



Christos Christodoulou
Michael Georgiopoulos

Applications *of Neural* Networks *in* **Electromagnetics**

Applications Of Neural Networks In Electromagnetics

Artech House Antennas And Propagation Library

Paul R.P. Hoole

Applications Of Neural Networks In Electromagnetics Artech House Antennas And Propagation Library:

Applications of Neural Networks in Electromagnetics Christos Christodoulou, Michael Georgopoulos, 2001 The high speed capabilities and learning abilities of neural networks can be applied to quickly solving numerous complex optimization problems in electromagnetics and this book shows you how Even if you have no background in neural networks this book helps you understand the basics of each main network architecture in use today including its strengths and limitations Moreover it gives you the knowledge you need to identify situations when the use of neural networks is the best problem solving option

Mobile Antenna Systems Handbook Kyōhei Fujimoto, 2001 This is an extensively revised and updated new edition of the best selling Mobile Antenna Systems Handbook Comprehensive authoritative and practical it provides the information you need to understand the relationship between the elements involved in antenna systems design for mobile communications You get sound advice in choosing the appropriate antenna for any given requirement including antennas for ITS access to the latest modeling formulas for macro micro and pico cell propagation and guidance on the latest RF safety standards and measurement techniques

Engineering Applications of the Modulated Scatterer Technique Jean-Charles Bolomey, Fred E. Gardiol, 2001 Due to the spectacular growth of electronic systems and the steady demand for new services with increased functionality the development of more efficient measurement techniques has become of paramount importance This practical resource details the cutting edge Modulated Scatterer Technique which offers a low invasive and rapid method for testing and measuring systems and equipment used in a wide range of electronic engineering applications Extensively referenced with 125 illustrations and 100 equations

Advanced Computational Electromagnetic Methods Wenhua Yu, Wenxing Li, Atef Elsherbeni, Yahya Rahmat-Samii, 2015-03-01 This new resource covers the latest developments in computational electromagnetic methods with emphasis on cutting edge applications This book is designed to extend existing literature to the latest development in computational electromagnetic methods which are of interest to readers in both academic and industrial areas The topics include advanced techniques in MoM FEM and FDTD spectral domain method GPU and Phi hardware acceleration metamaterials frequency and time domain integral equations and statistics methods in bio electromagnetics

Electromagnetic Modeling of Composite Metallic and Dielectric Structures Branko M. Kolundžija, Branko M. Kolundžija, A. R. Djordjević, 2002 Annotation This practical new book provides a much wider choice of analytical solutions to problems faced by antenna design engineers and researchers working in electromagnetic modeling Based on leading edge method of moments procedures the book presents new theories and techniques that help professionals optimize computer performance in numerical analysis of composite metallic and dielectric structures in the complex frequency domain For the first time comparisons and new combinations of techniques bring the elements of flexibility ease of implementation accuracy and efficiency into clear focus for all practitioners

Switched Parasitic Antennas for Cellular Communications David V. Thiel, Stephanie Smith, 2002 Presenting information typically not found in

other books the authors explore the numerous advantages of these antennas including high speed signal acquisition fixed input impedance low loss and small footprint Professionals find practical design examples strategies and optimization methods for designing economical switched parasitic antennas for applications such as direction finding and multibeam communications systems Cutting edge technologies and applications such as MEMs RF switches are also discussed

Adaptive Array Measurements in Communications M. A. Halim,2001 One of the most damaging factors associated with any radio communication system is the effect of undesirable or interference signals This innovative new book gives you the knowledge you need to ensure your adaptive array system is protecting your communication links to the fullest It presents concepts and procedures that help you realize the maximum processing capabilities of a given system choose the right system for a specific application and identify precautionary steps to avoid adverse effects

Dielectric Resonator

Antenna Handbook Aldo Petosa,2007 Today more and more antenna engineers are viewing the Dielectric Resonator Antenna DRA as a preferable alternative to conventional low gain designs because of several attractive features including high radiation light weight small size and low profile This practical resource presents complete up to date details on DRAs in a single volume The book provides professionals with clear guidance on the mode of operation and radiation behavior of DRAs the main methods of excitation and the major advances in DRA technology This hands on reference equips engineers with simple equations and graphs that help them rapidly design DRAs without the need for complex analytical or numerical calculations Numerous design examples are included to give practitioners a sense of the versatility that DRAs afford

