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Technical Program

Registration

Wireless Powered Communication Networks: Architectures, Protocols, and Applications

Abstract: This tutorial will provide a comprehensive review on the state-of-the-art research and technological developments on the architectures, protocols, and applications of the wireless powered communication networks. The tutorial will start with an introduction to the circuit design of wireless powered communication devices. Then the tutorial will discuss about the architecture and protocol design issues for the wireless powered communication networks. Different wireless network architectures including single-hop networks, multihop relay networks, centralized and decentralized networks, and multi-antenna systems for RF energy harvesting and wireless energy transfer will be covered. Then the tutorial will delve into different physical, radio link/MAC, and network layer protocol design issues to support and utilize wireless energy harvesting and transfer capability. Next the tutorial will discuss about applications of energy harvesting and transfer in different wireless networking scenarios, for example, those in cellular networks, sensor networks, cognitive radio networks, mobile ad hoc and delay tolerant networks. In addition to reviewing the existing approaches for architecture, protocol, and application design in wireless powered communication networks, the tutorial will outline some emerging research directions in this area.

Instructors:

Dong In Kim received the B.S. and M.S. degrees in Electronics Engineering from Seoul National University, Seoul, Korea, in 1980 and 1984, respectively, and the M.S. and Ph.D. degrees in Electrical Engineering from the University of Southern California (USC), Los Angeles, in 1987 and 1990, respectively. From 1984 to 1985, he was Researcher with Korea Telecom Research Center, Seoul. From 1986 to 1988, he was a Korean Government Graduate Fellow in the Department of Electrical Engineering, USC. From 1991 to 2002, he was with the University of Seoul, Seoul, leading the Wireless Communications Research Group. From 2002 to 2007, he was a tenured Professor in the School of Engineering Science, Simon Fraser University (SFU), Burnaby, BC, Canada. From 1999 to 2000, he was a Visiting Professor at the University of Victoria, Victoria, BC. Since 2007, he has been with Sungkyunkwan University (SKKU), Suwon, Korea, where he is a Professor and SKKU Fellow in the College of Information and Communication Engineering. Recently he was awarded the Engineering Research Center (ERC) on Wireless Energy Harvesting and appointed the Director of ERC by The Ministry of Science, ICT & Future Planning (MSIP), Korea. His current research interests include flexible spectrum utilization in future cellular systems, wireless energy harvesting, and cross-layer design for interference and resource management.

Dr. Kim has served as an Editor and a Founding Area Editor of Cross-Layer Design and Optimization for the IEEE Transactions on Wireless Communications from 2002 to 2011. From 2008 to 2011, he served as the Co-Editor-in-Chief for the Journal of Communications and Networks. He is currently the Founding Editor-in-Chief for the IEEE Wireless Communications Letters and has been serving as an Editor of Spread Spectrum Transmission and Access for the IEEE Transactions on Communications since 2001.

Dusit Niyato is currently an Associate Professor in the School of Computer Engineering, at the Nanyang Technological University, Singapore. He received B.E. from King Mongkuk's Institute of Technology Ladkrabang (KMITL) in 1999. He received Ph.D. in Electrical and Computer Engineering from the University of Manitoba, Canada in 2008. His research interests are in the area of the optimization of wireless communication and mobile cloud computing, smart grid systems, and green radio communications.

Heterogeneous Cloud Radio Access Networks: Principles and Technologies

Abstract: Heterogeneous networks (HetNets) have attracted intense interest from both academia and industry to potentially improve spatial reuse and coverage, thus allowing cellular systems to achieve higher data rates, while retaining the seamless connectivity and mobility of cellular networks. However, considering the severe inter-tier interference and limited cooperative gains resulting from the constrained and nonideal transmissions between adjacent base stations, a new paradigm for improving both spectral efficiency and energy efficiency through suppressing inter-tier interference and enhancing the cooperative processing capabilities is needed in the practical evolution of HetNets. Cloud computing technology has emerged as a promising solution for providing high energy efficiency together with gigabit data rates across software defined wireless communication networks, in which the virtualization of communication hardware and software elements place stress on communication networks and protocols. Consequently, heterogeneous cloud radio access networks (H-CRANs) have been proposed as cost-effective potential solutions to alleviating inter-tier interference and improving cooperative processing gains in HetNets through combination with cloud computing.

Inspired by the attractive features and potential advantages of H-CRANs, their development and deployment have been gaining momentum in the wireless industry and research communities during the past few years. However, H-CRANs also come with their own challenges, and there are significant technical issues that still need to be addressed for successful rollout and operation of these networks.

In this tutorial, we will introduce the principles and technologies of H-CRAN and discuss some recent results related to the fundamental understanding and design of H-CRANs. In conclusion, we will provide some discussions of future research topics related to H-CRAN and how H-CRAN will play a role in 5G and beyond.

Instructors:

Tony Q.S. Quek received the B.E. and M.E. degrees in Electrical and Electronics Engineering from Tokyo Institute of Technology, Tokyo, Japan, respectively. At Massachusetts Institute of Technology (MIT), Cambridge, MA, he earned the Ph.D. in Electrical Engineering and Computer Science. Currently, he is an Assistant Professor with the Singapore University of Technology and Design

(SUTD). He has been actively involved in organizing and chairing sessions, and has served as Technical Program Committee (TPC) chair and TPC member in a number of international conferences and workshops. He is serving as the PHY & Fundamentals Track Co-Chair for IEEE WCNC in 2015, the Communication Theory Symposium Co-Chair for IEEE ICC in 2015, the PHY & Fundamentals Track Co-Chair for IEEE EuCNC in 2015, the Communications Track Co-Chair for the IEEE ATC in 2015, and the Communication and Control Theory Symposium Co-Chair for IEEE ICC in 2015. He is currently an Executive Editorial Committee Member for the IEEE Transactions on Wireless Communications, an Editor for the IEEE Transactions on Communications and the IEEE Wireless Communications Letters. He was Guest Editor for the IEEE Signal Processing Magazine (Special Issue on Signal Processing for 5G Evolution) in 2014 and the IEEE Wireless Communications Magazine (Special Issue on Heterogeneous Cloud Radio Access Networks) in 2015. Dr. Quek was honored with the 2008 Philip Yeo Prize for Outstanding Achievement in Research, the IEEE Globecom 2010 Best Paper Award, the 2011 JSPS Invited Fellow for Research in Japan, the CAS Fellowship for Young International Scientists in 2011, the 2012 IEEE William R. Bennett Prize, the 2013 IEEE SPAWC Best Student Paper Award, and the 2014 IEEE WCSP Best Paper Award. He is a senior member of the IEEE.

Mugen Peng received the B.E. degree in Electronics Engineering from Nanjing University of Posts & Telecommunications, China in 2000 and a PhD degree in Communication and Information System from the Beijing University of Posts & Telecommunications (BUPT), China in 2005. After the PhD graduation, he joined in BUPT, and has become a full professor with the school of information and communication engineering in BUPT since Oct. 2012. During 2014, he is also an academic visiting fellow in Princeton University, USA. He is leading a research group focusing on wireless transmission and networking technologies in the Key Laboratory of Universal Wireless Communications (Ministry of Education) at BUPT. His main research areas include wireless communication theory, radio signal processing and convex optimizations, with particular interests in cooperative communication, radio network coding, self-organizing network, heterogeneous network, and cloud communication. He has authored/coauthored over 50 refereed IEEE journal papers and over 200 conference proceeding papers.

Dr. Peng is currently on the Editorial/Associate Editorial Board of the IEEE Communications Magazine, the IEEE Access, the IET Communications, the International Journal of Antennas and Propagation (IJAP), the China Communications, and the International Journal of Communications System (IJCS). He has been the guest leading editor for the special issues in the IEEE Wireless Communications. Dr. Peng was a recipient of the 2014 IEEE ComSoc AP Outstanding Young Researcher Award, and the best paper award in GameNets 2014, CIT 2014, ICCTA 2011, IC-BNMT 2010, and IET CCWMC 2009. He received the First Grade Award of Technological Invention Award in Ministry of Education of China for his excellent research work on the hierarchical cooperative communication theory and technologies, and the Second Grade Award of Scientific and Technical Advancement from China Institute of Communications for his excellent research work on the co-existence of multi-radio access networks and the 3G spectrum management.

