyzed? How does the analysis of building performance guide the improvement of buildings? And what can the building domain learn from the way performance is handled in other disciplines? Assembles the current body of knowledge on building performance analysis in one unique resource Offers deep insights into the complexity of using building performance analysis throughout the entire building life cycle, including design, operation and management Contributes an emergent theory of building performance and its analysis Building Performance Analysis will appeal to the building science community, both from industry and academia. It specifically targets advanced students in architectural engineering, building services design, building performance simulation and similar fields who hold an interest in ensuring that buildings meet the needs of their stakeholders.

This paper presents a freely available Modelica library for building heating, ventilation and air conditioning systems. The library is based on the Modelica. Fluid library. It has been developed to support research and development of integrated building energy and control systems. The primary applications are controls design, energy analysis and model-based operation. The library contains dynamic and steady-state component models that are applicable for analyzing fast transients when designing control algorithms and for conducting annual simulations when assessing energy performance. For most models, dimensional analysis is used to compute the performance for operating points that differ from nominal conditions. This allows parameterizing models in the absence of detailed geometrical information which is often impractical to obtain during the conceptual design phase of building systems. In the first part of this paper, the library architecture and the main classes are described. In the second part, an example is presented in which we implemented a model of a hydronic heating system with thermostatic radiator valves and thermal energy storage.

The scope of the symposium covers all major aspects of system identification, experimental modelling, signal processing and adaptive control, ranging from theoretical, methodological and scientific developments to a large variety of (engineering) application areas. It is the intention of the organizers to promote SYSID 2003 as a meeting place where scientists and engineers from several research communities can meet to discuss issues related to these areas. Relevant topics for the symposium program include: Identification of linear and multivariable systems, identification of nonlinear systems, including neural networks, identification of hybrid and distributed systems, Identification for control, experimental modelling in process control, vibration and modal analysis, model validation, monitoring and fault detection, signal processing and communication, parameter estimation and inverse modelling, statistical analysis and uncertainty bounding, adaptive control and data-based controller tuning, learning, data mining and Bayesian approaches, sequential Monte Carlo methods, including particle filtering, applications in process control systems, motion control systems, robotics, aerospace systems, bioengineering and medical systems, physical measurement systems, automotive systems, econometrics, transportation and communication systems *Provides the latest research on System Identification *Contains contributions written by experts in the field *Part of the IFAC Proceedings Series which provides a comprehensive overview of the major topics in control engineering.

Model-based tools and methods are playing important roles in the design and analysis of cyber-physical systems before building and testing physical prototypes. The development of increasingly complex CPSs requires the use of multiple tools for different phases of the development lifecycle, which in turn depends on the ability of the supporting tools to interoperate. However, currently no vendor provides comprehensive end-to-end systems engineering tool support across the entire product lifecycle, and no mature solution currently exists for integrating different system modeling and simulation languages,

tools and algorithms in the CPSs design process. Thus, modeling and simulation tools are still used separately in industry. The unique challenges in integration of CPSs are a result of the increasing heterogeneity of components and their interactions, increasing size of systems, and essential design requirements from various stakeholders. The corresponding system development involves several specialists in different domains, often using different modeling languages and tools. In order to address the challenges of CPSs and facilitate design of system architecture and design integration of different models, significant progress needs to be made towards model-based integration of multiple design tools, languages, and algorithms into a single integrated modeling and simulation environment. In this thesis we present the need for methods and tools with the aim of developing techniques for numerically stable co-simulation, advanced simulation model analysis, simulation-based optimization, and traceability capability, and making them more accessible to the model-based cyber physical product development process, leading to more efficient simulation. In particular, the contributions of this thesis are as follows: 1) development of a model-based dynamic optimization approach by integrating optimization into the model development process; 2) development of a graphical co-modeling editor and co-simulation framework for modeling, connecting, and unified system simulation of several different modeling tools using the TLM technique; 3) development of a tool-supported method for multidisciplinary collaborative modeling and traceability support throughout the development process for CPSs; 4) development of an advanced simulation modeling analysis tool for more efficient simulation.

Traditional building simulation programs possess attributes that make them difficult to use for the design and analysis of building energy and control systems and for the support of model-based research and development of systems that may not already be implemented in these programs. This article presents characteristic features of such applications, and it shows how equation-based object-oriented modelling can meet requirements that arise in such applications. Next, the implementation of an open-source component model library for building energy systems is presented. The library has been developed using the equation-based object-oriented Modelica modelling language. Technical challenges of modelling and simulating such systems are discussed. Research needs are presented to make this technology accessible to user groups that have more stringent requirements with respect to the numerical robustness of simulation than a research community may have. Two examples are presented in which models from the here described library were used. The first example describes the design of a controller for a nonlinear model of a heating coil using model reduction and frequency domain analysis. The second example describes the tuning of control parameters for a static pressure reset controller of a variable air volume flow system. The tuning has been done by solving a non-convex optimization problem that minimizes fan energy subject to state constraints.

At the Modelica 2009 conference, we introduced the Buildings library, a freely available Modelica library for building energy and control systems. This paper reports the updates of the library and presents example applications for a range of heating, ventilation and air conditioning (HVAC) systems. Over the past two years, the library has been further developed. The number of HVAC components models has been doubled and various components have been revised to increase numerical robustness. The paper starts with an overview of the library architecture and a description of the main packages. To demonstrate the features of the Buildings library, applications that include multizone airflow simulation as well as supervisory and local loop control of a variable air volume (VAV) system are briefly described. The paper closes with a discussion of the current development.

Development of Modelica Library for Dynamics Simulation of CHP PlantModelica Library Structure Design and Modeling for Transient Simulation of Combined Heat and Power (CHP) PlantRecent Developments of the Modelica"Buildings" Library for Building Energy and Control Systems

Modeling, Control And Optimization Of Complex Systems is a collection of contributions from leading international researchers in the fields of dynamic systems, control theory, and modeling. These papers were presented at the Symposium on Modeling and Optimization of Complex Systems in honor of Larry Yu-Chi Ho in June 2001. They include exciting research topics such as: -modeling of complex systems, -power control in ad hoc wireless networks, -adaptive control using multiple models, -constrained control, -linear quadratic control, -discrete events, -Markov decision processes and reinforcement learning, -optimal control for discrete event and hybrid systems, -optimal representation and visualization of multivariate data and functions in low-dimensional spaces.

This book contains the final reports of 19 workshops held during the 21st European Conference on Object-Oriented Programming, ECOOP 2007, in Berlin, Germany, in July 2007. The 19 collected reports from high-quality workshops - provided by the respective organizers - all are related to selected aspects in the field of object-oriented programming and technology. The reports are ordered in thematic groups on programming languages, aspects, formal techniques, roles, components, software engineering, and applications.

Provides an introduction to modern object-oriented design principles and applications for the fast-growing area of modeling and simulation Covers the topic of multi-domain system modeling and design with applications that have components from several areas Serves as a reference for the Modelica language as well as a comprehensive overview of application model libraries for a number of application domains