Dynamic Spectrum Access and Management in Cognitive Radio Networks

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Dynamic Spectrum Access And Management In Cognitive Radio Networks:

   Spectrum Access and Management for Cognitive Radio Networks Mohammad A Matin,2016-09-16 This book presents cutting edge research contributions that address various aspects of network design optimization implementation and application of cognitive radio technologies It demonstrates how to make better utilization of the available spectrum cognitive radios and spectrum access to achieve effective spectrum sharing between licensed and unlicensed users The book provides academics and researchers essential information on current developments and future trends in cognitive radios for possible integration with the upcoming 5G networks In addition it includes a brief introduction to cognitive radio networks for newcomers to the field   *Dynamic Spectrum Access and Management in Cognitive Radio Networks* Ekram Hossain,Dusit Niyato,Zhu Han,2014-05-14 An all inclusive introduction to this revolutionary technology presenting the key research issues and state of the art design analysis and optimization techniques   Dynamic Spectrum Access and Management in Cognitive Radio Networks Ekram Hossain,Dusit Niyato,Zhu Han,2009-06-18 An all inclusive introduction to this revolutionary technology presenting the key research issues and state of the art design analysis and optimization techniques   Cognitive Radio and Dynamic Spectrum Access Lars Berlemann,Stefan Mangold,2009-07-10 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

   Radio Resource Allocation and Dynamic Spectrum Access Badr Benmammar,Asma Amraoui,2013-02-05 We are currently witnessing an increase in telecommunications norms and standards given the recent advances in this field The increasing number of normalized standards paves the way for an increase in the range of services available for each consumer Moreover the majority of available radio frequencies have already been allocated This explains the emergence of cognitive radio CR the sharing of the spectrum between a primary user and a secondary user In this book we will present the state of the art of the different techniques for spectrum access using cooperation and competition to solve the problem of spectrum allocation and ensure better management of radio resources in a radio cognitive context The different aspects of research explored up until now on the applications of multi agent systems MAS in the field of cognitive radio are analyzed in this book The first chapter

begins with an insight into wireless networks and mobiles with special focus on the IEEE 802 22 norm which is a norm dedicated to CR Chapter 2 goes into detail about CR which is a technical field at the boundary between telecommunications and Artificial Intelligence AI In Chapter 3 the concept of the agent from AI is expanded to MAS and associated applications Finally Chapter 4 establishes an overview of the use of AI techniques in particular MAS for its allocation of radio resources and dynamic access to the spectrum in CR Contents 1 Wireless and Mobile Networks 2 Cognitive Radio 3 Multi agent Systems 4 Dynamic Spectrum Access About the Authors Badr Benmammar has been Associate Professor at UABT University Abou Bekr Belka d Tlemcen Algeria since 2010 and was a research fellow at CNRS LaBRI Laboratory of the University of Bordeaux 1 until 2007 He is currently carrying out research at the Laboratory of Telecommunications of Tlemcen LTT UABT Algeria His main research activities concern the cognitive radio network Quality of Service on mobile and wireless networks end to end signaling protocols and agent technology His work on Quality of Service has led to many publications in journals and conference proceedings Asma Amraoui is currently a PhD candidate she is preparing a doctoral thesis on a topic of research that explores the use of artificial intelligence techniques in cognitive radio networks She is attached to the Laboratory of Telecommunications of Tlemcen LTT in Algeria   Dynamic Spectrum Access for Wireless Networks Danda B. Rawat,Min Song,Sachin Shetty,2015-03-09 This SpringerBrief presents adaptive resource allocation schemes for secondary users for dynamic spectrum access DSA in cognitive radio networks CRNs by considering Quality of Service requirements admission control power rate control interference constraints and the impact of spectrum sensing or primary user interruptions It presents the challenges motivations and applications of the different schemes The authors discuss cloud assisted geolocation aware adaptive resource allocation in CRNs by outsourcing computationally intensive processing to the cloud Game theoretic approaches are presented to solve resource allocation problems in CRNs Numerical results are presented to evaluate the performance of the proposed methods Adaptive Resource Allocation in Cognitive Radio Networks is designed for professionals and researchers working in the area of wireless networks Advanced level students in electrical engineering and computer science especially those focused on wireless networks will find this information helpful