Problem Solving in Electromagnetics, Microwave Circuit, and Antenna Design for Communications Engineering Karl F. Warnick,Peter Russer,2006 Presenting a wide range of real world electromagnetics problems this one of a kind resource offers professionals and students complete step by step solutions to the most critical challenges relating to antenna and microwave circuit design The book serves as a practical standalone reference or as a perfect complement to the text Electromagnetics Microwave Circuit and Antenna Design for Communications Engineering Second Edition by Peter Russer Artech House 2006 Readers find in depth coverage of the concepts methods and theorems they need to understand to effectively tackle critical problems in the field Including numerous graphical illustrations and simplifying mathematical computations the book offers a deep and intuitive understanding of the subject

Influences of Road Surface

Characteristics on Scattering Mechanisms in Automotive Radar Vera Maria Kurz, In dieser Arbeit wird der Einfluss von Stra enoberfl chen und materialien auf die Radar Streuung im automotiven Frequenzband von 77GHz untersucht Sie umfasst alle blicherweise auf deutschen Autobahnen verbauten Asphalt und Betontypen und unterscheidet zwischen spiegelnder und diffuser Reflektion deren bergang durch das Rayleigh Kriterium und dem resultierenden kritischen Winkel definiert wird Hierf r werden verschiedene Messmethoden angewendet Diese sind die Sandfleckmethode die Focus beam Methode ein Messausbau mit Radar mit synthetischer Apertur SAR und Freiraum FMCW Radar Messungen die einen

Radarspiegel nutzen für eine mathematische Beschreibung werden einerseits Wahrscheinlichkeitsdichtefunktionen PDF der Reflexion mit Normalverteilung und Rayleigh Verteilung ermittelt. Um andererseits die Freiraummessungen zu verarbeiten werden Radargleichung und Fresnels Gleichungen genutzt, wodurch Werte für die relative Permittivität und die dazugehörige Rauigkeit berechnet werden, welche in der freizugängigen Datenbank OpenMATERIAL zu Verfügung stehen. Zur Validierung dienen Referenzobjekte und Messungen mit unterschiedlichen Polarisationen der Radarsensoren. In this work the influence of different road surfaces and materials or more precisely of different asphalt and concrete surfaces is analyzed for the automotive 77GHz band. It comprises all roads commonly found on German highways and distinguishes in specular reflection and diffuse scattering behavior. The changeover from one to the other behavior is determined by the Rayleigh criterion resulting in corresponding critical angles. For these measurements the area of sands method, the focus beam method, a synthetic aperture radar SAR setup as well as a openspace FMCW radar setup with a corner reflector are applied. The characterization includes probability density functions PDF of the reflectance of these dielectric surfaces using normal distribution as well as Rayleigh distribution. For the evaluation of the openspace measurements the radar equation and Fresnel's equations are used resulting in relative permittivity and roughness values which are provided as well in an open source material library named OpenMATERIAL. For validation purposes reference samples and measurements with different polarization of the radar sensor are used.

The British National Bibliography Arthur James Wells, 2001 **Whitaker's Books in Print**, 1998

Antenna Design for Cognitive Radio Youssef Tawk, Joseph Costantine, Christos Christodoulou, 2016-06-30. This one of a kind new resource presents cognitive radio from an antenna design perspective and introduces the concept of cognitive radio as a protocol that benefits from underutilized regions of the spectrum. This book covers topics that govern the operation of a cognitive radio and discusses the use of reconfigurable antennas, reconfigurable filtennas and MIMO antennas for cognitive radio. The analysis and design of different antenna systems are presented, compared and evaluated. New approaches to improve spectrum efficiency are explored by demonstrating how to design software controlled cognitive radio antenna systems. This new resource shows how to communicate using either interweave or underlay cognitive radio and demonstrates the benefits of designing appropriate sensing and communicating antennas. The first part of the book introduces the basic concept of cognitive radio and discusses the difference between cognitive radio and software defined radio from the RF system's perspective. The second part of the book discusses the main antenna design requirements, procedures and challenges for cognitive radio. The third part of the book introduces new trends in cognitive radio implementation such as the implementation of MIMO antennas on cognitive radio, the use of machine learning techniques to optimize the performance of a cognitive radio environment and the implementation of cognitive radar and cognitive radio in space.

