Sustainable Facility Management The Facility Managers Guide To Optimizing Building Performance

Building Performance Simulation for Design and OperationOptimizing Lighting, Thermal Performance, and Energy Production of Building Façades by Using Automated Blinds and PV CellsThermal Building Performance Optimization Using Spatial ArchetypesA Methodology for the Optimization of Building Energy, Thermal, and Visual PerformanceA Methodology for the Optimization of Building Energy, Thermal, and Visual PerformanceSustainability, Challenges and Opportunities to Optimize Building PerformanceMaterials and Construction Technologies for Sustainable DevelopmentLeedTM Energy Performance Modeling and Evaluation of the S.T. Dana Building RenovationsOptimizing Energy Performance of Building Renovation Using Traditional and Machine Learning ApproachesRetrofitting for Optimal Energy PerformanceGreen Building Technologies and Materials IITeaming for Efficiency: Commercial buildings : technologies, design, performance analysis, and building industry trendsStudy on Building Energy Efficiency Related to Simulation ModelsThe Engineering Guide to LEED-New Construction: Sustainable Construction for Engineers (GreenSource)Energy and Economic Optimization of Conduction-dominated BuildingsModeling, Design, and Optimization of Net-Zero Energy BuildingsEnergy Performance of BuildingsBuilding Performance AnalysisSimulation-based Building Energy OptimizationEvidenced-based Design and Operations Jan L.M. Hensen Hussain Hendi Alzoubi Eleni Primikiri Jérôme Conraud-Bianchi Conraud-Bianchi Jérôme. Igor Martek Mohammad Arif Kamal Sharada Gundala Seyed Amirhosain Sharif Arani Tantau, Adrian Zhi Li Cheng Pengyuan Shen Liv Haselbach William Leslie Carroll Andreas Athienitis Sofia-Natalia Boemi Pieter de Wilde Michael Wetter Cathy Higgins Building Performance Simulation for Design and Operation Optimizing Lighting, Thermal Performance, and Energy Production of Building Façades by Using Automated Blinds and PV Cells Thermal Building Performance Optimization Using

Spatial Archetypes A Methodology for the Optimization of Building Energy, Thermal, and Visual Performance A Methodology for the Optimization of Building Energy, Thermal, and Visual Performance Sustainability, Challenges and Opportunities to Optimize Building Performance Materials and Construction Technologies for Sustainable Development LeedTM Energy Performance Modeling and Evaluation of the S.T. Dana Building Renovations Optimizing Energy Performance of Building Renovation Using Traditional and Machine Learning Approaches Retrofitting for Optimal Energy Performance Green Building Technologies and Materials II Teaming for Efficiency: Commercial buildings : technologies, design, performance analysis, and building industry trends Study on Building Energy Efficiency Related to Simulation Models The Engineering Guide to LEED-New Construction: Sustainable Construction for Engineers (GreenSource) Energy and Economic Optimization of Conduction-dominated Buildings Modeling, Design, and Optimization of Net-Zero Energy Buildings Energy Performance of Buildings Building Performance Analysis Simulation-based Building Energy Optimization Evidenced-based Design and Operations *Jan L.M. Hensen Hussain Hendi Alzoubi Eleni Primikiri Jérôme Conraud-Bianchi Conraud-Bianchi Jérôme. Igor Martek Mohammad Arif Kamal Sharada Gundala Seyed Amirhosain Sharif Arani Tantau, Adrian Zhi Li Cheng Pengyuan Shen Liv Haselbach William Leslie Carroll Andreas Athienitis Sofia-Natalia Boemi Pieter de Wilde Michael Wetter Cathy Higgins*

effective building performance simulation can reduce the environmental impact of the built environment improve indoor quality and productivity and facilitate future innovation and technological progress in construction it draws on many disciplines including physics mathematics material science biophysics and human behavioural environmental and computational sciences the discipline itself is continuously evolving and maturing and improvements in model robustness and fidelity are constantly being made this has sparked a new agenda focusing on the effectiveness of simulation in building life cycle processes building performance simulation for design and operation begins with an introduction to the concepts of performance indicators and targets followed by a discussion on the role of building simulation in performance based building design and operation this sets the ground for in depth discussion of performance prediction for energy demand indoor environmental quality including thermal visual indoor air quality and moisture phenomena hvac and

renewable system performance urban level modelling building operational optimization and automation produced in cooperation with the international building performance simulation association ibpsa and featuring contributions from fourteen internationally recognised experts in this field this book provides a unique and comprehensive overview of building performance simulation for the complete building life cycle from conception to demolition it is primarily intended for advanced students in building services engineering and in architectural environmental or mechanical engineering and will be useful for building and systems designers and operators

