
Digital Twin Spark Ignition Engine

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Twin-Control National Academies Press

This open access book summarizes the results of the European research project “Twin-model based virtual manufacturing for machine tool-process simulation and control” (Twin-Control). The first part reviews the applications of ICTs in machine tools and manufacturing, from a scientific and industrial point of view, and introduces the Twin-Control approach, while Part 2 discusses the development of a digital twin of machine tools. The third part addresses the monitoring and data management infrastructure of machines and manufacturing processes and numerous

applications of energy monitoring. Part 4 then highlights various features developed in the project by combining the developments covered in Parts 3 and 4 to control the manufacturing processes applying the so-called CPSs. Lastly, Part 5 presents a complete validation of Twin-Control features in two key industrial sectors: aerospace and automotive. The book offers a representative overview of the latest trends in the manufacturing industry, with a focus on machine tools.

Potential of Spark Ignition Engine, Electronic Engine and Transmission Control NestFame Creations Pvt Ltd.

This book presents a step-by-step guide to the engine control system design, providing case studies and a thorough analysis of the modeling process using machine learning, and model predictive control (MPC). Covering advanced processes alongside the theoretical foundation, MPC enables engineers to improve performance in both hybrid and non-hybrid vehicles. Control system improvement is one of the major priorities for engineers

seeking to enhance an engine. Often possible on a low budget, substantial improvements can be made by applying cutting-edge methods, such as artificial intelligence when modeling engine control system designs and using MPC. This book presents approaches to control system improvement at mid, low, and high levels of control.

Beginning with the model-in-the-loop hierarchical control design of ported fuel injection SI engines, this book focuses on optimal control of both transient and steady state and also discusses hardware-in-the-loop. The chapter on low-level control discusses adaptive MPC and adaptive variable functioning, as well as designing a fuel injection feed-forward controller. At mid-level control, engine calibration maps are discussed, with consideration of constraints such as limits on pollutant emissions. Finally, the high-level control methodology is discussed in detail in relation to transient torque control of SI engines. This comprehensive yet clear guide to control system improvement is an essential read for any engineer working in automotive engineering and engine control system design.

Basics of Mechanical Engineering Academic Press

This book contains the theory and computer programs for the simulation of spark ignition (SI) engine processes. It starts with the fundamental concepts and goes on to the advanced level and can thus be used by undergraduates, postgraduates and Ph. D. scholars.

Digital Twin for Smart Manufacturing CRC Press

This book provides readers with a guide to the use of Digital Twin in manufacturing. It presents a collection of fundamental ideas about sensor electronics and data acquisition, signal and image processing techniques, seamless data communications, artificial intelligence and machine learning for decision making, and explains their necessity for the practical application of Digital Twin in Industry. Providing case studies relevant to the manufacturing processes, systems, and sub-systems, this book is beneficial for both academics and industry professionals within the field of Industry 4.0 and digital manufacturing.

Strategic Management BoD – Books on Demand

This book introduces the computing, mathematical and engineering background to understand and develop the concept of the digital twin. It provides background in modeling/simulation, computing technology, sensor/actuators, and so forth, needed to develop the next generation of digital twins.

Digital-Twin-Enabled Smart Control Engineering Walter de Gruyter GmbH & Co KG

Digital Twin Development and Deployment in the Cloud: Developing Cloud-Friendly Dynamic Models Using Simulink®/Simscape™ and Amazon AWS promotes a physics-based approach to the field of digital twins.