Contribution to Spectrum Management in Cognitive Radio Networks: a Cognitive Management Framework Faouzi Bouali,2014 To overcome the current under utilization of spectrum resources the CR Cognitive Radio paradigm has gained an increasing interest to perform the so called Dynamic Spectrum Access DSA In this respect Cognitive Radio networks CRNs have been strengthened with cognitive management support to push forward their deployment and commercialization This dissertation has assessed the relevance of exploiting several cognitive management functionalities in various scenarios and case studies Specifically this dissertation has constructed a generic cognitive management framework based on the fittingness factor concept to support spectrum management in CRNs Under this framework the dissertation has addressed two of the most promising CR applications namely an Opportunistic Spectrum Access OSA to licensed bands and

open sharing of license exempt bands In the former application several strategies that exploit temporal statistical dependence between primary activity inactivity durations to perform a proactive spectrum selection have been discussed A set of guidelines to select the most relevant strategy for a given environment have been provided In the latter application a fittingness factor based spectrum selection strategy has been proposed to efficiency exploit the different bands Several formulations of the fittingness factor have been compared and their relevance have been assessed under different settings Drawing inspiration from these applications a more general proactive strategy exploiting a characterization of spectrum resources at both the time and frequency domains has been developed to jointly assist spectrum selection SS and spectrum mobility SM functionalities Several variants of the proposed strategy each combining different choices and options of implementation have been compared to identify which of its components have the most significant impact on performance depending on the working conditions of the CRN To assess rationality of the proposed strategy with respect to other strategies a cost benefit analysis has been conducted to confront the introduced gain in terms of user satisfaction level to the incurred cost in terms of signaling amount Finally the dissertation has conducted an analysis of practicality aspects in terms of robustness to environment uncertainty and applicability to realistic environments With respect to the former aspect robustness has been assessed in front of two sources of uncertainty namely imperfection of the acquisition process and non stationarity of the environment and additional functionalities have been developed when needed to improve robustness With respect to the latter the proposed framework has been applied to a Digital Home DH environment to validate the obtained key findings under realistic conditions **Handbook of Research on Software-Defined and Cognitive Radio Technologies for Dynamic Spectrum Management** Kaabouch, Naima,Hu, Wen-Chen,2014-10-31 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 The Handbook of Research on Software Defined and Cognitive Radio Technologies for Dynamic Spectrum Management examines the emerging technologies being used to overcome radio spectrum scarcity Providing timely and comprehensive coverage on topics pertaining to channel estimation spectrum sensing communication security frequency hopping and smart antennas this research work is essential for use by educators industrialists and graduate students as well as academicians researching in the field *Dynamic Spectrum Management* Ying-Chang Liang,2019-11-02 This open access book authored by a world leading researcher in this field describes fundamentals of dynamic spectrum management provides a systematic overview on the enabling technologies covering cognitive radio blockchain and artificial intelligence and offers valuable guidance for designing advanced wireless communications systems This book is intended for a broad range of readers including students and professionals in this field as well as radio spectrum policy makers Cognitive Radio Network with Artificial Intelligence Dr. Jayant P. Pawar,Dr. Prashant V. Ingole,2024-11-09 Emerging cognitive radio technology has been identified

