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Cognitive Radio Networks Apr 02 2023 While still in the early stages of research and development, cognitive radio is a highly promising communications paradigm with the ability to effectively address the spectrum insufficiency problem. Written by those pioneering the field, *Cognitive Radio Networks: Architectures, Protocols, and Standards* offers a complete view of cognitive radio—including introductory concepts, fundamental techniques, regulations, standards, system implementations, and recent developments. From the physical layer to protocol layer, world-class editors provide comprehensive technical and regulatory guidance across cognitive radio, dynamic spectrum access, and cognitive wireless networks. The book examines routing, Medium Access Control (MAC), cooperation schemes, resource management, mobility, and game theory approach. Organized into three sections for ease of reference: Introduces and addresses the issues in the physical layer, including sensing, capacity, and power control Examines issues in the protocol layers and supplies practical solutions Explores applications, including cognitive radio systems Complete with illustrative figures that allow for complete cross-referencing, this authoritative reference provides readers with the understanding of the fundamental concepts, principles, and framework of cognitive wireless systems needed to initiate the development of future-generation wireless systems and networks.

Cognitive Radio System, Resource Allocation Apparatus Thereof and Method Therefor Nov 04 2020 Disclosed is a cognitive radio system, resource allocation apparatus thereof and method therefor. A resource allocation apparatus comprises: a transmission opportunity assessment device which is used to assess availabilities of transmission opportunities in radio resources of a primary communication system; a vector production device which is used to set a transmission opportunity selection vector for each secondary user in the cognitive radio system based on assessment results of the availabilities of transmission opportunities, wherein the transmission opportunity selection vector includes information for identifying multiple transmission opportunities assessed available; and a sending device which is used to distribute the transmission opportunity selection vector to the secondary user.

Advances in Cognitive Radio Systems Jan 31 2023 Cognitive radio technologies are forms of wireless communication with many and varied applications. The contributions in this book will benefit researchers and engineers as they offer cutting-edge knowledge in the field. Subjects include uses of wideband voltage controlled oscillators, control planes for spectrum access and mobility in networks with heterogeneous frequency devices. Other chapters cover cognitive media access control and measurement methods for spectrum occupancy. In addition, there are contributions on delay analysis and channel selection in single-hop networks for delay-sensitive applications, the application of transmission security (TRANSEC) protocols to cognitive radio communication and the use of blind detection, parameters, estimation and the despreading of DS-CDMA signals in multirate, multiuser cognitive radio systems.

Cognitive Communication and Cooperative HetNet Coexistence Oct 16 2021 This book, written by experts from universities and major industrial research laboratories, is devoted to the very hot topic of cognitive radio and networking for cooperative coexistence of heterogeneous wireless networks. Selected highly relevant advanced research is presented on spectrum sensing and progress toward the realization of accurate radio environment mapping, biomimetic learning for self-organizing networks, security threats (with a special focus on primary user emulation attack), and cognition as a tool for green next-generation networks. The research activities covered include work undertaken within the framework of the European COST Action IC0902, which is geared towards the definition of a European platform for cognitive radio and networks. Communications engineers, R&D engineers, researchers, and students will all benefit from this complete reference on recent advances in wireless communications and the design and implementation of cognitive radio systems and networks.

MIMO Systems Sep 14 2021 In recent years, it was realized that the MIMO communication systems seems to be inevitable in accelerated evolution of high data rates applications due to their potential to

dramatically increase the spectral efficiency and simultaneously sending individual information to the corresponding users in wireless systems. This book, intends to provide highlights of the current research topics in the field of MIMO system, to offer a snapshot of the recent advances and major issues faced today by the researchers in the MIMO related areas. The book is written by specialists working in universities and research centers all over the world to cover the fundamental principles and main advanced topics on high data rates wireless communications systems over MIMO channels. Moreover, the book has the advantage of providing a collection of applications that are completely independent and self-contained; thus, the interested reader can choose any chapter and skip to another without losing continuity.

