

Energy Efficient Cooperative Wireless Communication and Networks

Zhengguo Sheng • Chi Harold Liu



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Energy Efficient Cooperative Wireless Communication And Networks

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Compared with conventional communications cooperative communication allows multiple users in a wireless network to coordinate their packet transmissions and share each other's resources thus achieving high performance gain and better service coverage and reliability Energy Efficient Cooperative Wireless Communication and Networks provides a comp

Energy Efficient Cooperative Wireless Communication and Networks Zhengguo Sheng, Chi Liu, 2014 Compared with conventional communications cooperative communication allows multiple users in a wireless network to coordinate their packet transmissions and share each other's resources thus achieving high performance gain and better service coverage and reliability Energy Efficient Cooperative Wireless Communication and Networks provides a comprehensive look at energy efficiency and system design of cooperative wireless communication Introducing effective cooperative wireless communication schemes the book supplies the understanding and methods required to improve energy efficiency reliability and end to end protocol designs for wireless communication systems It explains the practical benefits and limitations of cooperative transmissions along with the associated designs of upper layer protocols including MAC routing and transport protocol The book considers power efficiency as a main objective in cooperative communication to ensure quality of service QoS requirements It explains how to bring the performance gain at the physical layer up to the network layer and how to allocate network resources dynamically through MAC scheduling and routing to trade off the performance benefits of given transmissions against network costs Because the techniques detailed in each chapter can help readers achieve energy efficiency and reliability in wireless networks they have the potential to impact a range of industry areas including wireless communication wireless sensor networks and ad hoc networks The book includes numerous examples best practices and models that capture key issues in real world applications Along with algorithms and tips for effective design the book supplies the understanding you will need to achieve high performing and energy efficient wireless networks with improved service coverage and reliability *Energy Efficient, Cooperative Communication in Low-Power Wireless Networks*

Abdelrahman Abdelkader, 2020

Energy Efficient Cooperative Communication Jie Yang, 2009 Abstract This

dissertation studies several problems centered around developing a better understanding of the energy efficiency of cooperative wireless communication systems Cooperative communication is a technique where two or more nodes in a wireless network pool their antenna resources to form a virtual antenna array Over the last decade researchers have shown that many of the benefits of real antenna arrays e.g spatial diversity increased range and or decreased transmission energy can be achieved by nodes using cooperative transmission This dissertation extends the current body of knowledge by providing a comprehensive study of the energy efficiency of two source cooperative transmission under differing assumptions about channel state knowledge cooperative protocol and node selfishness The first part of this dissertation analyzes the

effect of channel state information on the optimum energy allocation and energy efficiency of a simple cooperative transmission protocol called orthogonal amplify and forward OAF. The source nodes are required to achieve a quality of service QoS constraint e.g. signal to noise ratio or outage probability at the destination. Since a QoS constraint does not specify a unique transmit energy allocation when the nodes use OAF cooperative transmission, minimum total energy strategies are provided for both short term and long term QoS constraints. For independent Rayleigh fading channels, full knowledge of the channel state at both of the sources and at the destination is shown to significantly improve the energy efficiency of OAF cooperative transmission as well as direct non cooperative transmission. The results also demonstrate how channel state knowledge affects the minimum total energy allocation strategy. Under identical channel state knowledge assumptions, the results demonstrate that OAF cooperative transmission tends to have better energy efficiency than direct transmission over a wide range of channel conditions. The second part of this dissertation focuses on the development of an opportunistic hybrid cooperative transmission protocol that achieves increased energy efficiency by not only optimizing the resource allocation but also by selecting the most energy efficient cooperative transmission protocol from a set of available protocols according to the current channel state. The protocols considered in the development of the hybrid cooperative transmission protocol include compress and forward CF, estimate and forward EF, non orthogonal amplify and forward NAF, and decode and forward DF. Instantaneous capacity results are analyzed under the assumption of full channel state knowledge at both of the sources and the destination node. Numerical results are presented showing that the delay limited capacity and outage probability of the hybrid cooperative transmission protocol are superior to that of any single protocol and are also close to the cut set bound over a wide range of channel conditions. The final part of this dissertation focuses on the issue of node selfishness in cooperative transmission. It is common to assume in networks with a central authority e.g. military networks that nodes will always be willing to offer help to other nodes when requested to do so. This assumption may not be valid in ad hoc networks operating without a central authority. This section of the dissertation considers the effect selfish behavior has on the energy efficiency of cooperative communication systems. Using tools from non cooperative game theory, a two player relaying game is formulated and analyzed in non fading and fading channel scenarios. In non fading channels, it is shown that a cooperative equilibrium can exist between two self interested sources given that the end of the cooperative interaction is uncertain, that the sources can achieve mutual benefit through cooperation, and that the sources are sufficiently patient in the sense that they value future payoffs. In fading channels, a cooperative conditional trigger strategy is proposed and shown to be an equilibrium of the two player game. Sources following this strategy are shown to achieve an energy efficiency very close to that of a centrally controlled system when they are sufficiently patient. The results in this section show that cooperation can often be established between two purely self interested sources without the development of extrinsic incentive mechanisms like virtual currency.

