

## Chapter 7 Pwm Techniques

Week 7 Introduction To PWM Offline Optimized PWM Technique Single Loop Control Methods - Dealing with Deadtime // Chapter 7 Pulse Width Modulation (PWM) - Electronics Basics 23 New Powerful opposition coalition scares Ruto in Statehouse Liberal governor under fire for 'unhinged' warning to Trump voters Duty cycle, frequency and pulse width--an explanation Why 27 U.S. States Are Going Broke Laptop power supply and cheap PWM charge controller Car battery charger How to make a cube faster and smoother without lube or oil | Cubecraft | #cubing #cubecraft Understanding Pulse Width Modulation - Part 1 What is PWM? What is PWM? Single phase PWM for single phase inverter Growing up Pentecostal #short Mod-07 Lec-23 Harmonic analysis of PWM techniques DC to AC Converters Chapter—7 MSc Spring 2020 APE (Part—1) Lecture 9 : PWM Techniques, Power Electronics Lec 7: Unipolar PWM PWM - Pulse Width Modulation (Basics, Circuit, Working, \u0026 Waveforms) Explained Summary of Carrier- Based (Triangle- Comparison) PWM Techniques #shorts Animation of the Over Modulation of PWM Inverter all the Way to Six-Step Mode \"Arduino for DUMMIES\" - walkthrough - Chapter 7: Inputs Outputs and Communication Mod-07 Lec-26 Analysis and design of PWM techniques from line current ripple perspective SV-Based Continual-Clamp and Split-Clamp PWM Techniques Turn it off and back on again, just really fast. PWM Handbook of Research on Power and Energy System Optimization Origin of Power Converters Energy-Efficient Electric Motors and their Applications m-Mode SVPWM Technique for Power Converters Programming the BeagleBone 8051 Microcontroller VLSI Noise Processing Circuits - Theoretical Bases and Implementations Power Converters and AC Electrical Drives with Linear Neural Networks Modeling, Control, Estimation, and Optimization for Microgrids High Performance Control of AC Drives with Matlab/Simulink Compendium of New Techniques in Harmonic Analysis AC to AC Converters Practical Java Programming for IoT, AI, and Blockchain Microcontrollers Advanced Pulse-Width-Modulation: With Freedom to Optimize Power Electronics Converters Control of Power Electronic Converters with Microgrid Applications Power Management Techniques for Integrated Circuit Design

Chapter 7 Pwm Techniques

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### BRADLEY STEWART

#### Handbook of Research on Power and Energy System Optimization Elsevier

This book is a technical publication for students, scholars and engineers in electrical engineering, focusing on the pulse-width-modulation (PWM) technologies in power electronics area. Based on an introduction of basic PWM principles this book analyzes three major challenges for PWM on system performance: power losses, voltage/current ripple and electromagnetic interference (EMI) noise, and the lack of utilization of control freedoms in conventional PWM technologies. Then, the model of PWM's impact on system performance is introduced, with the current ripple prediction method for voltage source converter as example. With the prediction model, two major advanced PWM methods are introduced: variable switching frequency PWM and phase-shift PWM, which can reduce the power losses and EMI for the system based on the prediction model. Furthermore, the advanced PWM can be applied in advanced topologies including multilevel converters and paralleled converters. With more control variables in the advanced topologies, performance of PWM can be further improved. Also, for the special problem for common-mode noise, this book introduces modified PWM method for reduction. Especially, the paralleled inverters with advanced PWM can achieve good performance for the common-mode noise reduction. Finally, the implementation of PWM technologies in hardware is introduced in the last part.

#### Origin of Power Converters CRC Press

This book presents a novel control method for power converters, referred to as m-mode control. It provides an overview of traditional control methods for inverters - e.g. PWM and SVPWM - and the theory of the m-mode control method, while also discussing and applying m-mode control on various types of converters (including three-phase, nine-switch, five-leg and multi-level inverters, PWM rectifiers and modular multi-level converters). The book provides readers with sufficient background and understanding to delve deeper into the topic of SVPWM control. It is also a valuable guide for engineers and researchers whose work involves power converter control.