5G Channel Measurement and Modeling

Session 1

Indoor Office Channel Measurements and Analysis of Propagation Characteristics at 14 GHz

Runquan Miao (Beijing University of Posts and Telecommunications, P.R. China); Tian Lei (Beijing University of Posts and Telecommunications & Wireless Technology Innovation Institute, P.R. China); Yi Zheng (China Mobile, P.R. China); Pan Tang, Fusheng Huang and Jianhua Zhang (Beijing University of Posts and Telecommunications, P.R. China)
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Directional Path Loss Characteristics of Large Indoor Environments with 28 GHz Measurements

Juyul Lee, Jinyi Liang, Jae-Joon Park and Myung-Don Kim (ETRI, Korea)
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28GHz millimeter Wave Propagation Models Based on Ray-Tracing in Urban Scenario

Bolun Guo (Huawei Technologies Co., Ltd, P.R. China); Yong Wu (Huawei Technologies Co., Ltd., P.R. China); Meiyang Yang (Huawei Technologies Co., Ltd, P.R. China); Jian Li (Huawei Technologies Co., Ltd., P.R. China)
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Spectrogram Analysis of Multipath Fading Channels

Matthias Pätzold (University of Agder, Norway); Neji Youssef (Ecole superieure des communications de Tunis, Tunisia)
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15 GHz Propagation Properties Assessed with 5G Radio Access Prototype

Peter Ökvist (Ericsson Research, Sweden); Henrik Asplund (Ericsson Research, Ericsson AB, Sweden); Arne Simonsson and Björn Halvarsson (Ericsson, Sweden); Jonas Medbo (Ericsson Research, Sweden); Nima Seifi (Ericsson Research & Ericsson AB, Sweden)
pp. 2220-2224

Wireless Communications in Millimeter Wave Bands

Session 1

Scheduling Schemes for Interference Suppression in Millimeter-Wave Cellular Network

Hong Li (Huawei Technologies Co., Ltd, P.R. China); Lei Huang (Huawei Technologies Co., Ltd., P.R. China); Yi Wang (Huawei Technologies Co., Ltd, P.R. China)
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A Millimeter Wave Channel Model with Variant Angles under 3GPP SCM Framework

Yi Wang (Huawei Technologies Co., Ltd, P.R. China); Lei Huang (Huawei Technologies Co., Ltd., P.R. China); Zhenyu Shi (Huawei Technologies Co., Ltd, P.R. China); Kunpeng Liu (Huawei Technologies, Co. Ltd., Chengdu, P.R. China); Xiongfei Zou (Huawei Technologies Co., Ltd., P.R. China)
pp. 2249-2254

BF-assisted Joint Relay Selection and Power Control for Cooperative Multicast in MmWave Networks

Hongyun Chu and Pingping Xu (Southeast University, P.R. China); Wei Wang (Southeast University (China), P.R. China); Chencheng Yang (Purdue University, USA); Wenxiang Zhu (Southeast University, P.R. China)
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Coffee Break

Wireless Powered Communication Networks: Architectures, Protocols, and Applications

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Heterogeneous Cloud Radio Access Networks: Principles and Technologies

Continuation of T4.

5G Channel Measurement and Modeling

Session 2

45GHz propagation channel modeling for an indoor conference scenario

Jianwu Dou and Li Tian (ZTE Corporation, P.R. China); Haiming Wang (Southeast University, P.R. China); Xi Yuan (ZTE Corporation, P.R. China); Nan Zhang (Tongji University, P.R. China); Suping Mei (ZTE Corporation, P.R. China)
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Path Loss Models for Urban Macro Cell Scenario at 3.35, 4.9 and 5.4 GHz

Hang Zheng (Beijing University of Posts and Telecommunications, P.R. China); Wei Li (The State Radio Monitoring Center, P.R. China); Tian Lei (Beijing University of Posts and Telecommunications & Wireless Technology Innovation Institute, P.R. China); Chongpeng Xu, Fusheng Huang and Jianhua Zhang (Beijing University of Posts and Telecommunications, P.R. China)
pp. 2229-2233

Double-Directional and Dual-Polarimetric Indoor Measurements at 70 GHz

Diego Dupleich (Ilmenau University of Technology, Germany); Stephan Haefner (Technische Universität Ilmenau, Germany); Christian Schneider (Ilmenau University of Technology, Germany); Robert Müller (TU Ilmenau, Germany); Reiner S. Thomä (Ilmenau University of Technology, Germany); Jian Luo and Egon Schulz (Huawei Technologies Duesseldorf GmbH, Germany); Naveed Iqbal (Ilmenau University of Technology, Germany); Xiaofeng Lu (Huawei Technology Company, P.R. China); Guangjian Wang (Huawei Technologies, P.R. China)
pp. 2234-2238

A Non-Stationary Geometry-Based Scattering Model for Street Vehicle-to-Vehicle Wideband MIMO Channels

Xiaolin Liang, Xiongwen Zhao, Shu Li and Qi Wang (North China Electric Power University, P.R. China); Jingchun Li (State Radio Monitoring Center, P.R. China)
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Wireless Communications in Millimeter Wave Bands

Session 2

Dynamic Resource Allocation in mmWave Unified Access and Backhaul Network

Zhenyu Shi and Yi Wang (Huawei Technologies Co., Ltd, P.R. China); Lei Huang (Huawei Technologies Co., Ltd., P.R. China); Tianxiang Wang (Huawei Technologies Co., Ltd, P.R. China)
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Simulation Study on Millimeter Wave 3D Beamforming Systems in Urban Outdoor Multi-Cell Scenarios Using 3D Ray Tracing

Miaomiao Dong, Wai Ming Chan and Taejoon Kim (City University of Hong Kong, Hong Kong); Kunpeng Liu (Huawei Technologies, Co. Ltd., Chengdu, P.R. China); Huang Huang (Huawei Technologies Co., Ltd., P.R. China); Guangjian Wang (Huawei Technologies, P.R. China)
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AoD and AoA Tracking with Directional Sounding Beam Design for Millimeter Wave MIMO Systems

Qiyu Duan and Taejoon Kim (City University of Hong Kong, Hong Kong); Huang Huang (Huawei Technologies Co., Ltd., P.R. China); Kunpeng Liu (Huawei Technologies, Co. Ltd., Chengdu, P.R. China); Guangjian Wang (Huawei Technologies, P.R. China)
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Advanced Air Interface Techniques for 5G: Emerging Concepts and Research Opportunities

Abstract: The exponential increase of mobile traffic due to the widespread use of smart devices, further combined with the complexity of future wireless infrastructures in supporting more diverse applications and distributed radio resources, directly necessitates the current intensive research efforts on the 5th Generation (5G) wireless networks worldwide. In supporting the anticipated 1,000 times increase of the network capacity, advanced air interface techniques are essential for 5G in enabling new spatial transmission schemes with extremely high utilization rates of distributed radio resources, tight collaboration between heterogeneous networks, and extremely energy efficient 5G network operation.

The objective of the tutorial is to analyze the key technical aspects of 5G, identify the essential physical layer enabling technologies, and present the emerging research opportunities on 5G. Our target audience encompasses 5G researchers from academia, industry, government agencies and standard development bodies. We aim to bridge all stakeholders related to 5G and accelerate the ongoing R&D efforts and standardization processes worldwide.

Part I of the tutorial will start with an overview of 5G, with a focus on the technical analysis of 5G. Specific considerations of 5G communications will be discussed, including channel characteristics, downlink-uplink reciprocity and multi-tier architecture. In Part II of the tutorial, key physical layer technologies for 5G will be presented. These include the essential transmission technologies (i.e., distributed antenna systems and massive MIMO), new waveform and training sequence designs, and channel estimation. Emerging 5G research opportunities and challenges will be discussed in Part III of the tutorial. Topics in this section cover both theoretical and practical aspects, including channel modeling, estimation, prediction, system optimization, hardware distortion impact, and interference coordination and minimization.