WiMAX Evolution Marcos Katz, Frank H. P.

Fitzek,2009-04-27 This book presents the evolutionary and visionary developments of WiMAX WiMAX Evolution Emerging Technologies and Applications focuses on the future developments of WiMAX technology The book discusses the evolutionary aspects of WiMAX from the physical to the application layer including visions from industry standardization and research communities Several chapters of the book will present very new and unique information as editors and their respective organizations are involved in ongoing international projects on WiMAX developing advanced WiMAX techniques The Editors in house WiMAX test beds enhance the book with privileged and seldom published information on practical issues Key features Presents evolutionary and visionary developments of WiMAX motivating and inspiring readers to join and continue the developing work Contains chapters with previously unpublished material including measurements on real WiMAX equipment and their validation and introduction of robust header compression in WiMAX and more Unique results on real WiMAX test beds Covers WiMAX validation novel scenarios applications and business advanced WiMAX architectures WiMAX extensions and WiMAX evolution and future developments Expert authorship with a balanced mix of contributions from highly regarded professionals from top research institutes industry and academia This book is an invaluable resource for product developers research and standardization engineers in industry professors research scientists and advanced students in academia Technology managers and CTOs will also find this book insightful Energy-Efficient Computing and Communication

Sangheon Pack,2020-06-18 Information and communication technology ICT is responsible for up to 10% of world power consumption In particular communications and computing systems are indispensable elements in ICT thus determining how to improve the energy efficiency in communications and computing systems has become one of the most important issues for realizing green ICT Even though a number of studies have been conducted most of them focused on one aspect either communications or computing systems However salient features in communications and computing systems should be jointly considered and novel holistic approaches across communications and computing systems are strongly required to implement energy efficient systems In addition emerging systems such as energy harvesting IoT devices cyber physical systems CPSs autonomous vehicles AVs and unmanned aerial vehicles UAVs require new approaches to satisfy their strict energy consumption requirements in mission critical situations The goal of this Special Issue is to disseminate the recent advances in energy efficient communications and computing systems Review and survey papers on these topics are welcome Potential topics include but are not limited to the following energy efficient communications from physical layer to application layer energy efficient computing systems energy efficient network architecture through SDN NFV network slicing energy efficient system design energy efficient Internet of Things IoT and Industrial IoT IIoT energy efficient edge fog cloud computing new approaches for energy efficient computing and communications e g AI ML and data driven approaches new performance metrics on energy efficiency in emerging systems energy harvesting and simultaneous wireless information and power transfer SWIPT smart grid and vehicle to grid V2G and standardization and open source activities for energy efficient