Cognitive Radio Communication and Networking Apr 21 2022 The author presents a unified treatment of this highly interdisciplinary topic to help define the notion of cognitive radio. The book begins with addressing issues such as the fundamental system concept and basic mathematical tools such as spectrum sensing and machine learning, before moving on to more advanced concepts and discussions about the future of cognitive radio. From the fundamentals in spectrum sensing to the applications of cognitive algorithms to radio communications, and discussion of radio platforms and testbeds to show the applicability of the theory to practice, the author aims to provide an introduction to a fast moving topic for students and researchers seeking to develop a thorough understanding of cognitive radio networks. Examines basic mathematical tools before moving on to more advanced concepts and discussions about the future of cognitive radio Describe the fundamentals of cognitive radio, providing a step by step treatment of the topics to enable progressive learning Includes questions, exercises and suggestions for extra reading at the end of each chapter Topics covered in the book include: Spectrum Sensing: Basic Techniques; Cooperative Spectrum Sensing Wideband Spectrum Sensing; Agile Transmission Techniques: Orthogonal Frequency Division Multiplexing Multiple Input Multiple Output for Cognitive Radio; Convex Optimization for Cognitive Radio; Cognitive Core (I): Algorithms for Reasoning and Learning; Cognitive Core (II): Game Theory; Cognitive Radio Network IEEE 802.22: The First Cognitive Radio Wireless Regional Area Network Standard, and Radio Platforms and Testbeds.

Cognitive Radio Technology Jul 25 2022 Cognitive radio technology is a smarter, faster, and more efficient way to transmit information to and from fixed, mobile, other wireless communication devices. Cognitive radio builds upon software-defined radio technology. A cognitive radio system is 'aware' of its operating environment and automatically adjusts itself to maintain desired communications—it's like having a trained operator 'inside' the radio making constant adjustments for maximum performance. Operating frequency, power output, antenna orientation/beamwidth, modulation, and transmitter bandwidth are just a few of the operating parameters that can automatically be adjusted "on the fly in a cognitive radio system. Fette has constructed a cutting-edge volume that hits all of the important issues including research, management, and support. Cognitive techniques will be discussed such as position and network awareness, infrastructure and physical and link layer concerns. Though still a nascent technology, cognitive radio is being pushed by the US military and for mission-critical civilian communications (such as emergency and public safety services). *The first book on a revolutionary technology that will be critical to military, emergency, and public safety communications *A multi-contributed volume written by the leaders in this exciting new area *Describes the location-determination capabilities of cognitive radio (the precise location of all units in a cognitive radio network can be determined in real time)

Intelligent Spectrum Handovers in Cognitive Radio Networks Dec 26 2019 This book highlights the need for an efficient Handover Decision (HD) mechanism to perform switches from one network to another and to provide unified and continuous mobile services that include seamless connectivity and ubiquitous service access. The author shows how the HD involves efficiently combining handover initiation and network selection process. The author describes how the network selection decision is a challenging task that is a central component to making HD for any mobile user in a heterogeneous environment that involves

a number of static and dynamic parameters. The author also discusses prevailing technical challenges like Dynamic Spectrum Allocation (DSA) methods, spectrum sensing, cooperative communications, cognitive network architecture protocol design, cognitive network security challenges and dynamic adaptation algorithms for cognitive system and the evolving behavior of systems in general. The book allows the reader to optimize the sensing time for maximizing the spectrum utilization, improve the lifetime of the cognitive radio network (CRN) using active scan spectrum sensing techniques, analyze energy efficiency of CRN, find a secondary user spectrum allocation, perform dynamic handovers, and use efficient data communication in the cognitive networks. Identifies energy efficient spectrum sensing techniques for Cooperative Cognitive Radio Networks (CRN); Shows how to maximize the energy capacity by minimizing the outage probability; Features end-of-chapter summaries, performance measures, and case studies.

Cognitive Networks Oct 04 2020 Cognitive networks can dynamically adapt their operational parameters in response to user needs or changing environmental conditions. They can learn from these adaptations and exploit knowledge to make future decisions. Cognitive networks are the future, and they are needed simply because they enable users to focus on things other than configuring and managing networks. Without cognitive networks, the pervasive computing vision calls for every consumer to be a network technician. The applications of cognitive networks enable the vision of pervasive computing, seamless mobility, ad-hoc networks, and dynamic spectrum allocation, among others. In detail, the authors describe the main features of cognitive networks clearly indicating that cognitive network design can be applied to any type of network, being fixed or wireless. They explain why cognitive networks promise better protection against security attacks and network intruders and how such networks will benefit the service operator as well as the consumer. Cognitive Networks Explores the state-of-the-art in cognitive networks, compiling a roadmap to future research. Covers the topic of cognitive radio including semantic aspects. Presents hot topics such as biologically-inspired networking, autonomic networking, and adaptive networking. Introduces the applications of machine learning and distributed reasoning to cognitive networks. Addresses cross-layer design and optimization. Discusses security and intrusion detection in cognitive networks. Cognitive Networks is essential reading for advanced students, researchers, as well as practitioners interested in cognitive & wireless networks, pervasive computing, distributed learning, seamless mobility, and self-governed networks. With forewords by Joseph Mitola III as well as Sudhir Dixit.

