

Energy Efficient Cooperative Wireless Communication and Networks

Zhengguo Sheng • Chi Harold Liu



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SJ Ball



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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

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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 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 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

Green Communications for Energy-Efficient Wireless Systems and Networks Himal 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

Energy-Efficient Computing and Communication Sangheon Park,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

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

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 *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 **Energy Efficient Cooperative Communication in Wireless Sensor Networks Subject to Frequency-selective Fading** Jianjie Tian (the author),2017 Energy efficient cooperative diversity techniques are investigated in this thesis with the aim of improving the energy efficiency of wireless sensor networks WSNs in the presence of additive white Gaussian noise AWGN and frequency selective Rayleigh fading without degrading the reliability of data transmission The studies reported mainly focus the theoretical aspects of aiming establishing the feasibility of employing cooperative diversity techniques in WSNs subject to AWGN and frequency selective Rayleigh fading to effectively improve the network's energy efficiency in the physical layer With improvements to energy efficiency the operational lifetime of WSN applications operating in indoor environments can be prolonged A mathematical model of a single input single output SISO wireless communication system with direct sequence spread spectrum DSSS transceivers in the presence of AWGN and frequency selective Rayleigh fading is proposed modelled theoretically analysed and simulated In order to save the transmit energy consumption of sensor nodes DSSS transceivers with chip interleaving signal processing are considered as well Analytical expressions of bit error rate BER in closed form are derived and analysed for wireless systems using DSSS transceivers with or without chip interleaving signal processing Using the derived BER algorithms the BER performances of virtual multiple input single output vMISO decode and forward DF and adaptive decode and forward aDF cooperation in WSNs subject to AWGN and frequency selective Rayleigh fading are investigated as well Performance evaluations are carried out based on the BER expressions and energy consumption models of vMISO DF and aDF cooperation in terms of their optimal transmit power allocation and partner selection region Because the energy expenditure of a sensor node can also be reduced by using the chip interleaving signal processing cooperative diversity vMISO and DF and chip interleaved techniques are employed in combination to further improve the energy efficiency of WSNs operating over AWGN channels with frequency selective Rayleigh fading

Furthermore several simple partner selection heuristics are developed for energy efficient vMISO and DFcooperative schemes which will enable resource constrained sensor nodes to make cooperation decisions independently and autonomously In summary the analytical and simulation results demonstrate that the energy efficiency of WSNs subject to AWGN and frequency selective Rayleigh fading can be significantly improved by implementing the cooperative diversity techniques and the chip interleaving technique individually or in combination

Energy Efficient Cooperative Wireless Communication And Networks: Bestsellers in 2023 The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous engrossing novels captivating the hearts of readers worldwide. Lets delve into the realm of popular books, exploring the engaging narratives that have charmed audiences this year. The Must-Read : Colleen Hoover's "It Ends with Us" This heartfelt tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover expertly weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can prevail. Uncover the Best : Taylor Jenkins Reid's "The Seven Husbands of Evelyn Hugo" This spellbinding historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reid's absorbing storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic : Delia Owens' "Where the Crawdads Sing" This evocative coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These top-selling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of captivating stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and suspenseful novel that will keep you wondering until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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