

Sudharman K. Jayaweera

SIGNAL PROCESSING FOR COGNITIVE RADIOS



WILEY

Signal Processing For Cognitive Radios

Guodong Zhao, Wei Zhang, Shaoqian Li



Signal Processing For Cognitive Radios:

Signal Processing for Cognitive Radios Sudharman K. Jayaweera, 2014-12-16 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 introduces 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. Flexible Adaptation in Cognitive Radios Shujun Li, Miecyslaw Kokar, 2012-11-06 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. **Cognitive Radio Technology** Bruce A. Fette, 2009-04-28 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

Cognitive Radio Networks Ahmed Khattab, Dmitri Perkins, Magdy Bayoumi, 2012-08-27 This book describes a communication paradigm that could shape the future of wireless communication networks Opportunistic Spectrum Access OSA in Cognitive Radio Networks CRN While several theoretical OSA approaches have been proposed they are challenged by the practical limitations of cognitive radios the key enabling technology of OSA This book presents an unprecedented formulation of the OSA problem in CNR that takes into account the practical limitations encountered due to existing technologies Based on such a problem formulation this book presents a framework and protocol details implementing the analytically optimized solution of this problem Unlike the state of the art of CRN implementations that typically target software define radios which are not suitable for real systems this book describes the implementation of distributed OSA using practical radio transceiver technologies It provides a thorough characterization of the gains available to theoretical OSA approaches if the practical limitations are taken into consideration Tackles the cognitive radio networks performance optimization problem taking into account the practical limitations of today s technologies Provides thorough performance evaluation in arbitrary large scale networks as well as microscopic small scale performance evaluation using realistic hardware implementation Presents an empirical study of the gains available over existing techniques by adopting practical approaches Tackles the cognitive radio networks performance optimization problem taking into account the practical limitations of today s technologies Provides thorough performance evaluation in arbitrary large scale networks as well as microscopic small scale performance evaluation using realistic hardware implementation Presents an empirical study of the gains available over existing techniques by adopting practical approaches

Academic Press Library in Signal Processing Fulvio Gini, Nikolaos D. Sidiropoulos, 2013-09-10 This second volume edited and authored by world leading experts gives a review of the principles methods and techniques of important and emerging research topics and technologies in communications and radar engineering With this reference source you will Quickly grasp a new area of research Understand the underlying principles of a topic and its application Ascertain how a topic relates to other areas and learn of the research issues yet to be resolved Quick tutorial reviews of important and emerging topics of research in array and statistical signal processing Presents core principles and shows their application Reference content on core principles technologies algorithms and applications Comprehensive references to journal articles and other literature on which to build further more specific and detailed knowledge Edited by leading people

in the field who through their reputation have been able to commission experts to write on a particular topic

Energy-efficient VLSI Signal Processing for Wideband Spectrum Sensing in Cognitive Radios Tsung-Han Yu, 2013 With the rapid increases in the number of wireless devices fixed spectrum allocation has shown to be a major limitation to the evolution of wireless technologies Cognitive radio CR allows opportunistic spectrum access by searching and utilizing temporally and spatially unused spectrum provided that CR users do not cause interference to the primary users of the spectrum Spectrum sensing over a wide bandwidth increases the probability of finding under utilized spectrum for cognitive radios However the realization of wideband sensing is challenging because strong primary users introduce large dynamic range and spectral leakage to adjacent unused bands This work presents an algorithm architecture co design framework for wideband spectrum sensing The suppression of spectral leakage is achieved by multitap windowed FFT processing which also enables reduced sensing time The sensing time and detection threshold are adapted according to channel specific spectral leakage enabling reliable wideband detection within constrained sensing time Power and area cost of the compute intensive FFT block is minimized by using parallelism radix factorization and compact delay lines A per channel floating point data processing for large dynamic range signal is employed for power and area saving A partial PSD estimation scheme that performs energy detection on only the band of interest further improves the energy efficiency Two chips have been designed to demonstrate these concepts These chips guarantee reliable weak signal detection with short sensing time and outperform the prior work by at least 22x in power bandwidth Techniques developed in this dissertation enable energy efficient chip implementation of advanced wideband signal processing for cognitive radios

Communications, Signal Processing, and Systems Qilian Liang, Xin Liu, Zhenyu Na, Wei Wang, Jiasong Mu, Baoju Zhang, 2019-05-04 This book brings together papers from the 2018 International Conference on Communications Signal Processing and Systems which was held in Dalian China on July 14 16 2018 Presenting the latest developments and discussing the interactions and links between these multidisciplinary fields the book spans topics ranging from communications signal processing and systems It is aimed at undergraduate and graduate electrical engineering computer science and mathematics students researchers and engineers from academia and industry as well as government employees

Principles of Cognitive Radio Ezio Biglieri, Andrea J. Goldsmith, Larry J. Greenstein, Narayan B. Mandayam, H. Vincent Poor, 2012-11-15 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

Security-aware Cooperation in Cognitive Radio Networks Ning Zhang, Jon W. Mark, 2014-01-29 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