as a high impact disruptive technology innovation that could provide solutions to the radio traffic jam problem and provide a path to scaling wireless systems for the next 25 years Topics like Cognitive Radio Spectrum Sensing Dynamic Spectrum Access and Wireless Regional Area Network WRAN are very recent in electronic and telecommunication engineering Also statistical models Morkov Chain and Hidden Markov Model give more advantages to the reader Artificial Intelligence AI significantly enhances Cognitive Radio Networks CRNs by providing advanced capabilities for dynamic spectrum management interference mitigation network optimization and security **Cognitive Wireless Communication Networks** Ekram Hossain,Vijay K. Bhargava,2007-10-23 A Brief Journey through Cognitive Wireless Communication Networks Ekram Hossain University of Manitoba Winnipeg Canada Vijay Bhargava University of British Columbia Vancouver Canada Introduction Cognitive radio has emerged as a promising technology for maximizing the utili tion of the limited radio bandwidth while accommodating the increasing amount of services and applications in wireless networks A cognitive radio CR transceiver is able to adapt to the dynamic radio environment and the network parameters to maximize the utilization of the limited radio resources while providing exibility in wireless access The key features of a CR transceiver are awareness of the radio en ronment in terms of spectrum usage power spectral density of transmitted received signals wireless protocol signaling and intelligence This intelligence is achieved through learning for adaptive tuning of system parameters such as transmit power carrier frequency and modulation strategy at the physical layer and higher layer protocol parameters Development of cognitive radio technology has to deal with technical and pr tical considerations which are highly multidisciplinary as well as regulatory quirements There is an increasing interest on this technology among the researchers in both academia and industry and the spectrum policy makers The key enabling techniques for cognitive radio networks also referred to as dynamic spectrum cess networks are wideband signal processing techniques for digital radio advanced wireless communications methods arti cial intelligence and machine learning te niques and cognitive radio aware adaptive wireless mobile networking protocols **Efficient Spectrum Use in Cognitive Radio Networks Using Dynamic Spectrum Management** Tapiwa Moses Chiwewe,2016 Radiofrequency spectrum is a finite resource that consists of the frequencies in the range 3 kHz to 300 GHz It is used for wireless communication and supports several applications and services Whether it is at the personal community or society level and whether it is for applications in consumer electronics building management smart utility networks intelligent driving systems the Internet of Things industrial automation and so on the demand for wireless communication is increasing continuously Together with this increase in demand there is an increase in the quality of service requirements in terms of throughput and the reliability and availability of wireless services Industrial wireless sensor networks for example operate in environments that are usually harsh and time varying The frequency spectrum that is utilised by industrial wireless protocols such as WirelessHART and ISA 100 11a is also used by many other wireless technologies and with wireless applications growing rapidly it is possible that multiple heterogeneous