#### Energy-Efficient Electric Motors and their Applications Pulse Width Modulation

Although the programming and use of a Digital Signal Processor (DSP) may not be the most complex process, utilizing DSPs in applications such as motor control can be extremely challenging

for the first-time user. DSP-Based Electromechanical Motion Control provides a general application guide for students and engineers who want to implement DSP-base

#### M-MODE SVPWM TECHNIQUE FOR POWER CONVERTERS

CRC Press

Green Information and Communication Systems for a Sustainable Future covers the fundamental concepts, applications, algorithms, protocols, new trends, challenges, and research results in the area of Green Information and Communication Systems. This book provides the reader with up-to-date information on core and specialized issues, making it highly suitable for both the novice and the experienced researcher in the field. The book covers theoretical and practical perspectives on network design. It includes how green ICT initiatives and applications can play a major role in reducing CO2 emissions, and focuses on industry and how it can promote awareness and implementation of Green ICT. The book discusses scholarship and research in green and sustainable IT for business and organizations and uses the power of IT to usher sustainability into other parts of an organization. Business and management educators, management researchers, doctoral scholars, university teaching personnel and policy makers as well as members of higher academic research organizations will all discover this book to be an indispensable guide to Green Information and Communication Systems. It will also serve as a key resource for Industrial and Management training organizations all over the world.

Programming the BeagleBone IGI Global

This is the definitive reference for anyone involved in pulsewidth modulated DC-to-DC power conversion Pulsewidth Modulated DC-to-DC Power Conversion: Circuits, Dynamics, and Control Designs provides engineers, researchers, and students in the power electronics field with comprehensive and complete guidance to understanding pulsewidth modulated (PWM) DC-to-DC power converters. Presented in three parts, the book addresses the circuitry and operation of PWM DC-to-DC converters and their dynamic characteristics, along with in-depth discussions of control design of PWM DC-to-DC converters. Topics include: Basics of DC-to-DC power conversion DC-to-DC converter circuits Dynamic modeling Power stage dynamics Closed-loop performance Voltage mode control and feedback design Current mode control and compensation design Sampling effects of current mode control Featuring fully tested problems and simulation examples as well as

downloadable lecture slides and ready-to-run PSpice programs, Pulsewidth Modulated DC-to-DC Power Conversion is an ideal reference book for professional engineers as well as graduate and undergraduate students.

8051 Microcontroller Cambridge University Press

In this revised and expanded edition, Howard E. Jordan explains-in a clear manner-the technology of energy efficient electric motors including motor losses, testing, and efficiency labeling. He also discusses how to calculate the return on investment for an energy efficient motor in addition to several other subjects related to effective motor applications. New chapters explore permanent magnet synchronous motors and transistor pulse-width-modulated inverters. Engineers, purchasing managers, and executives who make decisions on motor selection will find this an invaluable reference.

#### VLSI Noise Processing Circuits - Theoretical Bases and Implementations World Scientific

This book offers a general approach to pulse width modulation techniques and multilevel inverter topologies. The multilevel inverters can be approximately compared to a sinusoidal waveform because of their increased number of direct current voltage levels, which provides an opportunity to eliminate harmonic contents and therefore allows the utilization of smaller and more reliable components. On the other side, multilevel inverters require more components than traditional inverters and that increases the overall cost of the system. The various algorithms for multilevel neutral point clamped inverter fed induction motor are proposed and implemented, and the results are analyzed. The performance of these algorithms is evaluated in terms of inverter output voltage, current waveforms and total harmonic distortion. Various basic pulse width modulation techniques, features and implementation of space vector pulse width modulation for a two-level inverter, and various multilevel inverter topologies are discussed in detail. This book is extremely useful for undergraduate students, postgraduate students, industry people, scientists of research laboratories and especially for the research scholars who are working in the area of multilevel inverters. Dr. Satish Kumar Peddapelli is Assistant Professor at the Osmania University in Hyderabad, India. His areas of interest are Power Electronics, Drives, Power Converters, Multi Level Inverters and Special Machines.