systems **Wireless Internet** Pinyi Ren,Chao Zhang,Xin Liu,Pei Liu,Song Ci,2012-09-28 This book constitutes the thoroughly refereed post conference proceedings of the 6th International ICST Conference on Wireless Internet WICON 2011 held in Xi an Shaanxi China in October 2011 The 55 revised full papers were carefully selected from numerous submissions and focus on research in telecommunication and networking and development in information and communication technologies The papers are presented in 10 technical sessions and cover topics as video streaming over OFDMA downlink systems cognitive radio networks distributed antenna systems joint source channel coding multiuser MIMO systems signal detection frequency synchronization in 3GPP LTE systems visual cognitive radio wireless relay networks and network flow identifying methods **Green Communications for Energy-Efficient Wireless Systems and Networks** Himel A. Suraweera,Jing Yang,Alessio Zappone,John S. Thompson,2020-11-05 The energy crisis growth in data traffic and increasing network complexity are driving the development of energy efficient architectures technologies and networks This edited book presents research from theory to practice plus methods and technologies for designing next generation green wireless communication networks **4g Mobile and Wireless Communications Technologies** Sofoklis Kyriazakos,Ioannis Soldatos,George Karetsos,2022-09-01 Mobile and wireless communications are moving towards a new era that will be characterized by the seamless collaboration of heterogeneous systems the need for high speed communications while on the move and for advanced services with quality guarantees Recent market research studies show that most of the traffic in the future wireless networks will be produced by mobile multimedia services which are expected to proliferate by the year 2010 On the other hand mobile and wireless communications technology is becoming more and more important in developing countries where people demand fast deployment and low cost for broadband wireless internet services The objective of this volume is to gather research and development on topics shaping the fourth generation 4G in mobile and wireless communications and reveal the key trends and enabling technologies for 4G We envisage 4G wireless communication systems as IP based solution providing integrated services voice data multimedia regardless of time and end users location 4G technologies will manifest the benefits of the wireless and wired technologies convergence through enabling a wide range of innovative both indoor and outdoor applications 4G applications will feature premium quality high security and an affordable cost The vision though fantastic is associated with a host of technical and technological challenges A great deal of the latter are discussed in the articles of this volume which aims at providing insights on the research issues and solutions that are directly associated with leading edge 4G technologies and services Taking into account recent developments in the world of wireless communications we have given emphasis to cover all these technologies and aspects that are considered as cornerstones for achieving the goals set for 4G and that will further boost research and development of next generation mobile communications *Green IT: Technologies and Applications* Jae H. Kim,Myung J. Lee,2011-07-25 This book is the first of its kind in presenting comprehensive technical issues and solutions for rapidly growing Green IT It brings together in

a single volume both green communications and green computing under the theme of Green IT and presents exciting research and developments taking place therein in a survey style Written by the subject matter experts consisting of an international team of recognized researchers and practitioners in the field Green IT Technologies and Applications will serve as an excellent source of information on the latest technical trend of Green IT for graduate undergraduate students researchers engineers and engineering managers in the IT Electrical Communications Computer Engineering Computer Science Information Science as well as interdisciplinary areas such as sustainability environment and energy The book comprises three parts Green Communications Green Computing and Smart Grid and Applications Part I Green Communications deals with energy efficient architectures and associated performance measures in wireless communications It covers energy issues in PHY MAC Routing Application layers and their solutions for a variety of networks Part II Green Computing deals with various energy issues in data centers computing clusters computing storage and associated optimization techniques Energy management strategies are presented to balance between energy efficiency and required qualities of services Part III Smart Grid and Applications presents an overview and research challenges for smart grid Applications include modeling of urban pollutant for transportation networks Wireless Sensor Network WSN architecture with long range radio and Green IT standards

Green Radio Communication Networks Ekram Hossain,Vijay K. Bhargava, Gerhard P. Fettweis, 2012-07-05 Presents state of the art research on green radio communications and networking technology to researchers and professionals working in wireless communication

Emerging Intelligent Computing Technology and Applications. With Aspects of Artificial Intelligence De-Shuang Huang, Kang-Hyun Jo, Hong-Hee Lee, Hee-Jun Kang, Vitoantonio Bevilacqua, 2009-09-19 The International Conference on Intelligent Computing ICIC was formed to provide an annual forum dedicated to the emerging and challenging topics in artificial intelligence machine learning bioinformatics and computational biology etc It aims to bring together researchers and practitioners from both academia and industry to share ideas problems and solutions related to the multifaceted aspects of intelligent computing ICIC 2009 held in Ulsan Korea September 16 19 2009 constituted the 5th International Conference on Intelligent Computing It built upon the success of ICIC 2008 ICIC 2007 ICIC 2006 and ICIC 2005 held in Shanghai Qingdao Kunming and Hefei China 2008 2007 2006 and 2005 respectively This year the conference concentrated mainly on the theories and methodologies as well as the emerging applications of intelligent computing Its aim was to unify the picture of contemporary intelligent computing techniques as an integral concept that highlights the trends in advanced computational intelligence and bridges theoretical research with applications Therefore the theme for this conference was Emerging Intelligent Computing Technology and Applications Papers focusing on this theme were solicited addressing theories methodologies and applications in science and technology

