

Cognitive Radio Interoperability Through Waveform Reconfiguration

Based on the popular Artech House classic, Digital Communication Systems Engineering with Software-Defined Radio, this book provides a practical approach to quickly learning the software-defined radio (SDR) concepts needed for work in the field. This up-to-date volume guides readers on how to quickly prototype wireless designs using SDR for real-world testing and experimentation. This book explores advanced wireless communication techniques such as OFDM, LTE, WLA, and hardware targeting. Readers will gain an understanding of the core concepts behind wireless hardware, such as the radio frequency front-end, analog-to-digital and digital-to-analog converters, as well as various processing technologies. Moreover, this volume includes chapters on timing estimation, matched filtering, frame synchronization message decoding, and source coding. The orthogonal frequency division multiplexing is explained and details about HDL code generation and deployment are provided. The book concludes with coverage of the WLAN toolbox with OFDM beacon reception and the LTE toolbox with downlink reception. Multiple case studies are provided throughout the book. Both MATLAB and Simulink source code are included to assist readers with their projects in the field.

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.

This exciting new book examines the feasibility of using a method of doubling the capacity of cellular networks by simultaneously transmitting and receiving signals at the same frequency, a process known as full duplexing (FD). To realize full duplexing, changes in the hardware of the cell- base stations, relaying equipment, "hot spot" access points and mobile phones are necessary to prevent the hardware's transmitters from interfering with their own receivers. This requires looking at how to separate the strong transmitted signal from the very weak received signal, a process requiring both hardware (analog) changes and more complex digital signal processing. Different ways of achieving that goal are examined. The books reviews the merits of hardware changes involving new duplexing components that may be different depending on the frequency band and cell hardware being used. Developing full duplex (FD) systems in 5G LTE cellular communications and what can be achieved with ferrite-based circulators in terms of size reduction and performance enhancement, especially at millimetric frequencies, is considered. The relative merits of ferrite and non-ferrite circulators are compared in terms of their fundamental materials and device technologies, such as isolation, insertion loss, bandwidth and non-linearity. FD in the entire 5G cell is also examined and its resulting range of equipment and device communication. This includes front-hauling, more sophisticated back and front-hauling, backhaul beam switching, and cell extenders and relays, all of which could involve FD.

This book examines signal processing techniques for cognitive radios. The book is divided into three parts: Part I, is an introduction to cognitive radios and presents a history of the cognitive radio (CR), and introduce their architecture, functionalities, ideal aspects, hardware platforms, and state-of-the-art developments. Dr. Jayaweera also introduces the specific type of CR that has gained the most research attention in recent years: the CR for Dynamic Spectrum Access (DSA). Part II of the book, Theoretical Foundations, guides the reader from classical to modern theories on statistical signal processing and inference. The author addresses detection and estimation theory, power spectrum estimation, classification, adaptive algorithms (machine learning), and inference and decision processes. Applications to the signal processing, inference and learning problems encountered in cognitive radios are interspersed throughout with concrete and accessible examples. Part III of the book, Signal Processing in Radios, identifies the key signal processing, inference, and learning tasks to be performed by wideband autonomous cognitive radios. The author provides signal processing solutions to each task by relating the tasks to materials covered in Part II. Specialized chapters then discuss specific signal processing algorithms required for DSA and DSS cognitive radios.

This practical book is an accessible introduction to Orthogonal frequency-division multiplexing (OFDM) receiver design, a technology that allows digitized data to be carried by multiple carriers. It offers a detailed simulation study of an OFDM algorithm for Wi-Fi and 4G cellular that can be used to understand other OFDM waveforms. Extensive simulation studies are included using the transmission waveform given by the IEEE 802.11 standard. Scrambler, error-correcting codes, interleaver and radio-wave propagation model are included. OFDM waveform characteristics, signal acquisition, synchronization issues, channel estimation and tracking, hard and soft decision decoding are all covered. Detailed derivations leading to the final formula for any algorithm are given, which allows the reader to clearly understand the approximations and conditions behind the formulas and apply them appropriately. The algorithms are selected not just for the best performance from simulation study but also for easy implementation. An example is a unique algorithm for signal acquisition using the principle of maximum likelihood detection.