Artificial Intelligent Techniques for Wireless Communication and Networking Feb 26 2020 ARTIFICIAL INTELLIGENT TECHNIQUES FOR WIRELESS COMMUNICATION AND NETWORKING The 20 chapters address AI principles and techniques used in wireless communication and networking and outline their benefit, function, and future role in the field. Wireless communication and networking based on AI concepts and techniques are explored in this book, specifically focusing on the current research in the field by highlighting empirical results along with theoretical concepts. The possibility of applying AI mechanisms towards security aspects in the communication domain is elaborated; also explored is the application side of integrated technologies that enhance AI-based innovations, insights, intelligent predictions, cost optimization, inventory management, identification processes, classification mechanisms, cooperative spectrum sensing techniques, ad-hoc network architecture, and protocol and simulation-based environments. Audience Researchers, industry IT engineers, and graduate students working on and implementing AI-based wireless sensor networks, 5G, IoT, deep learning, reinforcement learning, and robotics in WSN, and related technologies.

Cognitive Radio Networks Jul 13 2021 Resource allocation is an important issue in wireless communication networks. In recent decades, cognitive radio-based networks have garnered increased attention and have been well studied to overcome the problem of spectrum scarcity in future wireless communications systems. Many new challenges in resource allocation appear in cognitive radio-based networks. This book focuses on effective resource allocation solutions in several important cognitive radio-based networks, including opportunistic spectrum access networks, cooperative sensing networks, cellular networks, high-speed vehicle networks, and smart grids. Cognitive radio networks are composed of cognitive, spectrum-agile devices capable of changing their configuration on the fly based on the spectral environment. This capability makes it possible to design flexible and dynamic spectrum access strategies with the purpose of opportunistically reusing portions of the spectrum temporarily vacated by licensed

primary users. Different cognitive radio-based networks focus on different network resources, such as transmission slots, sensing nodes, transmission power, white space, and sensing channels. This book introduces several innovative resource allocation schemes for different cognitive radio-based networks according to their network characteristics: Opportunistic spectrum access networks - Introduces a probabilistic slot allocation scheme to effectively allocate the transmission slots to secondary users to maximize throughput Cooperative sensing networks - Introduces a new adaptive collaboration sensing scheme in which the resources of secondary users are effectively utilized to sense the channels for efficient acquisition of spectrum opportunities Cellular networks - Introduces a framework of cognitive radio-assisted cooperation for downlink transmissions to allocate transmission modes, relay stations, and transmission power/sub-channels to secondary users to maximize throughput High-speed vehicle networks - Introduces schemes to maximize the utilized TV white space through effective allocation of white space resources to secondary users Smart grids - Introduces effective sensing channel allocation strategies for acquiring enough available spectrum channels for communications between utility and electricity consumers

Cognitive Radio Networks Nov 28 2022 Giving a basic overview of the technologies supporting cognitive radio this introductory-level text follows a logical approach, starting with the physical layer and concluding with applications and general issues. It provides a background to advances in the field of cognitive radios and a new exploration of how these radios can work together as a network. Cognitive Radio Networks starts with an introduction to the fundamentals of wireless communications, introducing technologies such as OFDM & MIMO. It moves onto cover software defined radio and explores and contrasts wireless, cooperative and cognitive networks and communications. Spectrum sensing, medium access control and network layer design are examined before the book concludes by covering the topics of trusted cognitive radio networks and spectrum management. Unique in providing a brief but clear tutorial and reference to cognitive radio networks this book is a single reference, written at the appropriate level for newcomers as well as providing an encompassing text for those with more knowledge of the subject. One of the first books to provide a systematic description of cognitive radio networks Provides pervasive background knowledge including both wireless communications and wireless networks Written by leading experts in the field Full network stack investigation

Cognitive Radio Systems Sep 26 2022 Cognitive radio is a hot research area for future wireless communications in the recent years. In order to increase the spectrum utilization, cognitive radio makes it possible for unlicensed users to access the spectrum unoccupied by licensed users. Cognitive radio let the equipments more intelligent to communicate with each other in a spectrum-aware manner and provide a new approach for the co-existence of multiple wireless systems. The goal of this book is to provide highlights of the current research topics in the field of cognitive radio systems. The book consists of 17 chapters, addressing various problems in cognitive radio systems.