Through the use of multiphysics models running in the cloud, significant improvement to the diagnostics and prognostic of systems can be attained. The book draws a clear definition of digital twins, helping business leaders clearly identify the value it brings. In addition, it outlines the key elements needed for deployment, including the hardware and software tools needed. Special attention is paid to the process of developing and deploying the multi-physics models of the digital twins. Provides a high-level overview of digital twins and their underutilization in the field of asset management and maintenance Proposes a streamline process to create digital twins for a wide variety of applications using MATLAB® Simscape™ Deploys developed

digital twins on Amazon Web Services Includes MATLAB and Simulink codes available for free download on MATLAB central Covers popular prototyping hardwares, such as Arduino and Raspberry Pi

Light-load Burn Rate Analysis in an Air-cooled Utility Engine

Springer Science & Business Media

Digital Twin Driven Smart Service draws on the latest industry practice and research to explain how to implement digital twin service in a range of scenarios. It addresses relevant theory and methodologies, including product service, prognostic health management service, energy efficient service and testing service. Other sections discuss key enabling technologies supported by cutting-edge case studies of implementation. Drawing on the work of researchers at the forefront of this technology, this book is the ideal guide for anyone interested in product services, manufacturing services and digital twin services. This book is one part of a trilogy on digital twins, the other titles being Digital Twin Driven Smart Design and Digital Twin Driven Smart Manufacturing. Provides a wide range of applications, including tribological testing, cutting tool service and energy efficiency assessment Explains everything needed to understand and implement digital twin models for service, including frameworks, theories and technologies Explores future challenges for research in this area, including the ongoing standardization of digital twin technology *Digital Twin Development and Deployment on the Cloud* SK Research Group of Companies

This monograph covers different aspects related to utilization of alternative fuels in internal combustion (IC) engines with a focus on biodiesel, dimethyl ether, alcohols, biogas, etc. The focal point of this book is to present engine combustion, performance and emission characteristics of IC engines fueled by these alternative fuels. A section of this book also covers the potential strategies of utilization of these

alternative fuels in an energy efficient manner to reduce the harmful pollutants emitted from IC engines. It presents the comparative analysis of different alternative fuels in a variety of engines to show the appropriate alternative fuel for specific types of engines. This book will prove useful for both researchers as well as energy experts and policy makers.

Machine Learning Assisted Digital Twin for Event Identification in Electrical Power System PHI Learning Pvt. Ltd.

AIRCRAFT AND AUTOMOBILE PROPULSION: A Textbook covers basic concepts of automobile and aircraft propulsion i.e. thermodynamics, heat transfer and reciprocating engines alongwith concept of system, description of conjugate properties, parametric study of thermodynamic cycle, sensitivity analysis of cycle efficiency, numerical methods for 2-D heat conduction, fin analysis and testing of automobile engines.

Alternative Fuels and Advanced Combustion Techniques as Sustainable Solutions for Internal Combustion Engines Universities Press

The Digital Twin Paradigm for Smarter Systems and Environments: The Industry Use Cases, Volume 117, the latest volume in the Advances in Computers series, presents detailed coverage of new advancements in computer hardware, software, theory, design and applications. Chapters vividly illustrate how the emerging discipline of digital twin is strategically contributing to various digital transformation initiatives. Specific chapters cover Demystifying the Digital Twin Paradigm, Digital Twin Technology for "Smarter Manufacturing", The Fog Computing/ Edge Computing to leverage Digital Twin, The industry use cases for the Digital Twin idea, Enabling Digital Twin at the Edge, The Industrial Internet of Things (IIOT), and much more. Provides in-depth descriptions of digital transformation technologies and tools Covers various research accomplishments in this flourishing field of relevance Includes many

detailed industry use cases with all the right information

India Today Springer

The book, now in its fifth edition, offers a comprehensive treatment of Intellectual Property concepts and their applications in Indian industry. It provides a strategic framework for IP management, leading to competitive advantage for a business enterprise. Besides explaining the conceptual framework and practices of IP management, the book discusses IP as a strategic tool, its commercial exploitation and strategies for risk management of IP. Web-based material comprising chapter-wise PowerPoint Presentations (PPTs) and Multiple Choice Questions is available at www.phindia.com/sople. This book is primarily intended as a text for postgraduate students of management, students of engineering and those who are pursuing certificate, postgraduate diploma or degree courses in IPR. In addition, professionals and corporate decision-makers should find the text valuable. **NEW TO THE FIFTH EDITION** • A new chapter has been introduced on Filing Patent Applications. • Numerous sections such as clinical research regulations, planned purification, combination therapy, alternate delivery, trade dress trademark protection, trademark caution notice, comparative advertising and trademark violation, contributory and vicarious infringement, two statutes for farmers' rights, incremental innovation, piracy in fashion design, patentable or not patentable biotech inventions have now been incorporated in the respective chapters. • More cases/caselets have been introduced in the present edition. **KEY FEATURES** • Discusses IPs such as Patents, Copyrights, Trademarks, Trade Secrets, Designs,

