College of Communication Engineering

The First Asia-Pacific Workshop on Wireless Networking and Communications (APWNC 2013)

Changchun, China
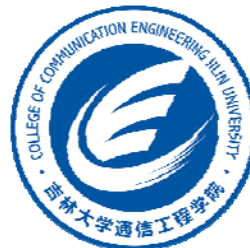
October 28-29, 2013

Workshop Program Guide

Sponsors:

- **Jilin University**

- **College of Communication Engineering, Jilin University**

- **Division of Science and Technology, Jilin University**

- **Division of International Relations, Jilin University**

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Part 1: APWNC 2013 Workshop Preliminary Program

Date	Time	Activity	Location
October 27, 2013 Sunday	8:00-20:00	Guest Arrival	Changchun Longjia International Airport
October 28, 2013 Monday	8:00-11:30	Poster Session	Nanhu Campus
	13:00-18:00	City Visit	Changchun
October 29, 2013 Tuesday	9:00-9:30	Opening Ceremony	Qianwei Campus Dongrong Conference Center
	9:30-10:30	Keynote Speech 1: Li-Chun Wang	
	10:30-11:00	Coffee Break	
	11:00-12:00	Keynote Speech 2: Vincent Lau	
	12:00-13:30	Lunch	
	14:00-15:00	Keynote Speech 3: Dong In Kim	
	15:00-16:00	Keynote Speech 4: Ying-Chang Liang	
	16:00-16:30	Coffee Break	
	16:30-17:30	Invited Speech: Xiaohui Zhao	
	18:00-20:00	Dinner	Qianwei Campus
October 30, 2013 Wednesday	8:00-20:00	Guest Departure	Changchun Longjia International Airport

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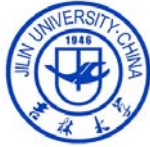
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Part 2: Keynote Speech

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Keynote Speech 1: Evolution to 5G Wireless for Personalized Cloud and Communications Services
Speaker: Li-Chun Wang, IEEE Fellow, Distinguished Professor and Chairman, Department of Electrical and Computer Engineering, National Chiao-Tung University, Taiwan
Time: 9:30-10:30, October 29, 2013
Location: Qianwei Campus, Dongrong Conference Center

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Abstract: With 1,000 times higher data rates and more flexible spectrum use as compared with current 4G LTE systems, 5G wireless aims at delivering one gigabyte of mobile data for everyone daily by 2020. The challenge is not just delivering one gigabyte per user daily, but personalizing every bit and being profitably. Smart phones will play the key role as the gateways to the cloud and the bridges of multiple sensors, and can teach networks to be cognitive. Management of heterogeneous networks, small cells, and the cloud-based radio access network (C-RAN) can result in the access virtualization capability for providing the so-called always-best-connections (ABC) service anywhere from a user viewpoint. Software defined networking (SDN), a new network paradigm supporting virtualization and programmability in the network infrastructure, can enable telecom operators to provide personalized network experiences to individuals in an efficient manner. In this talk we will discuss the opportunities, challenges, and solutions in orchestrating these state-of-the-art technologies for creating holistic personalized cloud and communications services in the era of 5G wireless and cloud computing.

Biography: Li-Chun Wang (M'96 -- SM'06 -- F'11) received the B.S. degree from National Chiao Tung University, Taiwan, R. O. C. in 1986, the M.S. degree from National Taiwan University in 1988, and the Ms. Sci. and Ph. D. degrees from the Georgia Institute of Technology , Atlanta, in 1995, and 1996, respectively, all in electrical engineering.

From 1990 to 1992, he was with the Telecommunications Laboratories of Chunghwa Telecom Co. In 1995, he was affiliated with Bell Northern Research of Northern Telecom, Inc., Richardson, TX. From 1996 to 2000, he was with AT&T Laboratories, where he was a Senior Technical Staff Member in the Wireless Communications Research Department. Since August 2000, he has joined the Department of Electrical and Computer Engineering of National Chiao Tung University in Taiwan and is the current Chairman of the same department. His current research interests are in the areas of radio resource management and cross-layer optimization techniques for wireless systems, heterogeneous wireless network

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design, and cloud computing for mobile applications.