Wireless Communications Networks for the Smart Grid Quang-Dung Ho, Yue Gao, Gowdemy Rajalingham, Tho Le-Ngoc, 2014-09-19 This brief presents a comprehensive review of the network architecture

and communication technologies of the smart grid communication network SGCN It then studies the strengths weaknesses and applications of two promising wireless mesh routing protocols that could be used to implement the SGCN Packet transmission reliability latency and robustness of these two protocols are evaluated and compared by simulations in various practical SGCN scenarios Finally technical challenges and open research opportunities of the SGCN are addressed Wireless Communications Networks for Smart Grid provides communication network architects and engineers with valuable proven suggestions to successfully implement the SGCN Advanced level students studying computer science or electrical engineering will also find the content helpful Full-Duplex Communications and Networks Lingyang Song,Risto Wichman,Yonghui Li,Zhu Han,2017-03-02 Learn about the key technologies and state of the art in research for full duplex communications with this comprehensive guide *Game Theory in Wireless and Communication Networks* Zhu Han,2012 This unified 2001 treatment of game theory focuses on finding state of the art solutions to issues surrounding the next generation of wireless and communications networks The key results and tools of game theory are covered as are various real world technologies and a wide range of techniques for modeling design and analysis Wideband Wave-Propagating Components for Wireless RF Communications Mohammad Alibakhshikenari,2025-03-19 This book provides detailed design studies on various microwave and millimeter wave components such as modern antennas well developed sensors low loss waveguides and high precision radar structures for wireless RF communications Innovative methodologies and design approaches to overcoming challenges and enhancing the efficiency of current wireless communication devices have been thoroughly demonstrated along with experimental validations The strength of this book lies in its extensive collection of review studies on numerous works available in the literature Their disadvantages and advantages have been explicitly summarized to provide a comprehensive insight for readers Then the feasible techniques proposed in this book offer proper solutions to resolve the disadvantages of prior arts causing the improvement of the quality of telecommunication networks These contributions in antennas and wave propagation sensors waveguides and radar systems can be useful for researchers in these fields from both academic and industrial sectors interested in establishing further developments of wireless RF communication systems This book includes ten chapters discussing several wireless communication applications which were prepared by various worldwide research groups with extensive track records in RF microwave and millimeter wave technologies Innovations in Electronics and Communication Engineering H. S. Saini,R. K. Singh,Mirza Tariq Beg,Ravibabu Mulaveesala,Md Rashid Mahmood,2022-03-12 This book covers various streams of communication engineering like signal processing VLSI design embedded systems wireless communications and electronics and communications in general The book is a collection of best selected research papers presented at 9th International Conference on Innovations in Electronics and Communication Engineering at Guru Nanak Institutions Hyderabad India The book presents works from researchers technocrats and experts about latest technologies in electronic and communication engineering The authors

have discussed the latest cutting edge technology and the book will serve as a reference for young researchers *Wireless Power Transfer Algorithms, Technologies and Applications in Ad Hoc Communication Networks* Sotiris Nikolettseas, Yuanyuan Yang, Apostolos Georgiadis, 2016-11-18 This book is the first systematic exposition on the emerging domain of wireless power transfer in ad hoc communication networks It selectively spans a coherent large spectrum of fundamental aspects of wireless power transfer such as mobility management in the network combined wireless power and information transfer energy flow among network devices joint activities with wireless power transfer routing data gathering and solar energy harvesting and safety provisioning through electromagnetic radiation control as well as fundamental and novel circuits and technologies enabling the wide application of wireless powering Comprising a total of 27 chapters contributed by leading experts the content is organized into six thematic sections technologies communication mobility energy flow joint operations and electromagnetic radiation awareness It will be valuable for researchers engineers educators and students and it may also be used as a supplement to academic courses on algorithmic applications wireless protocols distributed computing and networking

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 **Reliable**

Communications for Short-Range Wireless Systems Ismail Guvenc, Sinan Gezici, Zafer Sahinoglu, Ulas C. Kozat, 2011-03-24 Ensuring reliable communication is an important concern in short range wireless communication systems with stringent quality of service requirements Key characteristics of these systems including data rate communication range channel profiles network topologies and power efficiency are very different from those in long range systems This comprehensive book classifies short range wireless technologies as high and low data rate systems It addresses major factors affecting reliability at different layers of the protocol stack detailing the best ways to enhance the capacity and performance of short range wireless systems Particular emphasis is placed on reliable channel estimation state of the art interference mitigation techniques and cooperative communications for improved reliability The book also provides detailed coverage of related international standards including UWB ZigBee and 60 GHz communications With a balanced treatment of theoretical and practical aspects of short range wireless communications and with a focus on reliability this is an ideal resource for practitioners and researchers in wireless communications

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Energy Efficient Cooperative Wireless Communication And Networks Introduction

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