Instructors:

Dr. Xianbin Wang (S'98-M'99-SM'06) is a Professor and Canada Research Chair at Western University, Canada. He received his Ph.D. degree in electrical and computer engineering from National University of Singapore in 2001.

Prior to joining Western, he was with Communications Research Centre Canada as Research Scientist/Senior Research Scientist between July 2002 and Dec. 2007. From Jan. 2001 to July 2002, he was a system designer at STMicroelectronics, where he was responsible for system design for DSL and Gigabit Ethernet chipsets. His current research interests include adaptive wireless systems, 5G networks, communications security, and distributed ICT systems. Dr. Wang has over 200 peer-reviewed journal and conference papers on various communication system design issues, in addition to 24 granted and pending patents and several standard contributions.

Dr. Wang was the recipient of three IEEE Best Paper Awards. He currently serves as an Associate Editor for IEEE Wireless Communications Letters, IEEE Transactions on Vehicular Technology and IEEE Transactions on Broadcasting. He was also an editor for IEEE Transactions on Wireless Communications between 2007 and 2011. Dr. Wang is a Senior Member of IEEE and an IEEE

Distinguished Lecturer. He was involved in a number of IEEE conferences including GLOBECOM, ICC, WCNC, VTC, ICME and CWIT, in different roles such as symposium chair, tutorial instructor, session chair, track chair, and TPC chair.

Dr. Tadilo Endeshaw Bogale (S'09-M'14) has received a BSc degree in Electrical Engineering from Jimma University, Ethiopia. From 2004 to 2007, he was working in Ethio Telecom, Addis Ababa, Ethiopia. He received MSc and PhD degrees in Electrical Engineering from Karlstad University, Sweden and University Catholique de Louvain (UCL), Louvain la neuve, Belgium in 2008 and 2013, respectively. From January 2014 to October 2014, Tadilo was working as a postdoctoral researcher at the Institut National de la Recherche Scientifique (INRS), Montreal, Canada. Since November 2014, he has been working as a joint postdoctoral researcher with INRS and University of Western Ontario, London, Canada. Currently, he is working on assessing the potential technologies to enable the future 5G network.

Specifically, his research focuses on the exploitation of massive MIMO and millimeter wave (mmWave) techniques for 5G network. His research interests include hybrid Analog-digital Beamforming for massive MIMO and mmWave systems, pilot contamination reduction for multicell massive MIMO systems, spectrum sensing and resource allocation for cognitive radio networks, robust (non-robust) transceiver design for multiuser MIMO systems, centralized and distributed algorithms, and convex optimization techniques for multiuser systems. He has recently organized a workshop on Cognitive Radio for 5G networks which is collocated in CROWNCOM 2015 conference. He was acting as a session chair for ICC, CISS and CROWNCOM conferences and NEWCOM# workshop. Dr. Tadilo has also served as a TPC member on different international conferences such as PIMRC, CROWNCOM and VTC.

Dr. Fumiyuki Adachi is an IEEE Fellow and IEICE Fellow and a Professor at Tohoku University, Japan. He received the B.S. and Dr. Eng. degrees in electrical engineering from Tohoku University, Sendai, Japan, in 1973 and 1984, respectively. In April 1973, he joined the Electrical Communications Laboratories of NTT and conducted various types of research related to digital cellular mobile communications. From July 1992 to December 1999, he was with NTT DoCoMo, where he led a research group on Wideband CDMA for 3G systems. Since January 2000, he has been with Tohoku University, Sendai, Japan, where he is a full Professor of Communications Engineering at the Graduate School of Engineering.

Dr. Adachi is a pioneer in wireless communications since 1973 and has largely contributed to the design of wireless networks from 1st generation (1G) to 4G. He is an IEEE Vehicular Technology Society Distinguished Lecturer since 2012. He was a vice president of IEICE Japan in 2014. He was a recipient of the IEEE Vehicular Technology Society Avant Garde Award 2000, IEICE Achievement Award 2002, Thomson Scientific Research Front Award 2004, Ericsson Telecommunications Award 2008, Telecom System Technology Award 2010, Prime Minister Invention Award 2010, KDDI Foundation Excellent Research Award 2012, and C&C Prize 2014. His research interests include wireless signal processing for wireless access, equalization, transmit/receive antenna diversity, MIMO, adaptive transmission, channel coding, and wireless systems. He is listed in Highly Cited Researchers 2001 (<http://highlycited.com/isihighlycited.htm#table>). His recent research interests include 5G communications with a focus on distributed antenna network.

M2M Communications: Challenges, Solutions and Applications

Session 1: Analysis of Techniques for M2M Communications

Data Aggregation in Capillary Networks for Machine-to-Machine Communications

Hamidreza Shariatmadari, Prajwal Osti and Sassan Iraji (Aalto University, Finland); Riku Jäntti (Aalto University School of Electrical Engineering, Finland)
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Coverage Analysis of Bluetooth Low Energy and IEEE 802.11ah for Office Scenario

Piergiuseppe Di Marco (Ericsson Research, Sweden); Roman Chirikov (Ericsson AB, Sweden); Parth Amin (Ericsson Research, Finland); Francesco Militano (Ericsson, Sweden)
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Joint Machine-Type Device Selection and Power Allocation for Buffer-Aided Cognitive M2M Communication

Mostafa Darabi (University of Tehran, Iran); Behrouz Maham (Nazarbayev University, Kazakhstan); Walid Saad (Virginia Tech, USA); Abolfazl Mehdodniya and Fumiyuki Adachi (Tohoku University, Japan)
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Advancements in Massive MIMO

Session 1: Beamforming and CSI Feedback for Massive MIMO Systems

Adaptive Feedback Rate Control for Massive MIMO System in LTE

Runhua Chen (Datang Telecom Technology & Industry Group & China Academy of Telecommunication Technology, USA); Qiubin Gao, Hui Li, Shaohui Sun and Rakesh Tamrakar (China Academy of Telecommunications Technology (CATT), P.R. China); Wenhong Chen (China Academy of Telecommunication Technology (CATT), P.R. China)
pp. 2319-2323

CSI Feedback for Massive MIMO System with Dual-Polarized Antennas

Huahua Xiao, Yijian Chen, Yu-Ngok Ruyue Li and Zhaohua Lu (ZTE Corporation, P.R. China)

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Dual Layer Beamforming with Limited Feedback for Full-Dimension MIMO Systems

Can Liu, Wei Wang, Yongzhao Li, Mei-xia Hu and Hailin Zhang (Xidian University, P.R. China)
pp. 2329-2333

Practical Pilot Contamination Modelling and Reduction in TDD 3D-MIMO systems

Jing Jin (CMRI, P.R. China); Hui Tong (China Mobile Research Institution, P.R. China); Fei Wang and Lijie Hu (China Mobile Research Institute, P.R. China); Xueying Hou (Wireless Communication Research Institute of China Mobile Communications Corporation, P.R. China); Qixing Wang (CMCC, P.R. China); Guangyi Liu (Research Institute of China Mobile, P.R. China)
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9th International WDN Workshop on Cloud Cooperated Heterogeneous Cellular Networks for 5G

Session 1

Obstacle Avoidance Cell Discovery using mm-waves Directive Antennas in 5G Networks

Antonio Capone and Ilario Filippini (Politecnico di Milano, Italy); Vincenzo Sciancalepore (NEC Europe Ltd. & Politecnico di Milano, Germany); Denny Tremolada (Politecnico di Milano, Italy)
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Performance evaluation of the Isolated MmWave Small Cell

Alexander Maltsev (Intel Corporation & University of Nizhny Novgorod, Russia); Ilya Bolotin and Andrey Pudeyev (Intel, Russia); Gregory Morozov and Alexei Davydov (Intel Corp., Russia)
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Cell and User Virtualization for Ultra Dense Network

Yu-Ngok Ruyue Li, Peng Hao, Feng Xie, Huahua Xiao and Min Ren (ZTE Corporation, P.R. China)
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Coffee Break

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Advanced Air Interface Techniques for 5G: Emerging Concepts and Research Opportunities

Continuation of T8.