This book presents the outcomes of the workshop sponsored by the National Natural Sciences Foundation of China and the UK Newton Fund, British Council Researcher Links. The Workshop was held in Harbin, China, from 14 to 17 July 2017, and brought together some thirty young (postdoctoral) researchers from China and the UK specializing in geosciences, sensor signal networks and their applications to natural disaster recovery. The Workshop presentations covered the state of the art in the area of disaster recovery and blended wireless sensor systems that act as early warning systems to mitigate the consequences of disasters and function as post-disaster recovery vehicles. This book promotes knowledge transfer and helps readers explore and identify research opportunities by highlighting research outcomes in the internationally relevant area of disaster recovery and mitigation.

"This book addresses the advantages and the limitations of modern multicarrier technologies and how to meet the challenges they pose using non-contiguous multicarrier technologies and novel algorithms that enhance spectral efficiency, interference robustness, and reception performance. It explores techniques using non-contiguous subcarriers which allow for flexible spectrum aggregation while achieving high spectral efficiency and flexible transmission and reception at lower OSI layers. These include non-contiguous orthogonal frequency division multiplexing (NC-OFDM), its enhanced version, non-contiguous filter-bank-based multicarrier (NC-FBMC), and generalized multicarrier. Following an overview of current multicarrier technologies for radio communication, the authors examine particular properties of these technologies that allow for more efficient usage within key directions of 5G. They examine the principles of NC-OFDM and discuss efficient transmitter and receiver design. They present the principles of FBMC modulation and discuss key challenges for FBMC communications while comparing performance results with traditional OFDM. They move on from there to a fascinating discussion of GMC modulation within which they clearly demonstrate how that technology encompasses all of the advantages of previously discussed techniques, as well as all imaginable multi- and single-carrier waveforms. [...]" (source : 4ème de couverture.

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. This comprehensive new resource presents a technical introduction to the components, architecture, software, and protocols of IoT. This book is especially catered to those who are interested in researching, developing, and building IoT. The book covers the physics of electricity and electromagnetism laying the foundation for understanding the components of modern electronics and computing. Readers learn about the fundamental properties of matter along with security and privacy issues related to IoT. From the launch of the internet from ARPAnet in the 1960s to recent connected gadgets, this book highlights the integration of IoT in various verticals such as industry, smart cities, connected vehicles, and smart and assisted living. The overall design patterns, issues with UX and UI, and different network topologies related to architectures of M2M and IoT solutions are explored. Product development, power options for IoT devices, including battery chemistry, actuators from simple buzzers to complex stepper motors, and sensors from gyroscopes to the electrical sensing of organic compounds are covered. Hardware development, sensors, and embedded systems are discussed in detail. This book offers insight into the software components that impinge on IoT solutions, development, network protocols, backend software, data analytics and conceptual interoperability. This book advocates the idea of breaking up the cellular communication architecture by introducing cooperative strategies among wireless devices through cognitive wireless networking. It is divided into different parts dealing with cooperative and cognitive aspects for future wireless communication networks. Chapters written by world leading researchers in the field cover, among others, social and biological inspired behavior applied to wireless networks, peer-to-peer networking, cognitive radio or more generally cognitive networks, cooperative networks, game theory, spectrum sensing and management. In addition, tools and methodologies for modeling and analyzing cooperative and cognitive interactions in wireless networks are explained in detail to facilitate access to this advanced research topic.