Semiconductor Circuit Layouts and Geographical Indications, etc.

- Practices issues of IPRs in Cyber Space, Fashion Design, Biotechnology and Pharmaceutical industry.
- Classifies systems in practice for various IPs.
- Provides IPRs legal provision in Indian context.
- Includes a comprehensive glossary of important terms.
- Encloses CD-ROM containing Intellectual Property Rights' laws in India as per the latest amendments.

Digital Twin Technology SBPD Publishing House

Digital Twin for Smart Manufacturing: Emerging Approaches and Applications provides detailed descriptions on how to integrate and optimize novel digital technologies for smart manufacturing. The book discusses digital twins, which combine the industrial internet of things, artificial intelligence, machine learning and software analytics with spatial network graphs to create living digital simulation models that update and change as their physical counterparts change. In addition, they provide an effective way to integrate technologies like cyber-physical systems into a smart manufacturing system, potentially optimizing the entire business process and operating procedure of the manufacturing firm. Drawing on the latest research, the book addresses the topics and technologies key to successful implementation of a smart manufacturing system, including augmented and virtual reality, big data and energy management. Broader subjects such as additive manufacturing and robotics are also covered in this context, covering every aspect of production. Includes detailed case studies that show how digital twins have been successfully implemented Shows how digital twins can be used to improve sustainability through superior energy usage management Outlines potential future uses of the digital twin, thus pointing the way for future research directions

Digital Twin Driven Smart Manufacturing Academic Press

Strategic Management by R. Maheshwari & Saurabh Agarwal is a

publication of the SBPD Publishing House, Agra. Strategic management is concerned with the processes by which management plans and co-ordinates the use of business resources with the general objective of securing or maintaining competitive advantage. This book provides the student with a general insight into the historical development of management practices and international business policies. In particular, this book reviews the developments and literature on corporate strategy and critically reviews the possibilities and limitations of management action in highly contested international markets. This book targets to meet in full measure the requirements of students preparing for B.B.A., B.Com., M.Com., M.B.A. and other Professional Courses of various Indian Universities. What makes this book an ideal choice is that great care has been taken to illustrate each point with suitable examples. The basic motto of this book is to generate interest in the subject in the mind of the students and help them understand each and every concept. Salient features of this book are as follows - The motto of this book is to provide an easy and obvious understanding of the subject to the students. Every best effort has been made to include the questions asked in various examinations in different years. The subject matter of this book is prepared scientifically and analytically. The volume of the book and the size of different points have been kept keeping in view to meet out the need for examinations.

MANAGING INTELLECTUAL PROPERTY : The Strategic Imperative
Springer Nature

Digital Twin Driven Smart Manufacturing examines the background, latest research, and application models for digital twin technology, and shows how it can be central to a smart manufacturing process. The interest in digital twin in manufacturing is driven by a need for excellent product reliability, and an overall trend towards intelligent, and connected manufacturing systems. This book provides an ideal entry point to this subject for readers in industry and academia, as it answers the questions: (a) What is a digital twin? (b) How to construct a digital twin? (c) How to use a digital twin to improve manufacturing efficiency? (d) What are the essential activities in the implementation of a digital twin? (e) What are the most important obstacles

to overcome for the successful deployment of a digital twin? (f) What are the relations between digital twin and New Technologies? (g) How to combine digital twin with the New Technologies to achieve high efficiency and smartness in manufacturing? This book focuses on these problems as it aims to help readers make the best use of digital twin technology towards smart manufacturing. Analyzes the differences, synergies and possibilities for integration between digital twin technology and other technologies, such as big data, service and Internet of Things Discuss new requirements for a traditional three-dimension digital twin and proposes a methodology for a five-dimension version Investigates new models for optimized manufacturing, prognostics and health management, and cyber-physical fusion based on the digital twin