Neural Networks for RF and Microwave Design Q. J. Zhang, K. C. Gupta, Kuldip C. Gupta, 2000. Discover the new unconventional alternatives for conquering RF and microwave design and modeling problems.

using neural networks information processing systems that can learn generalize and even allow model development when component formulas are missing with this book and software package It shows you the ease of creating models with neural networks and how quick model evaluation can be done plus other opportunities presented by neural networks for conquering the toughest RF and microwave CAD problems

Smart Antennas and Electromagnetic Signal Processing in

Advanced Wireless Technology

Paul R.P. Hoole,2022-09-01 The book addresses the current demand for a scientific approach to advanced wireless technology and its future developments It gives a clear presentation of both antennas and adaptive signal processing which is what makes antennas powerful maneuverable and necessary for advanced wireless technology The book presents electromagnetic signal processing techniques that both control the antenna beam and track the moving station which is required for effective fast dynamic beamforming The first part of the book presents a comprehensive description and analysis of basic antenna theory starting from short dipole antennas to array antennas This section also includes important concepts related to antenna parameters electromagnetic wave propagation the Friis equation the radar equation and wave reflection and transmission through media The second part of the book focuses on smart antennas commencing from a look at the traditional approach to beamforming before getting into the details of smart antennas Complete derivation and description of the techniques for electromagnetic field signal processing techniques for adaptive beamforming are also presented Artificial Intelligence AI driven beamforming is presented using computationally fast and low memory demanding technique for AI beamforming is presented with the different excitation functions available A novel method for fast low memory and accurate maneuverable single beam generation is presented as well as other methods for beamforming with fewer elements along with a simple method for tracking the mobile antenna and station In this section for completeness the use of antenna signal processing for synthetic aperture techniques for imaging is also presented specifically the Inverse Synthetic Aperture Imaging technique The third part of the book presents technological aspects of advanced wireless technology including the 5G wireless system and the various devices needed to construct it While the books main emphasis is theoretical understanding and design it includes applications and legal matters are also presented

Smart Electromagnetic Structures: The Neural Antenna

,1993 Smart electromagnetic structures SEMS are defined as structures capable of interacting with their surrounding electromagnetic fields and either influencing the field or sensing and adapting to its presence A structure is smart when it integrates sensing elements e g antennas processing elements neural networks and control elements diodes autonomously SEMS provide an adaptive electromagnetic EM environment for the structure on which they are mounted The ability to adapt derives from the closed loop nature of the SEMS The speed of adaptation is determined by the speed of the loop Which is set by the computational elements Our experiments have shown the time required for a response is about fifteen gate delays The integration of artificial neural processors with tuneable antennas was proposed several years ago by our group We have studied this synergy over the past

three years The control of the operating frequency of a microstrip patch antenna has been demonstrated We believe that ours is a unique program offering great potential for payoff in the area of electromagnetic smart skins Our main goal in this program was to determine the feasibility of a neural network controlled antenna and to quantify the ability of the antenna and the NN to learn to tune automatically to the center frequency of a received signal We have achieved these goals and spun off neural networks that have application of radar and communications systems Because of its self adaptability the closed loop neural control of an antenna element provides the potential for design of an easily manufacturable antenna which is immune to typical siting problems and is tolerant to moderate external damage Artificial neural networks Antennas Electromagnetics closed loop systems Neural antennas Smart materials

Special Issue on Neural Network

Applications in Electromagnetics Christos G. Christodoulou,2003 *Automated Electromagnetic Antenna Synthesis Using Neural Networks and the Finite Difference Time Domain* Heriberto Jose Delgado,2003 *Smart Antennas and Electromagnetic Signal Processing in Advanced Wireless Technology* Paul R. P. Hoole,2020 *Neural Networks as a Numerical Tool to Solve the Electromagnetic Field in an Enclosed Space* Albert Herrero Parareda,2020 I am responsible for the formulation of preprocessing functions to enhance the efficiency of the simulations made by an Artificial Neural Network of the Electromagnetic Field emitted by a Dipole Antenna in a closed room ideally a clean room and then evolve towards the grounds of an enclosed factory The goal is to optimize the position of the antenna to obtain the strongest Received Signal Strength RSS with maximum efficiency both in computational and human costs

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