This brief examines the current research in cognitive wireless networks (CWNs). Along with a review of challenges in CWNs, this brief presents novel theoretical studies and architecture models for CWNs, advances in the cognitive information awareness and delivery, and intelligent resource management technologies. The brief presents the motivations and concepts of CWNs, including theoretical studies of temporal and geographic distribution entropy as well as cognitive information metrics. A new architecture model of CWNs is proposed with theoretical, functional and deployment architectures supporting cognitive information flow and resource flow. Key technologies are identified to achieve the efficient cognitive information awareness and delivery. The brief concludes by validating the effectiveness of proposed theories and technologies using the CWNs testbed and discussing the importance of standardization practices. The context and analysis provided by this text are ideal for researchers and practitioners interested in wireless networks and cognitive information. Cognitive Wireless Networks is also valuable for advanced-level students studying resource management and networking.

This book provides an introduction to software-defined radio and cognitive radio, along with methodologies for applying knowledge representation, semantic web, logic reasoning and artificial intelligence to cognitive radio, enabling autonomous adaptation and flexible signaling. Readers from the wireless communications and software-defined radio communities will use this book as a reference to extend software-defined radio to cognitive radio, using the semantic technology described.

This monograph addresses the spectrum-scarcity problem by providing a comprehensive overview of spectrum resource management in Cognitive Radio Sensor Networks (CRSNs). It shows a variety of CRSN applications covering Machine-to-Machine communications, cyber physical systems and Internet-of-Things. The authors explore the benefits of an integrated energy efficient spectrum management solution for CRSNs including spectrum sensing, decision and allocation. Both theoretical and experimental aspects of CRSNs are covered in detail. Academics, researchers and developers will find this monograph an exceptional resource with valuable knowledge and insights. It also has extensive references from top journals, conference proceedings, books and standards.

Taking an applications-oriented view, this unique volume delivers a forward-looking roadmap to military communications. This hands-on reference offers military and security technology practitioners insights into the key issues related to long-term development within the battlefield communications area. The book presents the technological alternatives for communication in the battlefield in unexpected situations and environments. This authoritative resource discusses unstructured formations of actors using a holistic approach that considers key capability requirements. Professionals and officers learn how to prepare for the unexpected and start building agile, adaptive and cognitive systems that are needed in future operating environments. From scenario-based capability planning...to situational and context awareness...to unmanned ground and aerial platforms, this easy-to-understand book covers the critical topics that practitioners need to master to achieve top performance in the battlefield.

Disasters happen over relatively short time periods and are usually unexpected, leaving in their wake large numbers of casualties and severe infrastructure damages. These disasters can be due to natural causes (earthquakes, fires, floods, hurricanes, epidemics or combinations thereof) or they can be manmade (industrial accidents, terrorism and war). Essential communications breakdown is one of the common characteristics of all disasters. The partial or complete failure of telecommunications infrastructure leads to preventable loss of life and damage to property, by causing delays and errors in emergency response and disaster relief efforts. Despite the increasing reliability and resiliency of modern telecommunications networks to physical damage, the risk associated with communications failures still remains serious because of growing dependence upon these tools in emergency operations. Coordinated relief to the affected areas needs to be given as soon as possible, so to minimize further nefarious effects. In such scenarios it is vital that communications between interested parties, i.e. relief and security groups, are established as quickly and as easily as possible, ideally in a plug & play or zero configuration fashion. The acknowledgment that infrastructure-based networks in such deployment areas may be destroyed raises the need for new alternatives and communication paradigms, ideally infrastructure-less, and for decentralized wireless technologies. Technical topics discussed in Telecommunications in Disaster Areas include: System Engineering, Power and Communication Infrastructure; Self-Organizing, Cognitive and Location-aware Networks; Public Safety Scenarios Modelling; Inter-Network Interoperability; Networks of Mobile Robots.

In the span of a century, radio technology advanced from spark transmitters, through analog radios based on vacuum tubes to solid state radios to finally software defined radios where most of the transmit and receive functionalities are implemented as programs running on specialized microprocessors. In recent years, cognitive radio emerged, which combines a software-defined radio with an intelligent agent, and promises to deliver a new level of functionality. This new resource addresses cognitive radio design from the perspective of interoperability with an emphasis on waveform configuration for increased flexibility and enhanced performance. The book provides readers with an extensive discussion of the concept of interoperability, as well as discusses some of the languages that could potentially be used for exchanging descriptions of waveforms.