Strategic Management Springer Nature

DIGITAL TWIN TECHNOLOGY The book lucidly explains the fundamentals of digital twin technology along with its applications and various industrial real-world examples. Digital twin basically means a replicated model of any object or product in digital form. A digital twin has many advantages as it remains connected with the original object or product it is replicating and receives real-time data. Therefore, the obstacles and issues that could be encountered in a product or object can be known before their actual happening which helps to prevent errors and major losses which otherwise might have been incurred. The various capabilities of digital twin technology make it a powerful tool that can be used to effectively boost various sectors of the healthcare, automotive, and construction industries, among others. Although this technology has been making its way into various sectors, it has not yet received the kind of exposure necessary to increase awareness of its potential in these industries. Therefore, it is critical that a better understanding of digital twin technology is acquired to facilitate growth and to have it implemented in the various sectors so that transformation can be ushered in. Therefore, this book was designed to

be a useful resource for those who want to become well acquainted with digital twin technology. Audience Engineers, researchers, and advanced students in information technology, computer science, and electronics, as well as IT specialists and professionals in various industries such as healthcare, automotive, and transportation.

Mechatronics & IoT Academic Press

The Handbook of Mechanical Engineering is a complete work for B.E./B.Tech. students as well as applicants preparing for competitive examinations such as the IES/IFS/GATE State Services and competitive tests held by public and private sector businesses to choose apprentice engineers. The third edition of this well-designed textbook presents the principles of mechanical engineering in the areas of thermodynamics, mechanics, machine theory, material strength, and fluid dynamics. This work is well adapted to meet the needs of the common course in mechanical engineering specified in the curriculum of practically all areas of engineering, as these courses are a fundamental aspect of an engineer's education. To match the course requirement, this revised "THIRD EDITION" includes a new chapter on 'Hydraulic and Pneumatic System.' With the world's finest engineering manual, you can solve any mechanical engineering problem fast and easily. Nearly 2400 pages of mechanical engineering facts, figures, standards, and practices, 2000 illustrations, and 900 tables clarifying important mathematical and engineering principles, as well as the collective wisdom of 160 experts, will help you answer any analytical, design, or application question you may have. Covers the important aspects of mechanical engineering in a concise manner, including definitions, equations, examples, theory, proofs, and explanations for all major topic areas. The purpose of the third edition of the Handbook of Principle of Mechanical Engineering is to continue providing practicing engineers in industry, government, and academia

with up-to-date information on the most important topics of modern mechanical engineering. ? This book provides a comprehensive and wide-ranging introduction to the fundamental principles of mechanical engineering in a distinct and clear manner. The book is intended for a core introductory course in the area of foundations and applications of mechanical engineering, ?

Assessment of Fuel Economy Technologies for Light-Duty Vehicles
NestFame Creations Pvt Ltd.

This book presents a novel design framework for the development of Digital Twin (DT) models for process- and motion-control applications. It is based on system-data acquisition using cutting-edge computing technologies, modelling of physical-system behavior through detailed simultaneous simulation of different aspects of the system, and optimal dynamic behavior-matching of the process. The design framework is enhanced with real-time data analytics to improve the performance of the DT's behavior-matching with the real system or physical twin. The methods of creating a DT detailed in Digital-Twin-Enabled Smart Control Engineering make possible the study of a system for real-time controller tuning and fault detection. They also facilitate life-cycle analysis for multiple critical and dangerous conditions that cannot be explored in the corresponding real system or physical twin. The authors show how a DT can be exploited to enable self-optimizing capabilities in feedback control systems. The DT framework and the control-performance assessment, fault diagnosis and prognosis, remaining-useful-life analysis, and self-optimizing control abilities it allows are validated with both process- and motion-control systems and their DTs. Supporting MATLAB-based material for a case study and an expanded introduction to the basic elements of DTs can be accessed on an associated website. This book helps university researchers from many areas of engineering to develop new

tools for control design and reliability and life-cycle assessment and helps practicing engineers working with robotic, manufacturing and processing, and mechatronic systems to maintain and develop the mechanical tools they use.