buildings are under the scope of environmentalists since they are the biggest energy consumers and polluters building performance could be greatly improved thanks to optimization yet optimizing for different aspects of a building s performance is a conflicting process and building designers have to rely on their experience to make decisions the present work proposes a method to assess the optimal configuration for a building in terms of energy and indoor environment performances the method relies on the good performance of genetic algorithms ga for complex optimization problems however gas require extensive computations artificial neural networks ann were used to alleviate the computational burden the main concern has been to make this method as universal and easy to use as possible resorting to widely used tools only the method was first successfully tested on a small scale four room section of an office building and on a full scale school in both cases the ann model performed well with prediction errors in the order of 5 finding a better design for the school building was rather difficult since the building performed well already but thermal comfort could be improved without increasing the energy demand or decreasing visual comfort the limits of the method were tested by playing with the number of inputs and outputs the ann performed well though its performance decreased as the number of design parameters increased the limits of the method were established regarding the performance of the ann and the number of cases required to train and validate the ann

in the face of climate change and resource depletion the construction industry faces the critical challenge of advancing sustainable solutions sustainability challenges and opportunities to optimize building performance offers an in depth exploration of

both the theoretical and practical dimensions of sustainable architecture and construction through 22 cutting edge studies it is organized into five thematic sections 1 foundational concepts in sustainable building design 2 advanced applications and modular design solutions 3 structural innovations and energy efficiency 4 energy optimization in extreme climates and 5 retrofit strategies this reprint systematically examines the challenges and opportunities in achieving optimal building performance from energy simulations and modular design to advanced material and energy efficient retrofitting this collection highlights global perspectives and innovative methodologies contributions from six continents demonstrate the universal relevance of these approaches key topics include reducing energy consumption leveraging building information modelling bim enhancing disaster resilience and fostering sustainable retrofits for housing by bridging theoretical insights with actionable strategies this reprint offers invaluable guidance for researchers practitioners and policymakers aiming to create resilient efficient and environmentally responsible built environments it underscores the interconnectedness of sustainable practices offering a holistic resource to advance the built environment toward net zero goals

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international energy agency iea studies show that buildings are responsible for more than 30 of the total energy consumption and an equally large amount of related greenhouse gas emissions improving the energy performance of buildings is a critical element of building energy conservation furthermore renovating existing buildings envelopes and systems offers significant opportunities for reducing life cycle cost lcc and minimizing negative environmental impacts this approach can be considered as one of the key strategies for achieving sustainable development goals at a relatively low cost especially when compared with the demolition and reconstruction of new buildings one of the main methodological and technical issues of this approach is selecting a desirable renovation strategy among a wide range of available options the main motivation behind this research relies on trying to bridge the gap between building simulation optimization algorithms and artificial intelligence ai techniques to take full advantage of the value of their couplings furthermore for a whole building simulation and optimization current simulation based optimization models often need

thousands of simulation evaluations therefore the optimization becomes unfeasible because of the computation time and complexity of the dependent parameters to this end one feasible technique to solve this problem is to implement surrogate models to computationally imitate expensive real building simulation models the aim of this research is three fold 1 to propose a simulation based multi objective optimization sbmo model for optimizing the selection of renovation scenarios for existing buildings by minimizing total energy consumption tec lcc and negative environmental impacts considering life cycle assessment lca 2 to develop surrogate artificial neural networks anns for selecting near optimal building energy renovation methods and 3 to develop generative deep machine learning models mlms to generate renovation scenarios considering tec and lcc this study considers three main areas of building renovation which are the building envelope heating ventilation and air conditioning hvac system and lighting system each of which has a significant impact on building energy performance on this premise this research initially develops a framework for data collection and preparation to define the renovation strategies and proposes a comprehensive database including different renovation methods using this database different renovation scenarios can be compared to find the near optimal scenario based on the renovation strategy each scenario is created from the combination of several methods within the applicable strategy the sbmo model simulates the process of renovating buildings by using the renovation data in energy analysis software to analyze tec lcc and lca and identifies the near optimal renovation scenarios based on the selected renovation methods furthermore an lca tool is used to evaluate the environmental sustainability of the final decision it is found that although the proposed sbmo is accurate the process of simulation is time consuming to this end the second objective focuses on developing robust mlms to explore vast and complex data generated from the sbmo model and develop a surrogate building energy model to predict tec lcc and lca for all building renovation scenarios the main advantage of these mlms is improving the computing time while achieving acceptable accuracy more specifically the second developed model integrates the optimization power of sbmo with the modeling capability of anns while the proposed anns are found to provide satisfactory approximation to the sbmo model in a very short period of time they do not have the capability to generate renovation scenarios finally the third objective focuses on developing a