This book provides a high-level overview of the current state of the art and future of satellite systems, satellite control systems, and satellite systems design. Chapters cover such topics as existing and future satellite systems, satellite communication subsystems, space control and Space Situation Awareness (SAA), machine learning methods with novel neural networks, data measurements in Global Navigation Satellite Systems, and much more. This volume is a practical reference for system engineers, design engineers, system analysts, and researchers in satellite engineering and advanced mathematical modeling fields.

Radio observations of the cosmos are gathered by geoscientists using complex earth-orbiting satellites and ground-based equipment, and by radio astronomers using large ground-based radio telescopes. Signals from natural radio emissions are extremely weak, and the equipment used to measure them is becoming ever-more sophisticated and sensitive. The radio spectrum is also being used by radiating, or "active," services, ranging from aircraft radars to rapidly expanding consumer services such as cellular telephones and wireless internet. These valuable active services transmit radio waves and thereby potentially interfere with the receive-only, or "passive," scientific services. Transmitters for the active services create an artificial "electronic fog" which can cause confusion, and, in severe cases, totally blinds the passive receivers. Both the active and the passive services are increasing their use of the spectrum, and so the potential for interference, already strong, is also increasing. This book addresses the tension between the active services' demand for greater spectrum use and the passive users' need for quiet spectrum. The included recommendations provide a pathway for putting in place the regulatory mechanisms and associated supporting research activities necessary to meet the demands of both users.

"Earth observation & navigation. Law and technology" jest publikacją wydaną przez Wydawnictwo Ius Publicum przy współpracy z Institute of Intellectual Property. Książka została wydana pod redakcją naukową dr Marleny Jankowskiej (Uniwersytet Śląski w Katowicach) oraz Profesora Mirosława Pawczyka (Uniwersytet Śląski w Katowicach, Prezes Fundacji Ius Publicum), a także Profesora Sławomira Augustyn (Wojskowa Akademia Techniczna) i Doktora Marcina Kulawiaka (Politechnika Gdańska). Książka dotyczy tematyki obserwacji Ziemi i nawigacji. Zagadnienia te zostały omówione zarówno od strony technicznej, jak i prawnej. Redaktorzy oraz autorzy książki wyszli z założenia, że dla zrozumienia tej problematyki konieczną jest zwrócenie naukowej uwagi na obie sfery obserwacji Ziemi i nawigacji. This book provides holistic yet concise information on what modern cognitive radio networks are, how they work, and the possible future directions for them. The authors first present the most generic models of modern cognitive radio networks while taking their different architectural designs and classifications into consideration. While the spectrum resource is shown to be the most important resource for the cognitive radio networks, the book exposes the importance of the other resources that are needed to help drive the technology. The book then discusses in-depth the key tools (such as optimization and queuing theory) and techniques (such as cooperative diversity and relaying) that are being employed to formulate resource problems, investigate solutions, and interpret such solutions for useful and practical modern cognitive radio networks realization. Further, the book studies the impact of modern cognitive radio networks on other emerging technologies such as 5G, Internet of Things, and advanced wireless sensor networks and discusses the role that cognitive radio networks play in the evolution of smart cities and in the realization of a highly interconnected world. In discussing the future of the cognitive radio networks, the book emphasizes the need to advance new or improved tools, techniques, and solutions to address lingering problems in the aspects of resource realization and utilization, network complexity, network security, etc., which can potentially limit the cognitive radio networks in their stride to becoming one of the most promising technologies for the immediate and near future. Presents a concise yet detailed in study, interpretation, and evaluation of modern cognitive radio networks; Includes topics such as stochastic geometry approach and deep learning in cognitive radio networks; Provides direction for further research engagements and makes recommendations for practical cognitive radio network implementation.