wireless systems will need to operate in overlapping spatiotemporal regions in the future Increased radiofrequency interference affects connectivity and reduces communication link quality This affects reliability and latency negatively both of which are core quality service requirements Getting multiple heterogeneous radio systems to co exist harmoniously in shared spectrum is challenging Traditionally this has been achieved by granting network operators exclusive rights that allow them to access parts of the spectrum assigned to them and hence the problems of co existence and limited spectrum could be ignored Design time multi access techniques have also been used At present however it has become necessary to use spectrum more efficiently to facilitate the further growth of wireless communication This can be achieved in a number of ways Firstly the policy that governs the regulation of radiofrequency spectrum must be updated to accommodate flexible dynamic spectrum access Secondly new techniques for multiple access and spectrum sharing should be devised A revolutionary new communication paradigm is required and one such paradigm has recently emerged in the form of Cognitive Radio technology Traditional methods to sharing spectrum assume that radios in a wireless network work together in an unchanging environment Cognitive radios on the other hand can sense learn and adapt In cognitive radio networks the interactions between users are taken into account in order for adjustments to be made to suit the prevailing radio environment In this thesis the problem of spectrum scarcity and coexistence is addressed using cognitive radio techniques to ensure more efficient use of radio frequency spectrum An introduction to cognitive radio networks is given covering cognitive radio fundamentals spectrum sensing dynamic spectrum management game theoretic approaches to spectrum sharing and security in cognitive radio networks A focus is placed on wireless industrial networks as a challenging test case for cognitive radio A study on spectrum management policy is conducted together with an investigation into the current state of radio frequency spectrum utilisation to uncover real and artificial cases of spectrum scarcity A novel cognitive radio protocol is developed together with an open source test bed for it Finally a game theoretic dynamic spectrum access algorithm is developed that can provide scalable fast convergence spectrum sharing in cognitive radio networks This work is a humble contribution to the advancement of wireless communication **Cognitive Radio Networks** Kwang-Cheng Chen,Ramjee Prasad,2009-03-30 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 **Resource Management in Future Internet** Vladimir Poulkov,Ramjee Prasad,2022-09-01 Future Internet and Internet of Things set out a new vision for connectivity real time applications and services Data procured from the use of a large number of heterogeneous physical and virtual devices must be real time processed and analyzed for the goal of effective resource management and control while maintaining the required performance and quality of service In addition the development of the communication networks towards heterogeneous and new generation broadband connectivity brings up new requirements towards the way of managing and controlling of the available resources Thus for the effective resource management in future internet novel approaches must be proposed and developed It could be seen that recently a considerable amount of effort has been devoted on behalf of industry and academia towards the research and design of methods for effective management of resources in internet and multimedia communications The book reviews some specific topics in the field of future internet and internet technologies that are closely related to the issue of finding effective solutions for the management of resources and performance Technical topics discussed in the book include Future Internet Technologies Internet of things Multimedia Networks Wireless Access Networks Software Communications Positioning and Localization in Communications Resource Management Resource Management in future Internet is recommended for specialists working in the field of information and communication industries as well as academic staff and researchers working in the field of multimedia communications and telecommunication networks **Dynamic Spectrum Management** Ying-Chang Liang,2020-09-18 This open access book authored by a world leading researcher in this field describes fundamentals of dynamic spectrum management provides a systematic overview on the enabling technologies covering cognitive radio blockchain and artificial intelligence and offers valuable guidance for designing advanced wireless communications systems This book is intended for a broad range of readers including students and professionals in this field as well as radio spectrum policy makers Cognitive Radio Networks Yan Zhang,Jun Zheng,Hsiao-Hwa Chen,2010-05-25 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 *Dynamic Spectrum Access (DSA) in Wireless Cognitive Radio Networks (WCRN).* Mary Adebola Ajiboye,2013 Dynamic Spectrum Access DSA is a technology that senses the unused free but allocated portion of the radio frequency spectrum on a non interfering basis These unused bands are also known as holes or white spaces DSA also refers to the time varying flexible usage of parts of the radio spectrum under consideration of regulatory and technical restrictions This type of spectrum access is due to the dynamic behavior that the Secondary User SU must employ in order to access the spectrum while avoiding interfering with a Primary User PU Intelligent or Cognitive Radio CR is a platform on which the DSA can be implemented CRs are radio systems that autonomously coordinate the usage of spectrum They utilize radio spectrum when it is not being used by incumbent primary radio systems Underutilized spectrum can be exploited with the concepts of DSA and CR This paper reviews the techniques that can be deployed for DSA reliably in a Wireless Cognitive Radio Network WCRN and models of network architecture based DSA in Cognitive Radio Networks CRN Cross-Layer Resource Allocation in Cognitive Radio Networks: Models, Algorithms, and Applications Hang Qin,2017-04-30 This book is about cognitive radio CR a revolution in radio technology and an enabling technology for dynamic spectrum access Due to the unique characteristics of the wireless networks it is essential to address the approach of multiple layers e g physical link and network to maximize the network performance The formulation of this cross layer problem is usually complicated and challenging while wireless resource allocation is a vital way to handle the race condition of the limited wireless resources However given the intrinsic characteristics of cognitive radio networks CRN none of the existing analytical approach could be a direct fit Therefore innovative theoretical results along with the corresponding mathematical techniques are necessary In this book we aim to develop some novel algorithmic design and optimization techniques that provide optimal or near optimal solutions Although cross layer design has been introduced to CRN for many years there are rarely any books for researchers engineers and students from the engineering perspective From one hand most of the existing books primarily focus on the mathematical and economic aspects which are considerably different from the engineering On the other hand all of the books mainly aim to system optimization or control techniques while the cross layer algorithm design in the distributed environment is usually ignored As the result there is an urgent demand for a reference source which can provide complete information on how to fully adopt cross layer resource allocation to the CRN In this regard this book not only focuses on the description of the main aspects of cross layer resource allocation over CRN but also provides a review of the application solutions In a nutshell it

provides a specific treatment of cross layer design in CRN The topics range from the basic concepts of cross layer resource allocation to the state of the art analyses modelings and optimizations for CRN   Cognitive Radio in 4G/5G Wireless Communication Systems Shahriar Shirvani Moghaddam,2018-12-05 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

Dynamic Spectrum Management in Cognitive Radio Partha Pratim Bhattacharya,MS. Anita Garhwal,2012-05 The radio frequency is a limited natural resource and getting enabled day by day due to growing demand of the wireless communication applications To operate on a specific frequency band license are needed The use of radio spectrum in each country is governed by the corresponding government agencies In conventional technique each user is assigned a license to operate in a certain frequency band Most of the time spectrum remains unused The allocated spectrum is not utilized properly it varies with time frequency and geographical locations Thus to overcome the spectrum scarcity and unutilized frequency band a new communication technique cognitive radio CR and dynamic spectrum access DSA are introduced CR network provides efficient utilization of the radio spectrum and highly reliable communication to users whenever and wherever needed DSA technology allows unlicensed secondary system to share the spectrum with licensed primary system In this thesis dynamic spectrum access techniques are discussed and few methods of spectrum management power management are proposed and presented

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