## POWER CONVERTERS AND AC ELECTRICAL DRIVES WITH LINEAR NEURAL NETWORKS

John Wiley & Sons

In many university curricula, the power electronics field has evolved beyond the status of comprising one or two special-topics courses. Often there are several courses dealing with the power electronics field, covering the topics of converters, motor drives, and power devices, with possibly additional advanced courses in these areas as well. There may also be more traditional power-area courses in energy conversion, machines, and power systems. In the breadth vs. depth tradeoff, it no longer makes sense for one textbook to attempt to cover all of these courses; indeed, each course should ideally employ a dedicated textbook. This text is intended for use in introductory power electronics courses on converters, taught at the senior or first-year graduate level. There is sufficient material for a one year course or, at a faster pace with some material omitted, for two quarters or one semester. The first class on converters has been called a way of enticing control and electronics students into the power area via the "back door". The power electronics field is quite broad, and includes fundamentals in the areas of • Converter circuits and electronics • Control systems • Magnetics • Power applications • Design-oriented analysis This wide variety of areas is one of the things which makes the field so interesting and appealing to newcomers. This breadth also makes teaching the field a challenging undertaking, because one cannot assume that all students enrolled in the class have solid prerequisite knowledge in so many areas.

**Modeling, Control, Estimation, and Optimization for Microgrids** John Wiley & Sons

A comprehensive guide to understanding AC machines with exhaustive simulation models to practice design and control Nearly seventy percent of the electricity generated worldwide is used by electrical motors. Worldwide, huge research efforts are being made to develop commercially viable three- and multi-phase motor drive systems that are economically and technically feasible. Focusing on the most popular AC machines used in industry – induction machine and permanent magnet synchronous machine – this book illustrates advanced control techniques and topologies in practice and recently deployed. Examples are drawn from important techniques including Vector Control, Direct Torque Control, Nonlinear Control, Predictive Control, multi-phase drives and multilevel inverters. Key features include: systematic coverage of the advanced concepts of AC motor drives with and without output filter; discussion on the modelling, analysis and control of three- and multi-phase AC machine drives, including the recently developed multi-phase-phase drive system and double fed induction machine; description of model predictive control applied to power converters and AC drives, illustrated together with their simulation models; end-of-chapter questions, with answers and PowerPoint slides available on the companion website [www.wiley.com/go/aburub\\_control](http://www.wiley.com/go/aburub_control) This book integrates a diverse range of topics into one useful volume, including most the latest developments. It provides an effective guideline for students and professionals on many vital electric drives aspects. It is an advanced textbook for final year undergraduate and graduate students, and researchers in power electronics, electric drives and motor control. It is also a handy tool for specialists and practicing engineers wanting to develop and verify their own algorithms and techniques.

**High Performance Control of AC Drives with Matlab/Simulink** CRC Press

DESIGN OF THREE-PHASE AC POWER ELECTRONICS CONVERTERS Comprehensive resource on design of power electronics converters for three-phase AC applications Design of Three-phase AC Power Electronics Converters contains a systematic discussion of the three-phase AC converter design considering various electrical, thermal, and mechanical subsystems and functions. Focusing on establishing converter components and subsystems models needed for the design, the text demonstrates example designs for these subsystems and for the whole three-phase AC converters considering interactions among subsystems. The design methods apply to different applications and topologies. The text presents the basics of the three-phase AC converter, its design, and the goal and organization of the book, focusing on the characteristics and models important to the converter design for components commonly used in three-phase AC converters. The authors present the design of subsystems, including passive rectifiers, inverters and active rectifiers, electromagnetic interference (EMI) filters, thermal management system, control and auxiliaries, mechanical system, and application considerations, and discuss design optimization, which presents methodology to achieve optimal design results for three-phase AC converters. Specific sample topics covered in Design of Three-phase AC Power Electronics Converters include: Models and characteristics for devices most commonly used in three-phase converters, including

conventional Si devices, and emerging SiC and GaN devices Models and selection of various capacitors; characteristics and design of magnetics using different types of magnetic cores, with a focus on inductors Optimal three-phase AC converter design including design and selection of devices, AC line inductors, DC bus capacitors, EMI filters, heatsinks, and control. The design considers both steady-state and transient conditions Load and source impact converter design, such as motors and grid condition impacts For researchers and graduate students in power electronics, along with practicing engineers working in the area of three-phase AC converters, Design of Three-phase AC Power Electronics Converters serves as an essential resource for the subject and may be used as a textbook or industry reference.