Maximizing Available Spectrum for Cognitive Radios Shridhar Mubaraq Mishra, 2009

Advanced Sensing Techniques for Cognitive Radio Guodong Zhao, Wei Zhang, Shaoqian Li, 2016-11-09 This SpringerBrief investigates advanced sensing techniques to detect and estimate the primary receiver for cognitive radio systems Along with a comprehensive overview of existing spectrum sensing techniques this brief focuses on the design of new signal processing techniques including the region based sensing jamming based probing and relay based probing The proposed sensing techniques aim to detect the nearby primary receiver and estimate the cross channel gain between the cognitive transmitter and primary receiver The performance of the proposed algorithms is evaluated by simulations in terms of several performance parameters including detection probability interference probability and estimation error The results show that the proposed sensing techniques can effectively sense the primary receiver and improve the cognitive transmission throughput Researchers and postgraduate students in electrical engineering will find this an exceptional resource

Blind Signal Classification Algorithms for Cognitive Radios Barathram Ramkumar, Tamal Bose, Alireza Babaei, William H. Tranter, 2015-07-12 This book provides a comprehensive tutorial to signal classification an important signal processing technique that enables cognitive radios to identify the kind of users present in a frequency band helping a radio to characterize the environment in which it is operating Engineers involved in the design and implementation of cognitive radio receivers will benefit from this book s coverage of a newly developed multiuser signal classification algorithm as well as techniques for design of other components to work in conjunction with the signal classifier such as blind equalizers blind channel estimators and cognitive engines

Cognitive Radios Danijela Branislav Čabrić, 2007

Advances in Multirate Systems Gordana Jovanovic Dolecek, 2017-09-09 This book offers readers a single source reference to the implementation aspects of multirate systems advances in design of comb decimation filters and multirate filter banks The authors describe a

variety of the most recent applications in fields such as image and video processing digital communications software and cognitive radio **Advancement in Sensing Technology** Subhas Chandra Mukhopadhyay, Krishanthi P.

Jayasundera, Anton Fuchs, 2012-09-06 The book presents the recent advancements in the area of sensors and sensing technology specifically in environmental monitoring structural health monitoring dielectric magnetic electrochemical ultrasonic microfluidic flow surface acoustic wave gas cloud computing and bio medical This book will be useful to a variety of readers namely Master and PhD degree students researchers practitioners working on sensors and sensing technology The book will provide an opportunity of a dedicated and a deep approach in order to improve their knowledge in this specific field

Networks of the Future Mahmoud Elkhodr, Qusay F. Hassan, Seyed Shahrestani, 2017-10-16 With the ubiquitous diffusion of the IoT Cloud Computing 5G and other evolved wireless technologies into our daily lives the world will see the Internet of the future expand ever more quickly Driving the progress of communications and connectivity are mobile and wireless technologies including traditional WLANs technologies and low ultra power short and long range technologies These technologies facilitate the communication among the growing number of connected devices leading to the generation of huge volumes of data Processing and analysis of such big data brings about many opportunities as well as many challenges such as those relating to efficient power consumptions security privacy management and quality of service This book is about the technologies opportunities and challenges that can drive and shape the networks of the future Written by established international researchers and experts Networks of the Future answers fundamental and pressing research challenges in the field including architectural shifts concepts mitigation solutions and techniques and key technologies in the areas of networking The book starts with a discussion on Cognitive Radio CR technologies as promising solutions for improving spectrum utilization and also highlights the advances in CR spectrum sensing techniques and resource management methods The second part of the book presents the latest developments and research in the areas of 5G technologies and Software Defined Networks SDN Solutions to the most pressing challenges facing the adoption of 5G technologies are also covered and the new paradigm known as Fog Computing is examined in the context of 5G networks The focus next shifts to efficient solutions for future heterogeneous networks It consists of a collection of chapters that discuss self healing solutions dealing with Network Virtualization QoS in heterogeneous networks and energy efficient techniques for Passive Optical Networks and Wireless Sensor Networks Finally the areas of IoT and Big Data are discussed including the latest developments and future perspectives of Big Data and the IoT paradigms **Cognitive Radio Technology** Bruce A. Fette, 2009-03-23 The

most comprehensive book on cognitive radio technologies bringing together everything a wireless engineer needs to know in this important and growing field Cognitive Radio. Future of Wireless Communication Pragnesh Patel, Snehal

Patel, 2015-04-30 Scientific Essay from the year 2015 in the subject Communications Technical Communication language English abstract This Paper describes the shortage of Radio Spectrum that the world is facing today The solution to this

problem is cognitive radio Cognitive radio and its briefs are explained here Increase in demand of something is good for mankind as it shows their economic development But there is a natural resource which creates problems whenever there is increase in demand That resource is radio spectrum and technology to deal with is this problem is called as cognitive radio Cognitive radio is been developed under DARPA XG Cognitive radio is next generation technology in which wireless communicators can use spectrum that is allotted to someone for commercial use under certain restrictions Section I introduces with the problems faced for spectrum and Cognitive radio and Cognitive Radio Networks are described in Section II and Section III respectively Section IV deals with Spectrum Assignment and related problems whereas Spectrum Sensing techniques are addressed in Section V Section VI discusses Applications of Cognitive Radio and we finally conclude in Section VII

Cognitive Radio Techniques Kandeepan Sithamparamathan,Andrea Giorgetti,2012 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

Cognitive Radio Receiver Front-Ends Bodhisatwa Sadhu,Ramesh Harjani,2013-10-11 This book focuses on the architecture and circuit design for cognitive radio receiver front ends The authors first provide a holistic explanation of RF circuits for cognitive radio systems This is followed by an in depth exploration of existing techniques that can be utilized by circuit designers Coverage also includes novel circuit techniques and architectures that can be invaluable for designers for cognitive radio systems

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