generative deep learning building energy model using variational autoencoders vaes the proposed semi supervised vaes extract deep features from a whole building renovation dataset and generate renovation scenarios considering tec and lcc of existing institutional buildings the proposed model also has the generalization ability due to its potential to reuse the dataset from a specific case in similar situations the proposed models will potentially offer new venues in two directions 1 to predict tec lcc and lca for different renovation scenarios and select the near optimal scenario and 2 to generate renovation scenarios considering tec and lcc architects and engineers can see the effects of different materials hvac systems etc on the energy consumption and make necessary changes to increase the energy performance of the building the proposed models encourage the implementation of sustainable materials and components to decrease negative environmental impacts the ultimate impact of the practical implementation of this research is significant savings in buildings energy consumption and having more environmentally friendly buildings within the predefined renovation budget

retrofitting expresses in a traditional approach the process of improving something after it has been manufactured constructed or assembled these systems integrate new technologies new functions and new services that increase the energy performance in existing private public and commercial buildings retrofitting for optimal energy performance is a comprehensive reference source that examines environmentally conscious technologies and their applications in advancing retrofitting practices providing relevant theoretical frameworks and the latest empirical research findings in the area it highlights an array of topics such as climate change energy management and optimization modeling and is essential for academicians students researchers engineers architects entrepreneurs managers policymakers and building owners

selected peer reviewed papers from the 2nd international conference on green buildings technologies and materials gbtm 2012 december 27 28 wuhan china

this special issue focuses on the need for advanced simulation techniques and computational methods in improving building energy efficiency with increasing trends in global energy consumption and the escalating impact of climate change reliable

predictive modeling of building performance and energy consumption has become a critical part of sustainable construction this reprint gathers the state of the art research that fills the gap between theoretical modeling and practice in the energy management and environmental performance of buildings this collection includes a variety of methodological approaches such as machine learning models for predicting thermal loads and advanced computation methods used to optimize an hvac system the presented studies have explored diverse building typologies in diverse climate regions covering retrofit impact in various climatic regions energy disaggregation for buildings and improved methods of thermal bridge analysis collectively these contributions extend the scientific understanding of optimizing building performance using advanced modeling approaches facilitating the shift toward a net zero energy future and sustainable development for the building sector

an up to date guide to the latest leed new construction guidelines fully revised for version 3 0 of the leed new construction rating system leed 2009 this greensource book helps you acquire the skills needed to apply leed nc to sustainable construction projects the engineering guide to leed new construction second edition offers comprehensive coverage of the environmental systems and impacts on which many of the leed nc subcategories are based detailed equations and exercises in the book can be used to perform the calculations outlined in leed nc valuable information on real world applications of leed nc in military low impact development lid and other sectors is included in this practical resource the engineering guide to leed new construction covers introduction to the u s green building council s leed nc rating system sustainable sites water efficiency energy and atmosphere materials and resources indoor environmental quality innovation in design and regional priorities a systematic view of green and minimum program requirements department of defense sustainable construction and indoor air quality iaq low impact development

building energy design is currently going through a period of major changes one key factor of this is the adoption of net zero energy as a long term goal for new buildings in most developed countries to achieve this goal a lot of research is needed to accumulate knowledge and to utilize it in practical applications in this book accomplished international experts present advanced modeling techniques as well as in depth case studies in order to aid designers in optimally using simulation

tools for net zero energy building design the strategies and technologies discussed in this book are however also applicable for the design of energy plus buildings this book was facilitated by international energy agency s solar heating and cooling shc programs and the energy in buildings and communities ebc programs through the joint shc task 40 ebc annex 52 towards net zero energy solar buildings r d collaboration after presenting the fundamental concepts design strategies and technologies required to achieve net zero energy in buildings the book discusses different design processes and tools to support the design of net zero energy buildings nzebs a substantial chapter reports on four diverse nzebs that have been operating for at least two years these case studies are extremely high quality because they all have high resolution measured data and the authors were intimately involved in all of them from conception to operating by comparing the projections made using the respective design tools with the actual performance data successful and unsuccessful design techniques and processes design and simulation tools and technologies are identified written by both academics and practitioners building designers and by north americans as well as europeans this book provides a very broad perspective it includes a detailed description of design processes and a list of appropriate tools for each design phase plus methods for parametric analysis and mathematical optimization it is a guideline for building designers that draws from both the profound theoretical background and the vast practical experience of the authors

this book analyzes the trends and technologies of green and energy efficient building identifying strategies for implementing energy savings and enabling the use of renewable resources in residential commercial healthcare and educational building sectors the authors focus on best practices in temperate climates providing in depth coverage of urban heat island climate change and fuel poverty mitigation through architectural optimization leveraging renewable energy sources and utilization of cutting edge cooling materials pragmatic emphasis is placed on improving the energy performance of existing building stock to meet short and long term objectives of climate and energy conservation strategies engineers architects designers students policy makers and efficiency professionals will all gain valuable insights and ideas from this practical handbook to greening the built environment

explores and brings together the existent body of knowledge on building performance analysis shortlisted in the cibse 2020 building performance awards 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

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