Cognitive Radio Networks Jul 01 2020 This SpringerBrief presents a survey of dynamic resource allocation schemes in Cognitive Radio (CR) Systems, focusing on the spectral-efficiency and energy-efficiency in wireless networks. It also introduces a variety of dynamic resource allocation schemes for CR networks and provides a concise introduction of the landscape of CR technology. The author covers in detail the dynamic resource allocation problem for the motivations and challenges in CR systems. The Spectral- and Energy-Efficient resource allocation schemes are comprehensively investigated, including new insights into the trade-offs for operating strategies. Promising research directions on dynamic resource management for CR and the applications in other wireless communication systems are also discussed. Cognitive Radio Networks: Dynamic Resource Allocation Schemes targets computer scientists and engineers working in wireless communications. Advanced-level students in computer science and electrical engineering will also find this brief useful reading about the next generation of wireless communication.

Focus on Cognitive Radio Technology Apr 29 2020 Book & CD. Cognitive Radio (CR technology) has the potential to provide more innovative, flexible, and comprehensive use of the radio frequency spectrum, while at the same time minimising the risk of interference to other spectrum users. CRs can be developed that have the technical capability to adapt their use of the spectrum in response to information external to the radio. As a result of this technical and operational flexibility, CR technologies may also make it possible

to use spectrum that may be available in a particular geographic location or during a particular period of time and would otherwise go unused. At this time, there is not a clear boundary between CR and software defined radio (SDR) technologies. In many instances, SDR will be used as the basic platform on which to build CR technology. This book provides the first details of this new and innovative technology.

Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems May 03 2023 Today's wireless services have come a long way since the roll out of the conventional voice-centric cellular systems. The demand for wireless access in voice and high rate data multi-media applications has been increasing. New generation wireless communication systems are aimed at accommodating this demand through better resource management and improved transmission technologies. This book discusses the cognitive radio, software defined radio, and adaptive radio concepts from several perspectives.

Cognitive Radio Networks Dec 06 2020 Fueled by ongoing and increasing consumer demand, the explosive growth in spectrum-based communications continues to tax the finite resources of the available spectrum. One possible solution, Cognitive Radio Network (CRN), allows unlicensed users opportunistic access to licensed bands without interfering with existing users. Although some initial study has been conducted in this field, researchers need a systematic reference book that presents clear definitions, functions, and current challenges of the CRNs. Cognitive Radio Networks presents state-of-the-art approaches and novel technologies for cognitive wireless radio networks and sheds light on future developments in these areas. Comprising the contributions of many prominent world-wide cognitive radio researchers, this book covers all CRN essentials including spectrum sensing, spectrum handoff, spectrum sharing, and CRN routing schemes. Divided into five parts, the book addresses the physical layer, medium access control, the routing layer, cross-layer considerations and advanced topics in cognitive radio networks. The chapters also review research, management, support, and cognitive techniques such as position and network awareness, infrastructure and physical and link layer concerns. The editors of this volume are noted experts in the field of wireless networks and security. Dr. Yang Xiao's research has been supported by the U.S. National Science Foundation (NSF), U.S. Army Research, Fleet & Industrial Supply Center San Diego (FISCSD), and the University of Alabama's Research Grants Committee. Dr. Fei Hu has worked with NSF, Cisco, Lockheed Martin, Sprint, and other organizations. By bringing together the combined input of international experts, these editors have advanced the field of this nascent technology and helped to forge new paths of discovery for progressive communications possibilities.

Cognitive Dynamic Systems Jan 07 2021 A groundbreaking book from Simon Haykin, setting out the fundamental ideas and highlighting a range of future research directions.

Cognitive Wireless Communication Networks Oct 28 2022 This book provides a unified view on the state-of-the-art of cognitive radio technology. It includes a set of research and survey articles featuring the recent advances in theory and applications of cognitive radio technology for the next generation (e.g., fourth generation) wireless communication networks. The contributed articles cover both the theoretical concepts (e.g., information-theoretic analysis) and system-level implementation issues.

Cognitive Radio Engineering Sep 02 2020 This book is both a text and a reference book about cognitive radio architecture and implementation. It is intended for readers who want to design and build working cognitive radios.

Machine Learning and Cognitive Computing for Mobile Communications and Wireless Networks Jan 25 2020 Communication and network technology has witnessed recent rapid development and numerous information services and applications have been developed globally. These technologies have high impact on society and the way people are leading their lives. The advancement in technology has undoubtedly improved the quality of service and user experience yet a lot needs to be still done. Some areas that still need improvement include seamless wide-area coverage, high-capacity hot-spots, low-power massive-connections, low-latency and high-reliability and so on. Thus, it is highly desirable to develop smart technologies for communication to improve the overall services and management of wireless communication. Machine learning and cognitive computing have converged to give some groundbreaking solutions for smart machines. With these two technologies coming together, the machines can acquire the ability to reason similar to the human brain. The research area of machine learning and cognitive computing cover many fields like psychology, biology, signal processing, physics, information theory,

mathematics, and statistics that can be used effectively for topology management. Therefore, the utilization of machine learning techniques like data analytics and cognitive power will lead to better performance of communication and wireless systems.