This comprehensive resource provides the latest information on digitization and reconstruction (D&R) of analog signals in digital radios. Readers learn how to conduct comprehensive analysis, concisely describe the major signal processing procedures carried out in the radios, and demonstrate the dependence of these procedures on the quality of D&R. The book presents and analyzes the most promising and theoretically sound ways to improve the characteristics of D&R circuits and illustrate the influence of these improvements on the capabilities of digital radios. The book is intended to bridge the gap that exists between theorists and practical engineers developing D&R techniques by introducing new signal transmission and reception methods that can effectively utilize the unique capabilities offered by novel digitization and reconstruction techniques.

An exciting new technology, described by the one who invented it This is the first book dedicated to cognitive radio, a promising new technology that is poised to revolutionize the telecommunications industry with increased wireless flexibility. Cognitive radio technology integrates computational intelligence into software-defined radio for embedded intelligent agents that adapt to RF environments and user needs. Using this technology, users can more fully exploit the radio spectrum and services available from wireless connectivity. For example, an attempt to send a 10MB e-mail in a zone where carrier charges are high might cause a cognitive radio to alert its user and suggest waiting until getting to the office to use the LAN instead. Cognitive Radio Architecture examines an "ideal cognitive radio" that features autonomous machine learning, computer vision, and spoken or written language perception. The author of this exciting new book is the inventor of the technology and a leader in the field. Following his step-by-step introduction, readers can start building aware/adaptive radios and then make steps towards cognitive radio. After an introduction to adaptive, aware, and cognitive radio, the author develops three major themes in three sections: Foundations Radio Competence User Domain Competence The book makes the design principles of cognitive radio more accessible to students of teleinformatics, as well as to wireless communications systems developers. It therefore embraces the practice of cognitive radio as well as the theory. In particular, the publication develops a cognitive architecture that integrates disparate disciplines, including autonomous machine learning, computer vision, and language perception technologies. An accompanying CD-ROM contains the Java source code and compiled class files for applications developed in the book. In addition, for the convenience of the reader, Web resources introducing key concepts such as speech applications programmer interfaces (APIs) are included. Although still five to ten years away from full deployment, telecommunications giants and research labs around the world are already dedicating R&D to this new technology. Telecommunications engineers as well as

advanced undergraduate and graduate students can learn the promising possibilities of this innovative technology from the one who invented it. Note: CD-ROM/DVD and other supplementary materials are not included as part of eBook file.

Cognitive Radio: Interoperability Through Waveform Reconfiguration Artech House

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 radio – a paradigm for wireless communication in which either a network or a wireless node changes its transmission or reception parameters to communicate more efficiently and avoid interference -- is one of the most exciting emerging fields in communications technology. Taking an integrated development approach, this cutting-edge book provides you with clear methods for performing quantitative analysis of cognitive radio techniques in a variety of environments. This detailed reference presents a quantitative structure that helps you determine the capability of cognitive radio to address a number of constraints of current radio design. Critical to understanding the operation of cognitive radio, the book develops an analytic model for a range of spectrum environments. Moreover, this unique resource offers you unique insight into the application of dynamic spectrum access (DSA) to improve the performance of all classes of wireless devices. DVD Included! Contains sample cognitive radio environments and closed form approximations of these environments in MATLAB file format. This data enables you to reproduce the analysis provided in the book, perform the exercises in each chapter, and extend the work through independent investigation and research. 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

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.

This proceedings is a representation of decades of research, teaching and application in the field. Image Processing, Fusion and Information Technology areas, Digital radio Communication, Wimax, Electrical engg, VLSI approach to processor design, embedded systems design are dealt in detail through models and illustrative techniques.

Widely regarded as one of the most promising emerging technologies for driving the future development of wireless communications, cognitive radio has the potential to mitigate the problem of increasing radio spectrum scarcity through dynamic spectrum allocation. Drawing on fundamental elements of information theory, network theory, propagation, optimisation and signal processing, a team of leading experts present a systematic treatment of the core physical and networking principles of cognitive radio and explore key design considerations for the development of new cognitive radio systems. Containing all the underlying principles you need to develop practical applications in cognitive radio, this book is an essential reference for students, researchers and practitioners alike in the field of wireless communications and signal processing.