## COMPENDIUM OF NEW TECHNIQUES IN HARMONIC ANALYSIS

John Wiley & Sons

The human brain, the ultimate intelligent processor, can handle ambiguous and uncertain information adequately. The implementation of such a human-brain architecture and function is called OC brainwareOCO. Brainware is a candidate for the new tool that will realize a human-friendly computer society. As one of the LSI implementations of brainware, a OC bio-inspiredOCO hardware system is discussed in this book. Consisting of eight enriched versions of papers selected from IIZUKA '98, this volume provides wide coverage, from neuronal function devices to vision systems, chaotic systems, and also an effective design methodology of hierarchical large-scale neural systems inspired by neuroscience. It can serve as a reference for graduate students and researchers working in the field of brainware. It is also a source of inspiration for research towards the realization of a silicon brain. Contents: Neuron MOS Transistor: The Concept and Its Application (T Shibata); Adaptive Learning Neuron Integrated Circuits Using Ferroelectric-Gate FETs (S-M Yoon et al.); An AnalogOCODigital Merged Circuit Architecture Using PWM Techniques for Bio-Inspired Nonlinear Dynamical Systems (T Morie et al.); Application-Driven Design of Bio-Inspired Low-Power Vision Circuits and Systems (A KAnig et al.); Motion Detection with Bio-Inspired Analog MOS Circuits (H Yonezu et al.); cents MOS Cellular-Automaton Circuit for Picture Processing (M Ikebe & Y Amemiya); Semiconductor Chaos-Generating Elements of Simple Structure and Their Integration (K Hoh et al.); Computation in Single Neuron with Dendritic Trees (N Katayama et al.). Readership: Graduate students, researchers and industrialists in artificial intelligence, neural networks, machine perception, computer vision, pattern/handwriting recognition, image analysis and biocomputing."

## AC TO AC CONVERTERS

John Wiley & Sons

The 8051 architecture developed by Intel has proved to be the most popular and enduring type of microcontroller, available from many manufacturers and widely used for industrial applications and embedded systems as well as being a versatile and economical option for design prototyping, educational use and other project work. In this book the authors introduce the fundamentals and capabilities of the 8051, then put them to use through practical exercises and project work. The result is a highly practical learning experience that will help a wide range of engineers and students to get through the steepest part of the learning curve and become proficient and productive designing with the 8051. The text is also supported by practical examples, summaries and knowledge-check questions. The latest developments in the 8051 family are also covered in this book, with chapters covering flash memory devices and 16-bit microcontrollers. Dave Calcutt, Fred Cowan and Hassan Parchizadeh are all experienced authors and lecturers at the University of Portsmouth, UK. Increase design productivity quickly with 8051 family microcontrollers Unlock the potential of the latest 8051 technology: flash memory devices and16-bit chips Self-paced learning for electronic designers, technicians and students

## PRACTICAL JAVA PROGRAMMING FOR IOT, AI, AND BLOCKCHAIN

Academic Press

This book is the result of the extensive experience the authors gained through their year-long occupation at the Faculty of Electrical Engineering at the University of Banja Luka. Starting at the fundamental basics of electrical engineering, the book guides the reader into this field and covers all the relevant types of converters and regulators. Understanding is enhanced by the given examples, exercises and solutions. Thus this book can be used as a textbook for students, for self-study or as a reference book for professionals.

*Microcontrollers* CRC Press

The only method of circuit analysis known to most engineers and students is nodal or loop analysis. Although this works well for obtaining numerical solutions, it is almost useless for obtaining analytical solutions in all but the simplest cases. In this unusual 2002 book, Vorpérian describes remarkable alternative techniques to solve, almost by inspection, complicated linear circuits in symbolic form and obtain meaningful analytical answers for any transfer function or impedance. Although not intended to replace traditional computer-based methods, these techniques provide engineers with a powerful set of tools for tackling circuit design problems. They also have great value in enhancing students' understanding of circuit operation, making this an ideal course book, and numerous problems and worked examples are included. Originally developed by Professor David Middlebrook and others at Caltech (California Institute of Technology), the techniques described here are now widely taught at institutions and companies around the world.

## ADVANCED PULSE-WIDTH-MODULATION: WITH FREEDOM TO OPTIMIZE POWER ELECTRONICS CONVERTERS

John Wiley & Sons

A voltage converter changes the voltage of an electrical power source and is usually combined with other components to create a power supply. This title is devoted to the control of static converters, which deals with pulse-width modulation (PWM) techniques, and also discusses methods for current control. Various application cases are treated. The book is ideal for professionals in power engineering, power electronics, and electric drives industries, as well as practicing engineers, university professors, postdoctoral fellows, and graduate students.