M2M Communications: Challenges, Solutions and Applications

Session 2: LTE-based M2M Communications

Overview of LTE Enhancements for Cellular IoT

Rapeepat Ratasuk, Nitin Mangalvedhe and Amitava Ghosh (Nokia Networks, USA)
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LTE-Direct vs. WiFi-Direct for Machine-Type Communications over LTE-A Systems

Massimo Condoluci (King's College London & Centre for Telecommunications Research, United Kingdom); Leonardo Militano (Mediterranea University of Reggio Calabria, Italy); Antonino Orsino (University Mediterranea of Reggio Calabria, Italy); Jesus Alonso-Zarate (Centre Tecnologic de Telecomunicacions de Catalunya - CTTC, Spain); Giuseppe Araniti (University Mediterranea of Reggio Calabria, Italy)
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Analysis of Transmission Methods for Ultra-Reliable Communications

Hamidreza Shariatmadari and Sassan Irajli (Aalto University, Finland); Riku Jäntti (Aalto University School of Electrical Engineering, Finland)

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A Study on LTE-A RACH Performance in M2M Communication Under Interference

Fatemah A. Alsewaidi (University of Bristol & University of Bristol, United Kingdom); Dritan Kaleshi and Angela Doufexi (University of Bristol, United Kingdom)

pp. 2309-2313

Contention Resolution Queues for Massive Machine Type Communications in LTE

Andres Laya (KTH Royal Institute of Technology, Sweden); Luis Alonso (Universidad Politecnica de Catalunya-BarcelonaTECH & Telecommunications and Aerospace Engineering School of Castelldefels, Spain); Jesus Alonso-Zarate (Centre Tecnologic de Telecomunicacions de Catalunya - CTTC, Spain)

pp. 2314-2318

Advancements in Massive MIMO

Session 2: Practical 3D Massive MIMO System

Field Trial and Future Enhancements for TDD Massive MIMO Networks

Wanchun Zhang, Jiyang Xiang, Yu-Ngok Ruyue Li, Yuxin Wang, Yijian Chen, Peng Geng and Zhaohua Lu (ZTE Corporation, P.R. China)

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3D Beamforming for Capacity Boosting in LTE-Advanced System

Hyounghu Ji (Seoul National University & Samsung Electronics. Co., Ltd, Korea); Byungju Lee (Purdue University, USA); Byonghyo Shim (Seoul National University, Korea); Young-Han Nam (Samsung Research America, USA); Youngwoo Kwak (Samsung Electronics & DMC R&D Center, Korea); Hoondong Noh (Samsung Electronics Co. Ltd., Korea); Cheolkyu Shin (Korea Advanced Institute of Science and Technology (KAIST), Korea)

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9th International WDN Workshop on Cloud Cooperated Heterogeneous Cellular Networks for 5G

Session 2

Dynamic cell activation and user association for green 5G heterogeneous cellular networks

Gia Khanh Tran (Tokyo Institute of Technology, Japan); Hidekazu Shimodaira (Tokyo Institute of Technology, Japan); Roya Ebrahim Rezagah (Tokyo Institute of Technology, Japan); Kei Sakaguchi (Osaka University & Tokyo Institute of Technology, Japan); Kiyomichi Araki (Tokyo Institute of Technology, Japan)

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Joint Base Station Operation and User Association in Cloud Based HCNs with Hybrid Energy Sources

Hongzhang Xu, Tiankui Zhang and Zhimin Zeng (Beijing University of Posts and Telecommunications, P.R. China); Dantong Liu (Queen Mary University of London, United Kingdom)

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Optimal Macrocell Partitioning for Redistributed Fractional Frequency Reuse in Heterogeneous Networks

Zehua Wang (Beijing University of Posts and Telecommunications, P.R. China); Xiaodong Xu (Beijing University of Posts and Telecommunications & Wireless Technology Innovation Institute, P.R. China); Rao Zhang (Beijing University of Posts and Telecommunications, P.R. China)

pp. 2374-2378

Welcome Reception

Registration

Opening Ceremony

Keynote 1: BATS: Network Coding in Action

Abstract: Network coding can significantly improve the transmission rate of communication networks with packet loss compared with routing. However, using network coding usually incurs higher computational and storage costs in the network devices and terminals. For example, some network coding schemes require the computational and/or storage capabilities of an intermediate network node to increase linearly with the number of packets for transmission, making them difficult to be implemented in a router-like device that has only constant computational and storage capabilities.

In this talk, we introduce BATS code, which enables a digital fountain approach to resolve the above issue. BATS code is a coding scheme that consists of an outer code and an inner code. The outer code is a matrix generation of a fountain code. It works with the inner code which comprises random linear coding at the intermediate network nodes. BATS codes preserve such desirable properties of fountain codes as ratelessness and low encoding/decoding complexity. The computational and storage capabilities of the intermediate network nodes required for applying BATS codes are independent of the number of packets for transmission. It has been verified theoretically for certain special cases and demonstrated numerically for general cases that BATS codes can achieve rates very close to optimality.

Biography: Raymond W. Yeung obtained his PhD in electrical engineering from Cornell University. Since 1991, he has been with The Chinese University of Hong Kong, where he is now Choh-Ming Li Professor of Information Engineering and Co-Director of Institute of Network Coding.

His research interests include information theory and network coding. He is the author of the textbooks A First Course in Information Theory (Kluwer Academic/Plenum 2002) and its revision Information Theory and Network Coding (Springer 2008), which have been adopted by over 80 institutions around the world. In spring 2014, based on his second book, he gave the first MOOC on information theory on Coursera that reached over 25,000 students.

Dr. Yeung was a member of the Board of Governors of the IEEE Information Theory Society. He was General Chair of the First and the Fourth Workshops on Network, Coding, and Applications (NetCod 2005, 2008), a Technical Co-Chair for the 2006 IEEE International Symposium on Information Theory, a Technical Co-Chair for the 2006 IEEE Information Theory Workshop, and a General Co-Chair of the 2015 IEEE International Symposium on Information Theory. He currently serves as an Editor-at-Large of Communications in Information and Systems, an Editor of Foundation and Trends in Communications and Information Theory and of Foundation and Trends in Networking, and was an Associate Editor for Shannon Theory of the IEEE Transactions on Information Theory.

He was a recipient of the Best Paper Award (Communication Theory) of the 2004 International Conference on Communications, Circuits and System, the 2005 Research Award of the Alexander von Humboldt Foundation in 2007. He will be a recipient of the 2016 IEEE Eric E. Sumner Award. He was a consultant in a project of Jet Propulsion Laboratory, Pasadena, CA, for salvaging the malfunctioning Galileo Spacecraft. He is a Fellow of the IEEE and the Hong Kong Institution of Engineers.

Coffee Break

Registration

Industrial Panel 1: 5G: Opportunities and Challenges in Air Interface, Media Access and Resource Allocation

The insatiable demand for media rich content and the increasing availability of advanced devices such as smart phones, tablets, etc., is forcing the mobile communications eco system to start in earnest to consider next generation systems to address these needs. Some of the options being mentioned as ingredients for such 5th Generation mobile radio systems include Small Cells, HetNets, Carrier Aggregation, Machine-to-Machine, Internet-of-Things, Relays, Device-to-Device and operation in the millimeter wave spectrum range, among others. In this panel we will discuss the main aspects driving the evolution with an emphasis on the Air Interface, Media Access and Resource Allocation. Key questions to be address by the panellist include:

- What are the critical services and features requiring a new air interface beyond LTE-A?
- What are the elements of a Media Access optimized for M2M and IoT?
- Can Resource Allocation be optimized across the wide variety of expected 5G services?