Cooperative Cognitive Radio Networking May 23 2022 This SpringerBrief examines the active cooperation between users of Cooperative Cognitive Radio Networking (CCRN), exploring the system model, enabling techniques, and performance. The brief provides a systematic study on active cooperation between primary users and secondary users, i.e., (CCRN), followed by the discussions on research issues and challenges in designing spectrum-energy efficient CCRN. As an effort to shed light on the design of spectrum-energy efficient CCRN, they model the CCRN based on orthogonal modulation and orthogonally dual-polarized antenna (ODPA). The resource allocation issues are detailed with respect to both models, in terms of problem formulation, solution approach, and numerical results. Finally, the optimal communication strategies for both primary and secondary users to achieve spectrum-energy efficient CCRN are analyzed.

Cognitive Radio May 11 2021 Globally considered as one of the key technologies in the field of wireless communications, cognitive radio has the capability to solve the issues related to radio spectrum scarcity with the help of dynamic spectrum allocation. It discusses topics including software defined radio architecture, linear predictive coding, variance fractal compression, optimal Codec design for mobile communication system, digital modulation techniques, spectrum sensing in cognitive radio networks and orthogonal frequency division multiplexing in depth. The text is primarily written for senior undergraduate and graduate students, in learning experimental techniques, designing and implementing models in the field wireless communication.

Artificial Intelligence in Wireless Communications Mar 28 2020 This cutting-edge resource offers practical overview of cognitive radio, a paradigm for wireless communications in which a network or a wireless node changes its transmission or reception parameters. The alteration of parameters is based on the active monitoring of several factors in the external and internal radio environment. This book offers a detailed description of cognitive radio and its individual parts. Practitioners learn how the basic processing elements and their capabilities are implemented as modular components. Moreover, the book explains how each component can be developed and tested independently, before integration with the rest of the engine. Practitioners discover how cognitive radio uses artificial intelligence to achieve radio optimization. The book also provides an in-depth working example of the developed cognitive engine and an experimental scenario to help engineers understand its performance and behavior.

Cognitive Radio Techniques Aug 02 2020 Providing an in-depth treatment of the core enablers of cognitive radio technology, this unique book places emphasis on critical areas that have not been sufficiently covered in existing literature. You find expert guidance in the key enablers with respect to communications and signal processing. The book presents fundamentals, basic solutions, detailed discussions of important enabler issues, and advanced algorithms to save you time with your projects in the field. For the first time in any book, you find an adequately detailed treatment of spectrum sensing that covers nearly every aspect of the subject. Moreover, this valuable resource provides you with thorough working knowledge of localization and interference mitigation as enablers of cognitive radio technology. The book includes all the necessary mathematics, statistical and probabilistic treatments, and performance analysis to give you a comprehensive understanding of the material.

Spectrum Sensing for Cognitive Radio May 30 2020 This comprehensive reference text discusses concepts of cognitive radio and the advances in the field of spectrum sensing. This text discusses the concept of cognitive radio for next generation wireless communication and a very critical aspect of cognitive radio - that is, spectrum sensing - in detail. It covers important topics including narrowband spectrum sensing, wideband spectrum sensing, cooperative spectrum sensing, system and channel models, detection algorithms, approximation of decision statistics, and theoretical analysis of detection algorithms in detail. Separate chapters are dedicated to discussing the analysis and use of detection algorithms for narrowband spectrum sensing, wideband spectrum sensing, and cooperative wideband spectrum sensing. Aimed at graduate students and academic researchers in the fields of electrical engineering and electronics and communication engineering, this text: Discusses concepts of cognitive radio and research in spectrum sensing. Presents mathematical analysis of algorithms considering practical environment. Explains novel

wideband spectrum sensing algorithms with detailed analysis. Provides mathematical derivations to help readers. Discusses basic spectrum sensing algorithms, from narrowband spectrum sensing to the more advanced wideband spectrum sensing.

