

Energy Efficient Cooperative Wireless Communication and Networks

Zhengguo Sheng • Chi Harold Liu



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Kaabouch, Naima, Hu, Wen-Chen



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Energy Efficient Cooperative Wireless Communication and Networks Zhengguo Sheng, Chi Harold Liu, 2014-11-11
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 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.

Energy Efficient, Cooperative Communication in Low-Power Wireless Networks Abdelrahman Abdelkader, 2020 *Wireless Sensor Networks* Ibrahiem M. M. El Emary, S.

Ramakrishnan,2013-08-28 Although there are many books available on WSNs most are low level introductory books The few available for advanced readers fail to convey the breadth of knowledge required for those aiming to develop next generation solutions for WSNs Filling this void Wireless Sensor Networks From Theory to Applications supplies comprehensive coverage of WSNs In order to provide the wide ranging guidance required the book brings together the contributions of domain experts working in the various subfields of WSNs worldwide This edited volume examines recent advances in WSN technologies and considers the theoretical problems in WSN including issues with monitoring routing and power control It also details methodologies that can provide solutions to these problems The book s 25 chapters are divided into seven parts Data Collection Physical Layer and Interfacing Routing and Transport Protocols Energy Saving Approaches Mobile and Multimedia WSN Data Storage and Monitoring Applications The book examines applications of WSN across a range of fields including health military transportation and mining Addressing the main challenges in applying WSNs across all phases of our life it explains how WSNs can assist in community development Complete with a list of references at the end of each chapter this book is ideal for senior undergraduate and postgraduate students researchers scholars academics industrial researchers and practicing engineers working on WSNs The text assumes that readers possess a foundation in computer networks wireless communication and basic electronics Intelligent Circuits and Systems for SDG 3 – Good Health and well-being

Bhaveskumar Choithram Dharman,Suman Lata Tripathi,2024-08-05 ICICS is a series of conferences initiated by School of Electronics and Electrical Engineering at Lovely Professional University Looking at the response to the conference the bi annual conference now onwards will be annual The 5th International Conference on Intelligent Circuits and Systems ICICS 2023 will be focusing on intelligent circuits and systems for achieving the targets in Sustainable Development Goal SDG 3 identified as Good Health and Wellbeing by United Nations Refs <https://sdgs.un.org/goals/goal3> <https://sdg-tracker.org>

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 *Full-Duplex Communications and Networks*

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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

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.

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 Algorithms and Protocols for Wireless Body Sensor Networks Rongrong Zhang, Jihong Yu, 2019-08-28 This book provides a systematic treatment of the theoretical foundation and algorithmic tools necessary in the design of energy efficient algorithms and protocols in wireless body sensor networks (WBSNs). These problems addressed in the book are of both fundamental and practical importance. Specifically, the book delivers a comprehensive treatment on the following problems ranging from theoretical modeling and analysis to practical

algorithm design and optimization energy efficient clustering based leader election algorithms in WBSNs MAC protocol for duty cycling WBSNs with concurrent traffic multi channel broadcast algorithms in duty cycling WBSNs and energy efficient sleep scheduling algorithms in WBSNs Target readers of the book are researchers and advanced level engineering students interested in acquiring in depth knowledge on the topic and on WBSNs and their applications both from theoretical and engineering perspective Game Theory Framework Applied to Wireless Communication Networks Yang, Chungang,Li, Jiandong,2015-08-26 The popularity of smart phones and other mobile devices has brought about major expansion in the realm of wireless communications With this growth comes the need to improve upon network capacity and overall user experience and game based methods can offer further enhancements in this area Game Theory Framework Applied to Wireless Communication Networks is a pivotal reference source for the latest scholarly research on the application of game theoretic approaches to enhance wireless networking Featuring prevailing coverage on a range of topics relating to the advanced game model mechanism designs and effective equilibrium concepts this publication is an essential reference source for researchers students technology developers and engineers This publication features extensive research based chapters across a broad scope of relevant topics including potential games coalition formation game heterogeneous networks radio resource allocation coverage optimization distributed dynamic resource allocation dynamic spectrum access physical layer security and cooperative video transmission **Broadband Communications, Networks, and Systems** Victor Sucasas,Georgios Mantas,Saud Althunibat,2018-12-29 This book constitutes the refereed post conference proceedings of the 9th International Conference on Broadband Communications Networks and Systems Broadnets 2018 which took place in Faro Portugal in September 2018 The 30 revised full and 16 workshop papers were carefully reviewed and selected from 68 submissions The papers are thematically grouped as follows Advanced Techniques for IoT and WSNs SDN and Network Virtualization eHealth and Telemedicine Mobile Applications Security and Privacy Preservation Communication Reliability and Protocols Spatial Modulation Techniques Hardware Implementation and Antenna Design 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 Proceedings of International Conference on ICT for Sustainable Development Suresh Chandra Satapathy,Amit Joshi,Nilesh Modi,Nisarg