Organizer/Moderator: Reinaldo Valenzuela, Bell Labs, Alcatel-Lucent, USA

Panelists:

- Jilei Hou, Qualcomm Research China, China
- Chih-Lin I, China Mobile Research Institute, China
- Vincent Lau, Hong Kong University of Science and Technology, Hong Kong
- Rapeepat Ratasuk, Nokia Networks, USA
- Nelson Sollenberger, Broadcom, USA

Cognitive Radio MAC

Spectrum Sharing in RF-Powered Cognitive Radio Networks using Game Theory

Yuanye Ma (University of Sydney, Australia); He Chen (The University of Sydney, Australia); Zihuai Lin (University of Sydney, Australia); Branka Vucetic (The University of Sydney, Australia); Xu Li (Beijing Jiaotong University, P.R. China)
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Full-Duplex Based Spectrum Sharing in Cognitive Two-Way Relay Networks

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User Association for Minimum Energy Consumption with Macro-Relay Interference

Jie Li and Nan Liu (Southeast University, P.R. China)
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Energy Efficiency in HetNets

Capacity and Energy Efficiency Analysis of Dense HetNets with Biasing

Edwin Mugume and Daniel K. C. So (University of Manchester, United Kingdom)
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Energy Efficiency Analysis of Downlink CoMP in Heterogeneous Network Considering Fronthaul Power Consumption

Seojoo Choi (Korea Advanced Institute of Science and Technology, Korea); Seungjae Jung (Korea Advanced Institute of Science and Technology (KAIST), Korea); Jinkyu Kang (Korea Advanced Institute of Science and Technology, Korea); Joonhyuk Kang (KAIST, Korea)
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Energy efficiency and cost issues in backhaul architectures for high data-rate green mobile heterogeneous networks

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An Energy Efficient Cell Selection Scheme for Femtocell Network with Spreading

Rahul Thakur (Indian Institute of Technology Madras, India); Vijeth Kotagi and Siva Ram Murthy (IIT Madras, India)
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Real-time Power Balancing in Green CoMP Network with Wireless Information and Energy Transfer

Wan Nur Suryani Firuz Wan Ariffin, Xinruo Zhang and Mohammad Reza Nakhai (King's College London, United Kingdom)
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Energy-Efficient Wireless Networks I

A Matching-Game-Based Energy Trading for Small Cell Networks with Energy Harvesting

Navid Reyhanian (University of Tehran, Iran); Behrouz Maham (Nazarbayev University, Kazakhstan); Vahid Shah-Mansouri (University of Tehran, Iran); Chau Yuen (Singapore University of Technology and Design, Singapore)
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Distributed Energy Cooperation for Energy Harvesting Nodes Using Reinforcement Learning

Wei-Ting Lin (University of California Santa Barbara, USA); I-Wei Lai (Chang Gung University, Taiwan); Chia-Han Lee (Academia Sinica, Taiwan)
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Game-based Multi-hop Broadcast Including Power Control and MRC in Wireless Networks

Mahdi Mousavi and Hussein Al-Shatri (TU Darmstadt, Germany); Hong Quy Le (Technical University Darmstadt, Germany); Alexander Kuehne (TU Darmstadt, Germany); Matthias Wichtlhuber (Technische Universität Darmstadt, Germany); David Hausheer and Anja Klein (TU Darmstadt, Germany)
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Yanjie Pan, Jie Zhong, Ming Lei and Minjian Zhao (Zhejiang University, P.R. China)
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Stochastic Network Calculus Analysis of Energy Harvesting Rate in Wireless Networks with Delay and Energy Storage Constraints

Zhidu Li and Yuehong Gao (Beijing University of Posts and Telecommunications, P.R. China); Bala Alhaji Salihu (Beijing University of Posts and Telecommunications & Federal University of Technology Minna Nigeria, P.R. China); Pengxiang Li, Lin Sang and Dacheng Yang (Beijing University of Posts and Telecommunications, P.R. China)
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Channel Coding, Modulation and ARQ II

On Network Coding and Modulation Mapping for Three-Phase Bidirectional Relaying

Ronald Y. Chang (Academia Sinica, Taiwan); Sian-Jheng Lin (King Abdullah University of Science and Technology (KAUST), Saudi Arabia); Wei-Ho Chung (Academia Sinica, Taiwan)
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Green Communication via HARQ Protocols using Message-Passing Decoder over AWGN Channels

Haifa Farès (Université de Rennes 1, INRIA-IRISA, France); Baptiste Vrigneau (University of Rennes 1 & INRIA/IRISA CAIRN, France); Olivier Berder (University of Rennes 1, IRISA, INRIA, France)
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Multilevel Buckets for Sequential decoding of Polar Codes

Nikolai Iakuba and Peter Trifonov (Saint-Petersburg State Polytechnic University, Russia)
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Novel M-ary Coded Modulation Scheme Based on Constellation Subset Selection

Kun Yan (Guilin University of Electrical Technology, P.R. China); Hsiao-Chun Wu (Louisiana State University, USA); Haiyan Zhou (Gulin University of Electronic Technology, P.R. China); Xiao Hailin (Electronic Science and Technology University, P.R. China)
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Constellation-Wavelet Transform Automatic Modulation Identifier for M-ary QAM Signals

Tian Cai and Cheng Wang (Beijing University of Posts and Telecommunications, P.R. China); Gaofeng Cui and Weidong Wang (Beijing University of Posts and Telecommunications, P.R. China)
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Cooperative Communications I

Energy-Efficiency Analysis of Regenerative Cooperative Systems Under Spatial Correlation

Mulugeta K Fikadu (Tampere University of Technology, Finland); Paschalis C. Sofotasios (Tampere University of Technology & Aristotle University of Thessaloniki, Finland); Mikko Valkama (Tampere University of Technology, Finland); Qimei Cui (Beijing University of Posts and Telecommunications, P.R. China); George K. Karagiannidis (Aristotle University of Thessaloniki, Greece)
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Overlaid-Pilot Based Channel State Information Feedback for Multicell Cooperative Networks

Qinyan Jiang, Hui Wang, Tianpeng Yuan, Xiaofeng Tao and Qimei Cui (Beijing University of Posts and Telecommunications, P.R. China)
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Effects of Imperfect Channel Estimation in Three-Node Cooperative Wireless Network

Jeong-Min Choi and JongSoo Seo (Yonsei University, Korea)
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Secure Amplify-and-Forward Untrusted Relaying Networks Using Cooperative Jamming and Zero-forcing Cancellation

Ki-Hong Park and Mohamed-Slim Alouini (King Abdullah University of Science and Technology (KAUST), Saudi Arabia)
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Secrecy Outage Probability of Cooperative Network through Distributed Alamouti Code

Esa R. Alotaibi, Daniel K. C. So and Khairi A. Hamdi (University of Manchester, United Kingdom)
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Full Duplex Systems I

Spectrum Sharing Opportunities of Full-Duplex Systems using Improper Gaussian Signaling

Mohamed Gaafar, Osama Amin, Walid Abediseid and Mohamed-Slim Alouini (King Abdullah University of Science and Technology (KAUST), Saudi Arabia)
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Buffer-Aided Full-Duplex Relaying with Residual Self-Interference and Statistical Delay Provisioning

Khoa Tran Phan and Tho Le-Ngoc (McGill University, Canada)
pp. 250-255

Polarization Mismatch Based Self-Interference Cancellation Against Power Amplifier Nonlinear Distortion in Full Duplex Systems

Wen Zhao, Chunyan Feng, Fangfang Liu, Caili Guo and Yao Nie (Beijing University of Posts and Telecommunications, P.R. China)
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Self-Interference Cancellation with Phase-noise Suppression in Full-Duplex Systems

Ruozhu Li, Ahmed Masmoudi and Tho Le-Ngoc (McGill University, Canada)
pp. 261-265

Ergodic Capacity Analysis of Full-Duplex Amplify-Forward MIMO Relay Channel Using Tracy-Widom Distribution

Ajib S. Arifin (University of Indonesia, Indonesia); Tomoaki Ohtsuki (Keio University, Japan)
pp. 266-270