Principles of MECHANICAL ENGINEERING Springer Nature

Automobile or Automotive Engineering has gained recognition and importance ever since motor vehicles capable for transporting passengers has been in vogue. Now due to the rapid growth of auto component manufacturers and automobile industries, there is a great demand for Automobile Engineers. Automobile Engineering alias Automotive Engineering or Vehicle Engineering is one of the most challenging careers in the field of engineering with a wide scope. This branch deals with the designing, developing, manufacturing, testing and repairing and servicing automobiles such as cars, trucks, motorcycles, scooters etc & the related sub Engineering systems. For the perfect blend of manufacturing and designing automobiles, Automobile Engineering uses the features of different elements of Engineering such as mechanical, electrical, electronic, software and safety engineering. To become a proficient automobile engineer, specialized training is essential and it is a profession, which requires a lot of hard work, dedication, determination and commitment. The major task of an Automobile Engineer is the designing, developing, manufacturing and testing of vehicles from the concept stage to the production stage. The automotive industry is one of the largest and most important industries in the world. Cars, buses, and other engine-based vehicles abound in every country on the planet, and it is continually evolving, with electric cars, hybrids, self-driving vehicles, and so on. Technologies that were once thought to be decades away are now on our roads right now. Engineers, technicians, and managers are constantly needed in the industry, and, often, they come from other areas of engineering, such as electrical engineering, process engineering, or chemical engineering. Introductory books like this one are very useful for engineers who are new to the industry and need a tutorial. Also valuable as a textbook for students, this introductory volume not only covers the basics of

automotive engineering, but also the latest trends, such as self-driving vehicles, hybrids, and electric cars. Not only useful as an introduction to the science or a textbook, it can also serve as a valuable reference for technicians and engineers alike. The volume also goes into other subjects, such as maintenance and performance. Data has always been used in every company irrespective of its domain to improve the operational efficiency and performance of engines. This work deals with details of various automotive systems with focus on designing various components of these system to suit the working conditions on roads. Whether a textbook for the student, an introduction to the industry for the newly hired engineer, or a reference for the technician or veteran engineer, this volume is the perfect introduction to the science of automotive engineering.

Aircraft and Automobile Propulsion PHI Learning Pvt. Ltd.

This book presents selected and peer-reviewed proceedings of the International Conference on Thermofluids (KIIT Thermo 2020). It focuses on the latest studies and findings in the areas of fluid dynamics, heat transfer, thermodynamics, and combustion. Some of the topics covered in the book include electronic cooling, HVAC system analysis, inverse heat transfer, combustion, nano-fluids, multiphase flow, high-speed flow, and shock waves. The book includes both experimental and numerical studies along with a few review chapters from experienced researchers, and is expected to lead to new research in this important area. This book is of interest to students, researchers as well as practitioners working in the areas of fluid dynamics, thermodynamics, and combustion.

Computer Simulation Of Spark-Ignition Engine Processes
Academic Press

This book presents selected proceedings of the International Conference on Advances in Mechanical Processing and Design (ICAMPD 2019). The contents highlight latest research in next-generation mechanical systems design, thermal and fluid systems design, materials and smart manufacturing processes, and

industrial engineering. Some of the topics covered include smart materials, materials processing and applications, smart machinery and machine design, system dynamics and simulation, biomimetics, energy systems, micro- and nano-scale transport, automotive engineering, advance material characterization and testing, and green and sustainable manufacturing. Given the scope of the contents, this book can be of interest to students, researchers as well as industry professionals.