Dr. Wang won the Distinguished Research Award of National Science Council, Taiwan in 2012, and was elected to the IEEE Fellow grade in 2011 for his contributions to cellular architectures and radio resource management in wireless networks. He was a co-recipient(with Gordon L. Stuber and Chin-Tau Lea) of the 1997 IEEE Jack Neubauer Best Paper Award for his paper ``Architecture Design, Frequency Planning, and Performance Analysis for a Microcell/Macrocell Overlaying System,'' IEEE Transactions on Vehicular Technology, vol. 46, no. 4, pp. 836-848, 1997. He has published over 200 journal and international conference papers. He served as an Associate Editor for the IEEE Trans. on Wireless Communications from 2001 to 2005, the Guest Editor of Special Issue on "Mobile Computing and Networking" for IEEE Journal on Selected Areas in Communications in 2005, "Radio Resource Management and Protocol Engineering in Future Broadband Networks" for IEEE Wireless Communications Magazine in 2006, and "Networking Challenges in Cloud Computing Systems and Applications," for IEEE Journal on Selected Areas in Communications in 2013, respectively. He is holding 10 US patents.

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Keynote Speech 2: Cached-Induced Opportunistic CoMP for Video Streaming in 5G Wireless Systems
Speaker: Vincent Lau, Professor, FIEEE, Dept of ECE, Hong Kong University of Science and Technology
Time:11:00-12:00, October 29, 2013
Location: Qianwei Campus, Dongrong Conference Center

Abstract: The 1000X increase in capacity demand for future 5G wireless networks have posed great challenges and it is anticipated that a holistic solution framework is needed to meet this aggressive goal. In this talk, we shall discuss a new promising architecture for future 5G wireless networks, namely the "Cache-induced Opportunistic CoMP". While there are many new architectures (such as the HetNet and Cloud Radio Access Networks) proposed for 5G networks, these solutions considered communication networks as transparent bit-pipes to deliver random bits to the users. However, in practice, we are not interested to deliver raw information bits but rather, we want to deliver content. Such subtle but important difference can have a profound impact on the design and architecture of future wireless networks. For instance, it is anticipated a significant portion of the 1000X increase will be coming from high quality video streaming applications. One important difference between content (e.g. video) and information (raw bits) is that content is "cachable". In conventional caching in the core network or internet, the benefit of cache is to reduce the number of hops from the source to the consumers. However, in the proposed caching solution for wireless networks, there is a unique and important additional benefit, namely the cache-induced cooperative MIMO (CoMP) opportunity. Specifically, we proposed a novel base-station level caching design and intelligent dynamic caching algorithm to induce CoMP opportunities in the physical layer. The key advantage of the solution is that the system can enjoy spatial multiplexing gains of CoMP without expensive payload backhaul between the BSs. This is very attractive because the cost of harddisk capacity in the cache is much lower than the backhaul capacity. Yet, there are various technical challenges involved and conventional caching solution from fixed line internet cannot be applied. For example, due to the cache-induced CoMP dynamics, the design of the caching algorithm and the CoMP PHY beamforming are tightly coupled. In this work, we propose a low complexity asymptotically optimal solution to support high quality wireless video streaming applications without backhaul. We show that significant performance gain can be achieved compared with various state-of-the-art baselines.

Biography: Vincent obtained B.Eng (Distinction 1st Hons) from the University of Hong Kong (1989-1992) and Ph.D. from the Cambridge University (1995-1997). He completed the Ph.D. degree in two years and joined Bell Labs from 1997-2004. He joined the Department of ECE, Hong Kong University of Science and Technology (HKUST) in 2004 and is currently a Professor and the Founding Director of Huawei-HKUST Joint Innovation Lab at HKUST. He is also elected as IEEE Fellow, Croucher Senior Research Fellow and Changjiang Chair

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Professor. Vincent has published more than 200 IEEE journal and conference papers and has contributed to 28 US patents on various wireless systems. In addition, he is also the key contributor of four IEEE standard contributions to IEEE 802.22 (WRAN / Cognitive Radio). His current research focus includes robust cross layer optimization for MIMO/OFDM wireless systems, interference mitigation techniques for wireless networks, delay-optimal cross layer optimizations as well as multi-timescale stochastic network optimization. He has obtained three IEEE best paper awards and is currently an area editor of IEEE Transactions on Wireless Communications, area editor of IEEE Signal Processing Letters, EUARSIP Wireless Communications and Networking as well as guest editor of JSAC.