MIMO II

An Adaptive Peak Cancellation Method for Linear-Precoded MIMO-OFDM Signals

Tomoya Kageyama and Osamu Muta (Kyushu University, Japan); Haris Gacanin (Alcatel-Lucent, Belgium)
pp. 271-275

Energy-Efficient BS Antenna Configuration for Downlink Distributed MIMO System

Jiancun Fan, Yue Ning, Jianguo Deng and Ying Zhang (Xi'an Jiaotong University, P.R. China); Zhikun Xu (China Mobile Research Institute, P.R. China)
pp. 276-280

A Markov Chain Monte Carlo Algorithm for Near-Optimum Detection of MIMO-GFDM Signals

Dan Zhang (Technische Universität Dresden, Germany); Maximilian Matthé (Technical University Dresden, Germany); Luciano Leonel Mendes (Inatel, Brazil); Gerhard Fettweis (Technische Universität Dresden, Germany)
pp. 281-286

Interference Alignment for Multi-User MIMO Interference Channels via a Riemannian Optimization Approach

Fereidoun H. Panahi and Tomoaki Ohtsuki (Keio University, Japan); Wenjie Jiang and Yasushi Takatori (NTT Network Innovation Laboratories, Japan)

Registration

Keynote 2: Disruptive Tech - The Next Frontier

Abstract: Each Internet generation was believed to be the last, with designs pushed to near perfection. The first and original Internet, a virtually infinite network of computers, was a paradigm changer and went on to define the economies of the late 20th century. However, after that Internet came the Mobile Internet, connecting billions of smart phones and laptops, and yet again redefining entire segments of the economy in the first decade of the 21st century. Today, we witness the emergence of the Internet of Things, shortly to connect trillions of objects and starting to redefine yet again various economies of this decade. Is that it? Surely, so we argue, there is something much, much bigger at stake still: the Tactile Internet. It is a true paradigm shift, in which sufficiently responsive, reliable network connectivity will enable it to deliver physical, tactile experiences remotely and thereby invoke an important shift from content-delivery to skillset-delivery networks. For this to work however we require some fundamental laws of physics to be "reengineered". This keynote is all about the disruptive technology approaches which will allow us to break through this next tech frontier.

Biography: Mischa Dohler is full Professor in Wireless Communications at King's College London, Head of the Centre for Telecommunications Research, co-founder and member of the Board of Directors of the smart city pioneer WorldSensing, Fellow and Distinguished Lecturer of the IEEE, and Editor-in-Chief of the Transactions on Emerging Telecommunications Technologies and the EAI Transactions on the Internet of Things.

He is a frequent keynote, panel and tutorial speaker, and has received numerous awards. He has pioneered several research fields, contributed to numerous wireless broadband, IoT/M2M and cyber security standards, holds a dozen patents, organized and chaired numerous conferences, has more than 200 publications, and authored several books. He has a citation h-index of 39. He acts as policy, technology and entrepreneurship adviser, examples being Richard Branson's Carbon War Room, House of Parliament UK, UK Ministry BIS, EPSRC ICT Strategy Advisory Team, European Commission, Tech London Advocate, ISO Smart City working group, and various start-ups.

He is also an entrepreneur, angel investor, passionate pianist and fluent in 6 languages. He has talked at TEDx. He had coverage by national and international TV & radio; and his contributions have featured on BBC News and the Wall Street Journal.

Keynote 3: 5G Wireless - Trend, Technology, and Challenges

Abstract: The emerging 5G wireless will have a huge impact on the transformation of mobile communications industries as well as vertical industries. This speech try to answer three issues: 1) identify the future trend of mobile industries and give use cases of future mobiles; 2) identify 5G key technologies in air interface and network architecture; and 3) introduce Huawei efforts in 5G research and address open challenges which might be suitable for academic researches.

Biography: Mr. Dang joint Huawei since 1997, since then he had been serving as RF R&D engineer, project manager, director of wireless e2e solution management, and took current position since 2010. His current interests include ICT converged architecture, Internet of Things, 5G wireless, etc.

Coffee Break

Registration

Industrial Panel 2: European Activities on 5G, Looking at Vertical Markets

The panel focuses on how to bridge the telecom and vertical industries, close the gap between different standardization bodies and form a common understanding, including business model. Panelist will present their views on new services and requirements from different verticals, with special focus on Automotive and Tele-Care/Health sectors. As a part of this framework, the distinguished speakers will address how to validate the most important requirements, especially in terms of latency, reliability and spectrum, are met, and demonstrate the dynamic slicing of the 5G network, over a specific physical network infrastructure, is really capable of supporting such a wider range of requirements, end to end, with the ability to create dedicated virtual networks that business customers can control. Looking at 5G tests and trials, we will also discuss how to realize a pan-EU platform, where any type of viable collaborative research project can be executed.

Organizers:

- David Soldani, Member of the Board of the 5G Infrastructure Association, Huawei, Germany
- Jorge Pereira, European Commission, Belgium

Panelists:

- Francesco Militano, Ericsson Research, Sweden
- Rapeepat Ratasuk, Nokia Networks, USA
- Hamid Aghvami, King's College London, UK
- Luis Correia, IST - University of Lisbon, Portugal
- Jorge Pereira, European Commission, Belgium

Cross-Layer Design I

Two-Timescale QoS-Aware Cross-Layer Optimisation for HetNets with Flexible Backhaul

Naeimeh Omidvar, An Liu and Vincent Lau (Hong Kong University of Science and Technology, Hong Kong); Fan Zhang (Hong Kong University of Science & Technology, Hong Kong); Danny H.K. Tsang (HKUST, Hong Kong); Mohammad Reza Pakravan (Sharif University of Technology, Iran)
pp. 1072-1076

A novel cross-layer resource allocation scheme for multi-user, multi-service, MIMO-OFDMA systems

Samy Kambou (University of Poitiers & XLIM Institute, France); Clency Perrine (Université de Poitiers, France); Afif Mériem (SupCom Tunisia, Tunisia); Yannis Pousset and Christian Olivier (Université de Poitiers, France)
pp. 1077-1081

Energy-Efficient Concurrent Media Streaming over Time-Varying Wireless Networks

Weihua Wu and Qinghai Yang (Xidian University, P.R. China); Peng Gong (Beijing Institute of Technology & Inha University, P.R. China); Kyung Sup Kwak (Inha University, Korea)
pp. 1082-1087

Application-Aware Cross-Layer Framework: Video Content Distribution in Wireless Multihop Networks

Mousie Fasil, Hussein Al-Shatri, Stefan Wilk and Anja Klein (TU Darmstadt, Germany)
pp. 1088-1093

A Fuzzy Logic Based Cross-Layer Mechanism for Medium Access Control in WBAN

Seyed Mohammad Nekooei, Gang Chen and Ramesh Kumar Rayudu (Victoria University of Wellington, New Zealand)
pp. 1094-1099

Resource Allocation I

Experimental Study on UE-Oriented Frequency Reuse for Indoor DAS Networks

Huiting Cheng (Alcatel Lucent Shanghai Bell Co., Ltd, P.R. China); Xiaobing Leng (Alcatel Shanghai Bell, P.R. China); Yanbo Tang (Alcatel-Lucent Shanghai Bell Co., Ltd., P.R. China); Yong Liu (Bell Labs China, P.R. China)
pp. 1100-1104

Resource Allocation Algorithms for OFDM based Wireless Systems

Soheil Rostami, Kamran Arshad and Predrag Rapajic (University of Greenwich, United Kingdom)
pp. 1105-1110

Fairness Awarred Joint Sub-channel and Power Allocation via Genetic Algorithm in MIMO Two-tier Networks

Liang Chen, Lin Ma and Yubin Xu (Harbin Institute of Technology, P.R. China)
pp. 1111-1115

QoS-aware proportional fair energy-efficient resource allocation with imperfect CSI in downlink OFDMA systems

Jing Wang and Yan Zhang (Beijing Normal University, P.R. China); Hui Hui (Xi'an University of Technology, P.R. China); Ningbo Zhang (Beijing University of Posts and Telecommunications, P.R. China)
pp. 1116-1120