**Control of Power Electronic Converters with Microgrid Applications** Walter de Gruyter GmbH & Co KG

Motor control technology continues to play a vital role in the initiative to eliminate or at least decrease petroleum dependency and greenhouse gas emissions around the world. Increased motor efficiency is a crucial aspect of this science in the global transition to clean power use in areas such as industrial applications and home appliances—but particularly in the design of vehicles. Summarizes the evolution of motor driving units toward high efficiency, low cost, high power density, and flexible interface with other components AC Motor Control and Electric Vehicle Applications addresses the topics mentioned in its title but also elaborates on motor design perspective, such as back EMF harmonics, loss, flux saturation, and reluctance torque, etc. Maintaining theoretical integrity in AC motor modeling and control throughout, the author focuses on the benefits and simplicity of the rotor field-oriented control, describing the basics of PWM, inverter, and sensors. He also clarifies the fundamentals of electric vehicles and their associated dynamics, motor issues, and battery limits. A powerful compendium of practical information, this book serves as an overall useful tool for the design and control of high-efficiency motors.

## POWER MANAGEMENT TECHNIQUES FOR INTEGRATED CIRCUIT DESIGN

Springer

Master BeagleBone programming by doing simple electronics and Internet of Things projects About This Book Quickly develop electronics projects that interact with Internet applications using JavaScript and Python Learn about electronics components such as sensors and motors, and how to communicate with them by writing programs A step-by-step guide to explore the exciting world of BeagleBone—from connecting BeagleBone to doing electronics projects and creating IoT applications Who This Book Is For If you want to learn programming on embedded systems with BeagleBone by doing simple electronics projects, this book is for you. This book is also helpful to BeagleBone owners who want to quickly implement small-scale home automation solutions. It is assumed that you have familiarity with C and Python programming. Some familiarity with electronics is helpful but not essential. What You Will Learn Connect your BeagleBone to a computer in different ways and get the Cloud9 IDE running to quick-start programming on the BeagleBone Get to know about BeagleBone extension pins such as GPIO and how to connect various electronics components with BeagleBone Read and write to various electronics components such as LED, Push-button, sensors, and motors Grasp in-depth theory on Analog, PWM, and BUS programming and the electronics components used in programs Handle data to and from various BUS supporting modules such as UART, I2C, and SPI using the Adafruit BBIO Python library Write real-life IoT applications in JavaScript and Python such as shooting an e-mail on

overheat and controlling a servo motor remotely Make use of online free cloud services to store and analyze sensor data collected on the BeagleBone Discover what else can be done using the BeagleBone Get to grips with embedded system BUS communication In Detail The whole world is moving from desktop computers to smartphones and embedded systems. We are moving towards utilizing Internet of Things (IoT). An exponential rise in the demand for embedded systems and programming in the last few years is driving programmers to use embedded development boards such as Beaglebone. BeagleBone is an ultra-small, cost-effective computer that comes with a powerful hardware. It runs a full-fledged Debian Linux OS and provides numerous electronics solutions. BeagleBone is open source and comes with an Ethernet port, which allows you to deploy IoT projects without any additions to the board. It provides plenty of GPIO, Analog pins, and UART, I2C, SPI pins which makes it the right choice to perform electronics projects. This gives you all the benefits of Linux kernel such as multitasking, multiusers, and extensive device driver support. This allows you to do programming in many languages including high-level languages such as JavaScript and Python. This book aims to exploit the hardware and software capabilities of BeagleBone to create real-life electronics and IoT applications quickly. It is divided into two parts. The first part covers JavaScript programs. The second part provides electronics projects and IoT applications in Python. First, you will learn to use BeagleBone as tool to write useful applications on embedded systems. Starting with the basics needed to set up BeagleBone and the Cloud9 IDE, this book covers interfacing with various electronics components via simple programs. The electronics theory related to these components is then explained in depth before you use them in a program. Finally, the book helps you create some real-life IoT applications. Style and approach An easy-to-follow guide full of real-world electronics programs and quick troubleshooting tips using BeagleBone. All the required electronics concepts are explained in detail before using them in a program and all programs are explained in depth. Most of the theory is covered in the first part; while the second part gives you some quick programs.