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

With nearly 7 billion mobile phone subscriptions worldwide, mobility and computing have become pervasive in our society and business. Moreover, new mobile multimedia communication services are challenging telecommunication operators. To support the significant increase in multimedia traffic—especially video—over wireless networks, new technological infrastructure must be created. Cognitive Radio Networks (CRNs) are widely regarded as one of the most promising technologies for future wireless communications. This book explains how to efficiently deliver video, audio, and other data over CRNs. Covering advanced algorithms, protocols, and hardware-/software-based experiments, this book describes how to encode video in a prioritized way to send to dynamic radio links. It discusses different FEC codes for video reliability and explains how different machine learning algorithms can be used for video quality control. It also explains how to use readily available software tools to build a CRN simulation model. This book explains both theoretical and experimental designs. It describes how universal software radio peripheral (USRP) boards can be used for real-time, high-resolution video transmission. It also discusses how a USRP board can sense the spectrum dynamics and how it can be controlled by GNU Radio software. A separate chapter discusses how the network simulator ns-2 can be used to build a simulated CRN platform.

Publisher description

The fast user growth in wireless communications has created significant demands for new wireless services in both the licensed and unlicensed frequency spectra. Since many spectra are not fully utilized most of the time, cognitive radio, as a form of spectrum reuse, can be an effective means to significantly boost communications resources. Since its introduction in late last century, cognitive radio has attracted wide attention from academics to industry. Despite the efforts from the research community, there are still many issues of applying it in practice. This book is an attempt to cover some of the open issues across the area and introduce some insight to many of the problems. It contains thirteen chapters written by experts across the globe covering topics including spectrum sensing fundamental, cooperative sensing, spectrum management, and interaction among users.

"This cohesive treatment of cognitive radio and networking technology integrates information and decision theory to provide insight into relationships throughout all layers of networks and across all wireless applications. It encompasses conventional considerations of spectrum and waveform selection, and covers topology determination, routing policies, content positioning, and future hybrid architectures that fully integrate wireless and wired services. Features specific examples of decision-making structures and criteria required to extend network density and scaling to unprecedented levels. - Integrates sensing, control plane and content operations into a single cohesive structure - Provides simpler and more powerful models of network operation - Presents a unique approach to decision-making and mechanisms to adjust control plane activity to ensure network scaling. - Generalises the concepts of shared and adaptive spectrum policies - Addresses network transport operations and dynamic management of cognitive wireless networks' own information seeking behaviour"--

This brief investigates spectrum efficient and energy efficient strategies, known as cognitive radio networks (CRNs), to ensure secure cooperation between licensed and unlicensed users. The authors address issues of spectrum scarcity, spectrum sensing, transmission performance, trust-aware cooperation, and secure communications. Two security-aware cooperation based spectrum access schemes are presented. The first is a trust-aware cooperative framework for CRNs to improve the throughput or energy efficiency of licensed users and offer transmission opportunities to unlicensed users, taking into consideration the trustworthiness of unlicensed users. The second scheme is a cooperative framework to enhance secure communications of licensed users. An introduction to CRNs and literature survey enhance the discussion while numerical results are provided to demonstrate the viability of the proposed schemes. The brief is designed for researchers and professionals working with cognitive radio networks or interested in cooperation based access. Advanced-level students studying computer communication networks and communications engineering will also find this brief useful.

Internet of Things (IoT) deals with the interconnection of devices that can communicate with each other over the internet. Currently, several

smart systems have evolved with the evolution in IoT. Cognitive Radio - an enabler for Internet of Things is a research level subject for all communication engineering students at undergraduate, post graduate and research levels. The contents of the book are designed to cover the prescribed syllabus for one semester course on the subject prescribed by universities. Concepts have been explained thoroughly in simple and lucid language. Mathematical analysis has been used wherever necessary followed by clear and lucid explanation of the findings and their implication. Key technologies presented include dynamic spectrum access, spectrum sensing techniques, IEEE 802.22 and different radio network architectures. Their role and use in the context of mobile broadband access in general is explained, giving both a high level overview and a detailed step by step explanation. The book includes a large number of diagrams, MATLAB examples, thereby enabling the readers to have a sound grasp of the concepts presented and their applications. This book is a must have resource for engineers and other professionals in the telecommunication industry working with cellular or wireless broadband technologies, helping comprehension of the process of utilization of the updated technology to enable being ahead competition.