Energy-efficient Subcarrier Power Allocation for Cognitive Radio Networks using Statistical Interference Model

Ashok K Karmokar, Muhammad Naeem and Alagan Anpalagan (Ryerson University, Canada)
pp. 1121-1126

Energy-Efficient Wireless Networks II

Crowdsourcing Energy-Efficient Participants to Ensure Quality-of-Information

Bo Zhang (Beijing University of Posts and Telecommunications, P.R. China); Chi Harold Liu (Beijing Institute of Technology, P.R. China); Ziyu Ren (Tsinghua University, P.R. China); Jian Ma and Wendong Wang (Beijing University of Posts and Telecommunications, P.R. China)
pp. 1606-1610

Energy Efficient Power Allocation Scheme for Multi-Cell with Hybrid Energy Sources

Xianmiao Ni and Deyu Yuan (School of Electronic Engineering, Beijing University of Posts & Telecommunications, P.R. China); Yinglei Teng and Mei Song (Beijing University of Posts and Telecommunications, P.R. China)
pp. 1611-1616

Renewable Energy Distribution in Cooperative Cellular Networks with Energy Harvesting

Navid Reyhanian and Vahid Shah-Mansouri (University of Tehran, Iran); Behrouz Maham (Nazarbayev University, Kazakhstan); Chau Yuen (Singapore University of Technology and Design, Singapore)
pp. 1617-1621

Renewable Energy-Aware Video Download in Cellular Networks

Po-Han Chiang, Ranjini Guruprasad and Sujit Dey (University of California, San Diego, USA)
pp. 1622-1627

Energy Saving Mechanism for Future HetNets

Hocine Ameur (University of Technology of Troyes, France); Moez Esseghir (Technology University of Troyes & Charles Delaunay Institute, France); Lyes Khoukhi (University of Technology of Troyes, France)
pp. 1628-1633

Energy-Efficient Wireless Networks III

Energy Efficient Joint Subchannel Selection and Resource Allocation for Heterogeneous CRNs

Qin Hu and Rong Chai (Chongqing University of Posts and Telecommunications, P.R. China); Na Zhao (CQUPT, P.R. China); Zhimin Guo and Qianbin Chen (Chongqing University of Posts and Telecommunications, P.R. China)
pp. 1634-1638

Coordinated Beamforming for Energy Efficient Transmission in Distributed Antenna Systems

Qiao Pang, Xiangyang Wang and Wangtao Wan (Southeast University, P.R. China); Yang Zhao (Southeast University, Nanjing City, Jiangsu Province, P.R. China); Xiaoteng Gu (Southeast University, P.R. China)
pp. 1639-1643

Grouping Based Power Control for Improving Energy Efficiency in Dense Small Cell Networks

Yalan Zhao (Beijing University of Posts and Telecommunications, Beijing, P.R. China); Hailun Xia and Zhimin Zeng (Beijing University of Posts and Telecommunications, P.R. China)
pp. 1644-1648

Power Allocation for Sum Rate Maximization in Non-Orthogonal Multiple Access System

Ziad Al Abbasi and Daniel K. C. So (University of Manchester, United Kingdom)
pp. 1649-1653

Power Allocation for Energy Efficiency Maximization in DAS with Hybrid Rate Constraint

Jianwei Liu and Guan Wei (Southeast University, P.R. China); Jiang Wu (Southeast University & National Mobile Communications Research Laboratory, P.R. China); Zhen Tian and Wanlin Li (Southeast University, P.R. China)
pp. 1654-1658

HetNets

Joint Downlink and Uplink Network Performance Analysis with CRE in Heterogeneous Wireless Network

Kun Yang, Pingyang Wang and Xuefen Hong (BUPT, P.R. China); Xing Zhang (Beijing University of Posts and Telecommunications, P.R. China)
pp. 1659-1663

Cross-tier Interference Mitigation for RTDD-based Macro-femto Networks

Jiandong Li (Xidian University, P.R. China); Guogang Huang (Xidian University & State Key Laboratory of Integrated Service Networks, P.R. China); Jehangir Arshad (Xidian University, P.R. China)
pp. 1664-1668

Transmit Power Control and Channel Assignment for Femto Cells in HetNet Systems Using Genetic Algorithm

Kohta Nakamura, Taichi Tashiro, Keiji Yamamoto and Kenichi Ohno (Toshiba Corporation, Japan)
pp. 1669-1674

Consensus-Based Algorithm for Making Network Selection Decisions in Heterogeneous Wireless Networks

Olabisi Emmanuel Falowo and Olugbenga Adekunle Taiwo (University of Cape Town, South Africa)
pp. 1675-1680

Load-Based Cell Association for Load Balancing in Heterogeneous Cellular Networks

Guan-Ting Chou, Kuang-Hao (Stanley) Liu and Szu-Lin Su (National Cheng Kung University, Taiwan)
pp. 1681-1686

mmWave I

Energy Efficiency of a Heterogeneous Network using Millimeter-Wave Small-Cell Base Stations

Jinho Choi (Gwangju Institute of Science and Technology (GIST), Korea)
pp. 293-297

Doppler Power Spectrum Densities for Fixed-to-Fixed Radio Channels with Moving Scatterers in Millimeter-Wave Band

Xiongwen Zhao and Qingdong Han (North China Electric Power University, P.R. China); Bin Li and Jianwu Dou (ZTE Corporation, P.R. China); Hong Wei (Southeast University, P.R. China)
pp. 298-302

An Efficient and Low-complexity Beam Training Technique for mmWave Communication

Wenfang Yuan, Simon Armour and Angela Doufexi (University of Bristol, United Kingdom)
pp. 303-308

A Scalable Sub-band Sub-sampled Radio Architecture for Millimeter Wave Communications

Rakesh R T and Ayush Chowdhary (Indian Institute of Technology Kharagpur, India); Debarati Sen (Indian Institute of Technology Kharagpur, India); Goutam Das (IIT Kharagpur, India)
pp. 309-314

Partially Adaptive Arrays application for MU-MIMO mode in a MmWave Small Cells

Alexander Maltsev (Intel Corporation & University of Nizhny Novgorod, Russia); Ali Sadri (Intel & President and Chairman of WiGig Alliance, USA); Andrey Pudneyev and Ilya Bolotin (Intel, Russia); Alexei Davydov and Gregory Morozov (Intel Corp., Russia); Richard J. Weiler (Fraunhofer HHI, Germany)
pp. 315-319

Massive MIMO I

Pilot Contamination Elimination Precoding in Multi-Cell Massive MIMO Systems

Binyue Liu (Xidian University, P.R. China); Yong Cheng (Bell Labs, Alcatel-Lucent, Germany); Xiaojun Yuan (ShanghaiTech University, P.R. China)

pp. 320-325

Principal Component Analysis Based Limited Feedback Scheme for Massive MIMO Systems

Anmeng Ge and Tiankui Zhang (Beijing University of Posts and Telecommunications, P.R. China); Zhirui Hu (Beijing University of Post and Telecommunication, P.R. China); Zhimin Zeng (Beijing University of Posts and Telecommunications, P.R. China)

pp. 326-331

Effects of the Length of Training Sequence on the Achievable Rate in FDD Massive MIMO System

Yi Wang (School of Information Science and Engineering Southeast University, P.R. China); Wenting Song, Yongming Huang, Chunguo Li, Shidang Li and Luxi Yang (Southeast University, P.R. China)

pp. 332-337

Wideband and High-order Multi-user Spatial Multiplexing Transmission with Massive MIMO for Future Radio Access

Xin Wang (DOCOMO Beijing Communications Laboratories Co., Ltd, P.R. China); Chongning Na (DOCOMO Beijing Communications Laboratories Co., Ltd., P.R. China); Xiaolin Hou (DOCOMO Beijing Communications Laboratories Co., Ltd, P.R. China); Huiling Jiang and Hidetoshi Kayama (DOCOMO Beijing Communications Laboratories Co., Ltd., P.R. China)

pp. 338-343

Multi-cell Massive MIMO Coordinated Beamforming for Transmit Power Minimization with Imperfect CSIT