[DSP-Based Electromechanical Motion Control](#) Springer Science & Business Media

A comprehensive guide to approaches to decoding, synthesizing and modeling pulse width modulation (PWM) converters Origin of Power Converters explores the original converter and

provides a systematic examination of the development and modeling of power converters based on decoding and synthesizing approaches. The authors—noted experts on the topic—present an introduction to the origins of the converter and detail the fundamentals related to power the converter's evolution. They cover a range of converter synthesis approaches, synthesis of multi-stage/multi-level converters, extension of hard-switching converters to soft-switching ones, and determination of switch-voltage stresses in the converters. In later chapters, this comprehensive resource reviews conventional two-port network theory and the state-space averaged (SSA) modeling approach, from which systematic modeling approaches are based on the graft switch technique. In addition, the book reviews the converter layer scheme and some fundamental circuit theories. This important book: • Contains a review of several typical transfer codes, such as step-down, step-up, step-up&down, and  $\pm$  step-up&down • Describes the syntheses of pulse width modulation (PWM) converters such as voltage-fed z-source, current-fed z-source, quasi z-source, switched capacitor, and switched inductor converters • Presents two application examples based on previously proposed modeling approaches Written for academic researchers, graduate students, and seniors in power electronics, Origin of Power Converters provides a comprehensive understanding of the evolution of the converter and its applications.

[High Performance Control of AC Drives with Matlab / Simulink Models](#) Lulu.com

Induction motors are the most important workhorses in industry. They are mostly used as constant-speed drives when fed from a voltage source of fixed frequency. Advent of advanced power electronic converters and powerful digital signal processors, however, has made possible the development of high performance, adjustable speed AC motor drives. This book aims to explore new areas of induction motor control based on artificial intelligence (AI) techniques in order to make the controller less sensitive to parameter changes. Selected AI techniques are applied for different induction motor control strategies. The book presents a practical computer simulation model of the induction motor that could be used for studying various induction motor drive operations. The control strategies explored include expert-system-based acceleration control, hybrid-fuzzy/PI two-stage control, neural-network-based direct self control, and genetic algorithm based extended Kalman filter for rotor speed estimation. There are also chapters on neural-network-based parameter estimation, genetic-algorithm-based optimized random PWM strategy,

and experimental investigations. A chapter is provided as a primer for readers to get started with simulation studies on various AI techniques. Presents major artificial intelligence techniques to induction motor drives Uses a practical simulation approach to get interested readers started on drive development Authored by experienced scientists with over 20 years of experience in the field Provides numerous examples and the latest research results Simulation programs available from the book's Companion Website This book will be invaluable to graduate students and research engineers who specialize in electric motor drives, electric vehicles, and electric ship propulsion. Graduate students in intelligent control, applied electric motion, and energy, as well as engineers in industrial electronics, automation, and electrical transportation, will also find this book helpful. Simulation materials available for download at [www.wiley.com/go/chanmotor](http://www.wiley.com/go/chanmotor)

### REAL-TIME SIMULATION AND HARDWARE-IN-THE-LOOP TESTING USING TYPHOON HIL

CRC Press

Provides comprehensive coverage of the basic principles and methods of electric power conversion and the latest developments in the field This book constitutes a comprehensive overview of the modern power electronics. Various semiconductor power switches are described, complementary components and systems are presented, and power electronic converters that process power for a variety of applications are explained in detail. This third edition updates all chapters, including new concepts in modern power electronics. New to this edition is extended coverage of matrix converters, multilevel inverters, and applications of the Z-source in cascaded power converters. The book is accompanied by a website hosting an instructor's manual, a PowerPoint presentation, and a set of PSpice files for simulation of a variety of power electronic converters. Introduction to Modern Power Electronics, Third Edition: Discusses power conversion types: ac-to-dc, ac-to-ac, dc-to-dc, and dc-to-ac Reviews advanced control methods used in today's power electronic converters Includes an extensive body of examples, exercises, computer assignments, and simulations Introduction to Modern Power Electronics, Third Edition is written for undergraduate and graduate engineering students interested in modern power electronics and renewable energy systems. The book can also serve as a reference tool for practicing electrical and industrial engineers.

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