Spectrum Sharing in Cognitive Radio Networks Dec 30 2022 This book discusses the use of the spectrum sharing techniques in cognitive radio technology, in order to address the problem of spectrum scarcity for future wireless communications. The authors describe a cognitive radio medium access control (MAC) protocol, with which throughput maximization has been achieved. The discussion also includes use of this MAC protocol for imperfect sensing scenarios and its effect on the performance of cognitive radio systems. The authors also discuss how energy efficiency has been maximized in this system, by applying a simple algorithm for optimizing the transmit power of the cognitive user. The study about the channel fading in the cognitive user and licensed user and power adaptation policy in this scenario under peak transmit power and interference power constraint is also present in this book.

Cognitive Radio Systems Jun 11 2021 Cognitive radio is a hot research area for future wireless communications in the recent years. In order to increase the spectrum utilization, cognitive radio makes it possible for unlicensed users to access the spectrum unoccupied by licensed users. Cognitive radio let the equipments more intelligent to communicate with each other in a spectrum-aware manner and provide a new approach for the co-existence of multiple wireless systems. The goal of this book is to provide highlights of the current research topics in the field of cognitive radio systems. The book consists of 17 chapters, addressing various problems in cognitive radio systems.

Handbook of Cognitive Radio Dec 18 2021 This major reference work provides the most up-to-date research advances and theories in cognitive radio technology, from cognitive radio principles and theory to cognitive radio standards and systems, from fundamental limits of cognitive radio channels to cognitive radio networks, from the current cognitive radio practices and examples to future 5G cognitive cellular networks. This handbook will include some emerging applications of cognitive radio in areas such as smart grid, internet-of-things, big data, small cell/heterogeneous networks, and in 5G. The potential readers include postgraduate students, academic staff, telecommunications engineering, spectrum policy makers, and industry entrepreneurs.

Cognitive Radio Networks Aug 26 2022 This book gives a comprehensive overview of the medium access control (MAC) principles in cognitive radio networks, with a specific focus on how such MAC principles enable different wireless systems to coexist in the same spectrum band and carry out spectrum sharing. From algorithm design to the latest developments in the standards and spectrum policy, readers will benefit from leading-edge knowledge of how cognitive radio systems coexist and share spectrum resources. Coverage includes cognitive radio rendezvous, spectrum sharing, channel allocation, coexistence in TV white space, and coexistence of heterogeneous wireless systems.

Sensing Techniques for Next Generation Cognitive Radio Networks Feb 17 2022 The inadequate use of wireless spectrum resources has recently motivated researchers and practitioners to look for new ways to improve resource efficiency. As a result, new cognitive radio technologies have been proposed as an effective solution. Sensing Techniques for Next Generation Cognitive Radio Networks is a pivotal reference source that provides vital research on the application of spectrum sensing techniques. While highlighting topics such as radio identification, compressive sensing, and wavelet transform, this publication explores the standards and the methods of cognitive radio network architecture. This book is ideally designed for IT and network engineers, practitioners, and researchers seeking current research on radio scene analysis for cognitive radios and networks.

Fundamentals of Cognitive Radio Nov 16 2021 A comprehensive treatment of cognitive radio networks and the specialized techniques used to improve wireless communications The human brain, as exemplified by cognitive radar, cognitive radio, and cognitive computing, inspires the field of Cognitive Dynamic Systems. In particular, cognitive radio is growing at an exponential rate. Fundamentals of Cognitive Radio details different aspects of the human brain and provides examples of how it can be mimicked by cognitive dynamic systems. The text offers a communication-theoretic background, including information on resource allocation in wireless networks and the concept of robustness. The authors provide a thorough mathematical background with data on game theory, variational inequalities, and projected dynamic

systems. They then delve more deeply into resource allocation in cognitive radio networks. The text investigates the dynamics of cognitive radio networks from the perspectives of information theory, optimization, and control theory. It also provides a vision for the new world of wireless communications by integration of cellular and cognitive radio networks. This groundbreaking book: Shows how wireless communication systems increasingly use cognition to enhance their networks Explores how cognitive radio networks can be viewed as spectrum supply chain networks Derives analytic models for two complementary regimes for spectrum sharing (open-access and market-driven) to study both equilibrium and disequilibrium behaviors of networks Studies cognitive heterogeneous networks with emphasis on economic provisioning for resource sharing Introduces a framework that addresses the issue of spectrum sharing across licensed and unlicensed bands aimed for Pareto optimality Written for students of cognition, communication engineers, telecommunications professionals, and others, Fundamentals of Cognitive Radio offers a new generation of ideas and provides a fresh way of thinking about cognitive techniques in order to improve radio networks.