Handbook of Defence Electronics and Optronics Anil K. Maini, Former Director, Laser Science and Technology Centre, India First complete reference on defence electronics and optronics Fundamentals, Technologies and Systems This book provides a complete account of defence electronics and optronics. The content is broadly divided into three categories: topics specific to defence electronics; topics relevant to defence optronics; and topics that have both electronics and optronics counterparts. The book covers each of the topics in their entirety from fundamentals to advanced concepts, military systems in use and related technologies, thereby leading the reader logically from the operational basics of military systems to involved technologies and battlefield deployment and applications. Key features: • Covers fundamentals, operational aspects, involved technologies and application potential of a large cross-section of military systems. Discusses emerging technology trends and development and deployment status of next generation military systems wherever applicable in each category of military systems. • Amply illustrated with approximately 1000 diagrams and photographs and around 30 tables. • Includes salient features, technologies and deployment aspects of hundreds of military systems, including: military radios; ground and surveillance radars; laser range finder and target designators; night visions devices; EW and EO jammers; laser guided munitions; and military communications equipment and satellites. Handbook of Defence Electronics and Optronics is an essential guide for graduate students, R&D scientists, engineers engaged in manufacturing defence equipment and professionals handling the operation and maintenance of these systems in the Armed Forces.

This volume constitutes the proceedings of the First European Conference on Intelligence and Security Informatics, EuroISI 2008, held in Esbjerg Denmark, December 3–5, 2008. Intelligence and security informatics (ISI) is a multidisciplinary field encompassing methodologies, models, algorithms, and advanced tools for intelligence analysis, homeland security, terrorism research as well as security-related public policies. EuroISI 2008 was the first European edition of the series of ISI symposiums that have been held annually in the USA since 2003, and more recently in Asia. These meetings gather together people from previously disparate communities to provide a stimulating forum for the exchange of ideas and results. Participants have included academic researchers (especially in the fields of information technologies, computer science, public policy, and social and behavioral studies), law enforcement and intelligence experts, as well as information technology companies, industry consultants and practitioners in the relevant fields. These proceedings contain 25 original papers, out of 48 submissions received, related to the topics of intelligence and security informatics. The papers cover a broad range of fields such as: social network analysis, knowledge discovery, web-based intelligence and analysis, privacy protection, access control, digital rights management, malware and intrusion detection, surveillance, crisis management, and computational intelligence, among others. Additionally to the main conference, a poster section was organized.

Software Defined Radio makes wireless communications easier, more efficient, and more reliable. This book bridges the gap between academic research and practical implementation. When beginning a project, practicing engineers, technical managers, and graduate students can save countless hours by considering the concepts presented in these pages. The author covers the myriad options and trade-offs available when selecting an appropriate hardware architecture. As demonstrated here, the choice between hardware- and software-centric architecture can mean the difference between meeting an aggressive schedule and bogging down in endless design iterations. Because of the author's experience overseeing dozens of failed and successful developments, he is able to present many real-life examples. Some of the key concepts covered are: Choosing the right architecture for the market – laboratory, military, or commercial, Hardware platforms – FPGAs, GPPs, specialized and hybrid devices, Standardization efforts to ensure interoperability and portability State-of-the-art components for radio frequency, mixed-signal, and baseband processing. The text requires only minimal knowledge of wireless communications; whenever possible, qualitative arguments are used instead of equations. An appendix provides a quick overview of wireless communications and introduces most of the concepts the readers will need to take advantage of the material. An essential introduction to SDR, this book is sure to be an invaluable addition to any technical bookshelf.

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