Xinmin Li and Ling Qiu (University of Science and Technology of China, P.R. China)

pp. 344-349

Spectrum Sensing

Energy-efficient Node Selection and Power Control in Cooperative Spectrum Sensing

Linlin Zhang, Liyang Liu, Zhaowei Qu and Sixing Yin (Beijing University of Posts and Telecommunications, P.R. China)

pp. 350-354

Spectrum Prediction and Channel Selection for Sensing-based Spectrum Sharing Scheme Using Online Learning Techniques

Zhao Zhang (Tsinghua National Laboratory for Information Science and Technology, P.R. China); Kaiqing Zhang (University of Illinois at Urbana-Champaign, USA); Feifei Gao (Tsinghua University, P.R. China); Shun Zhang (Xidian University, P.R. China)

pp. 355-359

Feature Detection Based Computationally Efficient Spectrum Sensing by Test Statistics Sharing among Multiple Receive Antennas

Daiki Cho and Shusuke Narieda (National Institute of Technology, Akashi College, Japan)

pp. 360-364

Linear Fusion of Interrupted Reports in Cooperative Spectrum Sensing for Cognitive Radio Networks

Younes Abdi and Tapani Ristaniemi (University of Jyväskylä, Finland)

pp. 365-369

Unified Analysis of Cooperative Spectrum Sensing over Generalized Multipath Fading Channels

Lina Mohjazi and Diana Dawoud (University of Surrey, United Kingdom); Paschalis C. Sofotasios (Tampere University of Technology & Aristotle University of Thessaloniki, Finland); Sami Muhaidat (Khalifa University, UAE); Mehrdad Dianati (University of Surrey, United Kingdom); Mikko Valkama (Tampere University of Technology, Finland); George K. Karagiannidis (Aristotle University of Thessaloniki, Greece)

pp. 370-375

Cyber-Physical Systems

HELPER: A Home assisted and cost Effective Living system for People with disabilities and homebound Elderly

Vibhutesh Kumar Singh and Sanjeev Baghoriya (Indraprastha Institute of Information Technology Delhi, India); Vivek A Bohara (Indraprastha Institute of Information Technology, Delhi (IIIT-Delhi), India)
pp. 2115-2119

A Comparison of Key Distribution Schemes Using Fuzzy Commitment and Fuzzy Vault within Wireless Body Area Networks

Guanglou Zheng, Gengfa Fang, Mehmet Orgun and Rajan Shankaran (Macquarie University, Australia)
pp. 2120-2125

SYSTAS: Density-based Algorithm for Clusters Discovery in Wireless Networks

Apostolos Kousaridas (Huawei Technologies, Germany); Stefanos Falangitis, Panagis Magdalinos and Nancy Alonistioti (University of Athens, Greece); Markus Dillinger (Huawei Technologies, Germany)
pp. 2126-2131

Lunch

Industrial Panel 3: From 4G to 5G and IoT: Changing Business Models and New Revenue Opportunities

While consensus on enabling technologies and spectrum allocation is still some time away, there is palpable momentum in the industry around use cases and features of the next generation of mobile systems - the 5G. This effort comes at a large cost and massive commitment of key industry players - according to a 2014 report, operators and vendors will spend at least \$1 Billion per annum in R&D spending to drive standardization and commercialization of 5G technology.

A complementary and often overlapping, landscape-changing paradigm is the IoT / Connected things / Smart objects concept, with its focus on people-centric, prevent / detect technologies, smart sensors and open platforms. Monetising IoT and its many benefits has been the topic of considerable research, with many key concepts however still quite fluid. 5G and IoT are now inextricably linked and worked on in parallel. While major effort is underway to nail down the key requirements of the next generation of mobile systems and more broadly the IoT, less attention is given to the changing business landscape and the far-reaching effects it will have on the mobile industry and ICT as a whole.

This Panel will bring together key industry players - representatives of operators, manufacturers and vendors - as well as members of academia with interest in the next major paradigm shift in wireless communication, and the potentially changing roles of key actors. There is considerable work on the technical elements of 5G, including the pivotal issues of shared spectrum access, mmWave mobile access, and Cloud RAN. This Panel proposes a look at the 'big picture' - building upon these (and other) technology building blocks, to examine how the business models and overall ecosystem will evolve over time.

Organizers:

- Milos Tesanovic, Samsung Electronics R&D Institute, UK
- Maziar Nekovee, Samsung Electronics R&D Institute, UK

Moderator: Milos Tesanovic, Samsung Electronics R&D Institute, UK

Panelists:

- Chih-Lin I, China Mobile Research Institute, China
- Yoshihisa Kishiyama, NTT DOCOMO, Japan
- Narcis Cardona, The Polytechnic University of Valencia, Spain
- Daegyun Kim, Samsung Electronics, Korea

Interference and Power Management

Proportional Fairness-Based User Pairing and Power Allocation for Non-Orthogonal Multiple Access

Fei Liu (RWTH Aachen University & Institute for Networked Systems, Germany); Petri Mähönen and Marina Petrova (RWTH Aachen University, Germany)

pp. 1127-1131

Improving random access efficiency with uniformly deployed relays and interference cancellation for energy-constrained M2M devices

Yuya Toyoda and Hiroyuki Yomo (Kansai University, Japan)

pp. 1132-1136

Power control algorithm based on the interference statistic properties in heterogeneous networks

Mingzhe Chen, Fangfang Liu and Zhimin Zeng (Beijing University of Posts and Telecommunications, P.R. China)

pp. 1137-1141

Unequal Power Allocation for Real-time Uncompressed Video Transmission over Wireless Channels

Zhilong Zhang and Danpu Liu (Beijing University of Posts and Telecommunications, P.R. China)

pp. 1142-1147

Distributed Offloading Strategy With Interference Avoidance for Heterogeneous Cellular Networks

Tianqing Zhou, Yongming Huang and Luxi Yang (Southeast University, P.R. China)

pp. 1148-1152

Resource Allocation II

Stackelberg-Game Based Pricing Framework for Hybrid Access Control in Femtocell Network

Chengyi Liu (Southeast University, P.R. China); Song Xing (California State University, Los Angeles, USA); Lianfeng Shen (National Mobile Communications Research Laboratory, Southeast University, P.R. China)

pp. 1153-1156

Distributed Dynamic-TDD Resource Allocation in Femtocell Networks Using Evolutionary Game

Cheng-Chih Chao (National Taiwan University, Taiwan); Chia-Han Lee (Academia Sinica, Taiwan); Hung-Yu Wei (National Taiwan University, Taiwan); Chih-Yu Wang and Wen-Tsuen Chen (Academia Sinica, Taiwan)

pp. 1157-1162

A Resource Management Scheme for Hybrid Access Femtocells in LTE/LTE-A Networks

Ying Loong Lee (Multimedia University (MMU), Malaysia); Jonathan Loo (Middlesex University, United Kingdom); Teong Chee Chuah (Multimedia University, Malaysia)

pp. 1163-1167

Three-state Fuzzy Logic Method on Resource Allocation for Small Cell Networks

Xiping Wu (The University of Edinburgh, United Kingdom); Majid Safari (University of Edinburgh, United Kingdom); Harald Haas (The University of Edinburgh, United Kingdom)

pp. 1168-1172

Load Balancing via Joint Transmission in Heterogeneous LTE: Modeling and Computation

Lei You, Lei Lei and Di Yuan (Linköping University, Sweden)

pp. 1173-1177

Performance Analysis and Simulation

Accuracy vs. Complexity Trade-off in Simulations of Future Wireless Networks

Carlo Galietto (CTVR, Trinity College Dublin, Ireland); Heather Crowley (Trinity College Dublin, Ireland); Nicola Marchetti (CTVR Trinity College, Ireland); Linda Doyle (Trinity College Dublin, Ireland)

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Combination of Random Linear Coding and Cross-Layer Opportunistic Routing: Performance over Bursty Wireless Channels

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