Software Defined Radios Jan 19 2022 Many and ever more mobile users wish to enjoy a variety of multimedia services, in very diverse geographical environments. The growing number of communication options within and across wireless standards is accommodating the growing volume and heterogeneity in wireless wishes. On the other hand, advancement in radio technologies opening much more flexibility, a.o. through Software Defined Radios, opens up the possibility to realize mobile devices featuring multi-mode options at low cost and interesting form factors. It is crucial to manage the new degrees of freedom opened up in radios and standards in a smart way, such that the required service is offered at satisfactory quality as efficiently as possible. Efficiency in energy consumption is clearly primordial for battery powered mobile terminals specifically, and in the context of growing ecological concerns in a broader context. Moreover, efficient usage of the spectrum is a growing prerequisite for wireless systems, and coexistence of different standards puts overall throughput at risk. The management of flexibility risks bringing about intolerable complexity and hamper the desired agility. A systematic approach, consisting of anticipative preparing for smooth operation, allows mastering this challenge. Case studies show that already today, this approach enables smart operation of radios realizing impressive efficiency gains without hampering Quality-of-Service. In the future wireless communication scenes will be able to profit from the opening of the spectrum. Even smarter and cognitive behavior will become possible and essential.

Cognitive Radio in 4G/5G Wireless Communication Systems Mar 01 2023 The limitation of the radio spectrum and the rapid growth of communication applications make optimal usage of radio resources essential. Cognitive radio (CR) is an attractive research area for 4G/5G wireless communication systems, which enables unlicensed users to access the spectrum. Delivering higher spectral efficiency, supporting the higher number of users, and achieving higher coverage and throughput are the main advantages of CR-based networks compared to conventional ones. The main goal of this book is to provide highlights of current research topics in the field of CR-based systems. The book consists of six chapters in three sections focusing on primary and secondary users, spectrum sensing, spectrum sharing, CR-based IoT, emulation attack, and interference alignment.

Cognitive Radio and Dynamic Spectrum Access Feb 05 2021 Cognitive Radio for Dynamic Spectrum Access gives a comprehensive overview of the main concepts behind radio spectrum regulation, dynamic spectrum access and cognitive radio. Spectrum measurements are introduced to illustrate the inefficiencies in today's spectrum usage and the book also discusses enablers for horizontal and vertical spectrum sharing. Among others a game-theory-based approach for spectrum sharing is described and evaluated. Institution and standardisation approaches in academic research and industry are highlighted including IEEE SCC41, 802.11k/n/s/y and 802.22 which lead towards commercial exploitation of cognitive radio. In conclusion, this book looks at the initial steps towards the vision of true cognitive radio and the potential impact on telecommunication business. Introduces the benefits and challenges of cognitive radio Presents cognitive radio in research and industry and covers implications for operators from the perspective of a telecom operator Examines how cognitive radio techniques will considerably change the wireless communication market.

Antenna Design for Cognitive Radio Apr 09 2021 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 under-utilized 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.

Cognitive Radio Communications and Networks Jun 23 2022 Cognitive Radio Communications and Networks gives comprehensive and balanced coverage of the principles of cognitive radio communications, cognitive networks, and details of their implementation, including the latest developments in the standards and spectrum policy. Case studies, end-of-chapter questions, and descriptions of various platforms and test beds, together with sample code, give hands-on knowledge of how cognitive radio systems can be implemented in practice. Extensive treatment is given to several standards, including IEEE 802.22 for TV White Spaces and IEEE SCC41 Written by leading people in the field, both at universities and major industrial research laboratories, this tutorial text gives communications engineers, R&D engineers, researchers, undergraduate and post graduate students a complete reference on the application of wireless communications and network theory for the design and implementation of cognitive radio systems and networks Each chapter is written by internationally renowned experts, giving complete and balanced treatment of the fundamentals of both cognitive radio communications and cognitive networks, together with implementation details Extensive treatment of the latest standards and spectrum policy developments enables the development of compliant cognitive systems Strong practical orientation - through case studies and descriptions of cognitive radio platforms and testbeds - shows how real world cognitive radio systems and network architectures have been built Alexander M. Wyglinski is an Assistant Professor of Electrical and Computer Engineering at Worcester Polytechnic Institute (WPI), Director of the WPI Limerick Project Center, and Director of the Wireless Innovation Laboratory (WI Lab) Each chapter is written by internationally renowned experts, giving complete and balanced treatment of the fundamentals of both cognitive radio communications and cognitive networks, together with implementation details Extensive treatment of the latest standards and spectrum policy developments enables the development of compliant cognitive systems Strong practical orientation - through case studies and descriptions of cognitive radio platforms and testbeds - shows how "real world" cognitive radio systems and network architectures have been built