Pathak,2016-02-10 The two volumes of this book collect high quality peer reviewed research papers presented in the International Conference on ICT for Sustainable Development ICT4SD 2015 held at Ahmedabad India during 3 4 July 2015 The book discusses all areas of Information and Communication Technologies and its applications in field for engineering and management The main focus of the volumes are on applications of ICT for Infrastructure e Governance and contemporary technologies advancements on Data Mining Security Computer Graphics etc The objective of this International Conference is to provide an opportunity for the researchers academicians industry persons and students to interact and exchange ideas experience and expertise in the current trend and strategies for Information and Communication Technologies *Green Networking and Communications* Shafiullah Khan,Jaime Lloret Mauri,2013-10-29 Although the information and communication technology ICT industry accounted for only 2 percent of global greenhouse gas emissions in 2007 the explosive increase in data traffic brought about by a rapidly growing user base of more than a billion wireless subscribers is expected to nearly double that number by 2020 It is clear that now is the time to rethink how we design and build our networks Green Networking and Communications ICT for Sustainability brings together leading academic and industrial researchers from around the world to discuss emerging developments in energy efficient networking and communications It covers the spectrum of research subjects including methodologies and architectures for energy efficiency energy efficient protocols and networks energy management smart grid communications and communication technologies for green solutions Examines foraging inspired radio communication energy management for green multi radio networks Considers a cross layer approach to the design of energy efficient wireless access networks Investigates the interplay between cooperative device to device communications and green LTE cellular networks Considers smart grid energy procurement for green LTE cellular networks Details smart grid networking protocols and standards Considering the spectrum of energy efficient network components and approaches for reducing power consumption the book is organized into three sections Energy Efficiency and Management in Wireless Networks Cellular Networks and Smart Grids It addresses many open research challenges regarding energy efficiency for IT and for wireless sensor networks including mobile and wireless access networks broadband access networks home networks vehicular networks intelligent future wireless networks and smart grids It also examines emerging standards for energy efficient protocols Since ICT technologies touch on nearly all sectors of the economy the concepts presented in this text offer you the opportunity to make a substantial contribution to the reduction of global greenhouse gas emissions **Mobile Opportunistic Networks: Architectures, Protocols and Applications** Mieso K. Denko,2011 *Ambient Backscatter Communication Networks* Dinh Thai Hoang,Dusit Niyato,Dong In Kim,Nguyen Van Huynh,Shimin Gong,2020-04-30 Understand the fundamental principles and applications of ambient backscatter technology with this authoritative review Covering both theory and practical engineering leading researchers describe and explain hardware design network design and signal processing and discuss architectures protocols communication methods

open research issues emerging applications and advanced system models with innovative solutions This is an essential tool for graduate students researchers engineers developers and entrepreneurs *Next-Gen Technologies in Computational Intelligence* R. Anandan,M. Senthil Kumar,Biji C. L.,Vicente García Díaz,Souvik Pal,2024-06-07 The Proceeding includes the research contribution from the International Conference on Next Gen Technologies in Computational Intelligence NGTCA 2023 held on March 24th 2023 at Vels Institute of Science Technology and Advanced Studies NGCTA 2023 is the flagship conference of the Computer Society of India Region 7 Computer Society of India CSI is the largest association of IT professionals in India CSI is a non profit organization established in 1965 and its members are committed to the advancement of theory and practice of Computer Engineering and Technology Systems The Mission of CSI is to facilitate research knowledge sharing learning and career enhancement for all categories of IT professionals while simultaneously inspiring and nurturing new entrants into the industry and helping them to integrate into the IT community At present CSI has 76 chapters across India over 550 student branches with 1 00 000 plus members It serves its members through technical events seminars workshops conferences publications journals research projects competitions special interest groups awards recognitions etc Various CSI chapters conduct Research Convention every year

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