Cognitive Radio Technology Mar 09 2021 This book gives a thorough knowledge of cognitive radio concepts, principles, standards, spectrum policy issues and product implementation details. In addition to 16 chapters covering all the basics of cognitive radio, this new edition has eight brand-new chapters covering cognitive radio in multiple antenna systems, policy language and policy engine, spectrum sensing, rendezvous techniques, spectrum consumption models, protocols for adaptation, cognitive networking, and information on the latest standards, making it an indispensable resource for the RF and wireless engineer. The new edition of this cutting edge reference, which gives a thorough knowledge of principles, implementation details, standards, policy issues in one volume, enables the RF and wireless engineer to master and apply today's cognitive radio technologies. Bruce Fette, PhD, is Chief Scientist in the

Communications Networking Division of General Dynamics C4 Systems in Scottsdale, AZ. He worked with the Software Defined Radio (SDR) Forum from its inception, currently performing the role of Technical Chair, and is a panelist for the IEEE Conference on Acoustics Speech and Signal Processing Industrial Technology Track. He currently heads the General Dynamics Signal Processing Center of Excellence in the Communication Networks Division. Dr. Fette has 36 patents and has been awarded the "Distinguished Innovator Award". * Foreword and a chapter contribution by Joe Mitola, the creator of the field * Discussion of cognitive aids to the user, spectrum owner, network operator * Explanation of capabilities such as time - position awareness, speech and language awareness, multi-objective radio and network optimization, and supporting database infrastructure * Detailed information on product implementation to aid product developers * Thorough descriptions of each cognitive radio component technology provided by leaders of their respective fields, and the latest in high performance analysis - implementation techniques * Explanations of the complex architecture and terminology of the current standards activities * Discussions of market opportunities created by cognitive radio technology

Fundamentals of Cognitive Radio Aug 14 2021 A comprehensive treatment of cognitive radio networks and the specialized techniques used to improve wireless communications The human brain, as exemplified by cognitive radar, cognitive radio, and cognitive computing, inspires the field of Cognitive Dynamic Systems. In particular, cognitive radio is growing at an exponential rate. Fundamentals of Cognitive Radio details different aspects of the human brain and provides examples of how it can be mimicked by cognitive dynamic systems. The text offers a communication-theoretic background, including information on resource allocation in wireless networks and the concept of robustness. The authors provide a thorough mathematical background with data on game theory, variational inequalities, and projected dynamic systems. They then delve more deeply into resource allocation in cognitive radio networks. The text investigates the dynamics of cognitive radio networks from the perspectives of information theory, optimization, and control theory. It also provides a vision for the new world of wireless communications by integration of cellular and cognitive radio networks. This groundbreaking book: Shows how wireless communication systems increasingly use cognition to enhance their networks Explores how cognitive radio networks can be viewed as spectrum supply chain networks Derives analytic models for two complementary regimes for spectrum sharing (open-access and market-driven) to study both equilibrium and disequilibrium behaviors of networks Studies cognitive heterogeneous networks with emphasis on economic provisioning for resource sharing Introduces a framework that addresses the issue of spectrum sharing across licensed and unlicensed bands aimed for Pareto optimality Written for students of cognition, communication engineers, telecommunications professionals, and others, Fundamentals of Cognitive Radio offers a new generation of ideas and provides a fresh way of thinking about cognitive techniques in order to improve radio networks.

Cognitive Radio Mar 21 2022 Cognitive radio is a radio that can sense, learn and adapt to the surrounding environment according to its inner and outer stimuli. A primary feature of cognitive radios is the ability to adapt the transmission parameters given a dynamic wireless environment. In this book, the cognitive radio adaptation is formalised and four evolutionary algorithms are explored and used to intelligently solve this problem and determine the optimal parameters for a given situation. Moreover, the authors of this book limit the scope of cognition to reduce mutual interference between CR-based rental (unlicensed) users and licensed users (LUs) and in providing coexistence between them. The modulation strategies employed to realise a co-existence between the CR-based rental system and the licensed system are introduced. In addition, a novel dynamic spectrum sharing scheme combining spectrum adaptation and MIMO-OFDM for cognitive radio system is proposed. In order to improve spectrum efficiency and reduce computational complexity, a simple power allocation algorithm is proposed as well. Other chapters report recent results on policy-based self-management towards self-adaptive and Cognitive Radio Systems (CRS). Its focus is not on self-properties of cognitive radio systems but on self-learning policy and cognition.