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Keynote Speech 3: UE Relay Evolving with D2D for Heterogeneous Cellular Networks
Speaker: Dong-In Kim, Editor-in-Chief, IEEE Wireless Comunications Letters, Professor, Sungkyunkwan University, Korea
Time: 14:00-15:00, October 29, 2013
Location: Qianwei Campus, Dongrong Conference Center

Abstract: This talk reviews the current state-of-the-art of device-to-device communication leading to advanced User Equipment (UE) Relay which is being considered for LTE-Advanced Cellular Standard and proposes a number of novel UE relaying and enhanced small-cell techniques. An important related issue is the availability or the absence of the channel state information (CSI) and cell-specific CSI at UE relay and small cells, which leads to the concepts of demodulation-specific UE relaying and soft cell. It is expected that UE relaying and soft-cell concepts evolving with device-to-device (D2D) communication for LTE-Advanced will play an important role in extending and improving the coverage and cell capacity of heterogeneous cellular networks (HCNs). The latter is a promising technique to provide wireless peer-to-peer services and enhance spectrum utilization in the LTE-Advanced networks. However, enabling D2D communication in HCNs poses some challenges, which are addressed in this talk.

Biography: Dong In Kim received the Ph.D. degree in electrical engineering from the University of Southern California, Los Angeles, in 1990. He was a tenured Professor with the School of Engineering Science, Simon Fraser University, Burnaby, British Columbia, Canada. Since 2007, he has been with Sungkyunkwan University (SKKU), Suwon, Korea, where he is currently a Professor with the College of Information and Communication Engineering. His research interests include wireless cellular, relay networks, and cross-layer design. 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.

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Keynote Speech 4: Cognitive Wireless Networks: Enabling 5G Mobile Communications

Speaker: Ying-Chang Liang, IEEE Fellow, Principal Scientist, Institute for Infocomm Research, Singapore

Time: 15:00-16:00, October 29, 2013
Location: Qianwei Campus, Dongrong Conference Center

Abstract: Over the past decade, there have been a lot of research and development activities devoted to the cognitive communications and networking research. Through applying artificial intelligence approaches into communication system design, three main objectives are expected to achieve: smart resource utilization, autonomic network operation and intelligent service provisioning. This presentation will highlight the key ideas and technologies that could contribute to the development of 5G cellular networks, including, e.g., small cells, D2D communications, TV white spaces, spectrum refarming, carrier aggregation, and software-defined wireless network access.

Biography: Ying-Chang Liang is a Principal Scientist in the Institute for Infocomm Research (I2R), Agency for Science, Technology and Research (A*STAR), Singapore. He was a visiting scholar with the Department of Electrical Engineering, Stanford University, from Dec 2002 to Dec 2003, and taught graduate courses in National University of Singapore from 2004 – 2009. His research interest includes cognitive communications and networking, dynamic spectrum access, reconfigurable signal processing for broadband communications, information theory and statistical signal processing.

Dr Liang was elected a Fellow of the IEEE in 2011 for contributions to cognitive radio communications, and has received five Best Paper Awards, including IEEE ComSoc APB outstanding paper award in 2012, and EURASIP Journal of Wireless Communications and Networking best paper award in 2010. He also received the Institute of Engineers Singapore (IES)'s Prestigious Engineering Achievement Award in 2007, and the IEEE Standards Association's Certificate of Appreciation Award in 2011, for contributions to the development of IEEE 802.22, the first international standard based on cognitive radio technology.

Dr Liang currently serves as Editor-in-Chief of IEEE Journal on Selected Areas in Communications – Cognitive Radio Series, and is on the editorial board of IEEE Signal Processing Magazine. He was an Associate Editor of IEEE Transactions on Wireless Communications and IEEE Transactions on Vehicular Technology, and served as a Guest Editor of five special issues on emerging topics published in IEEE, EURASIP and Elsevier journals in the past years. He is a Distinguished Lecturer of the IEEE Communications Society and the IEEE Vehicular Technology Society

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Part 3: Invited Speech

Invited Speech 1: A Survey of Robust Power Control for Cognitive Radio Networks
Speaker: Xiaohui Zhao, Professor, Dean, College of Communications Engineering, Jilin University
Time: 16:30-17:30, October 29, 2013
Location: Qianwei Campus, Dongrong Conference Center

Abstract: Cognitive radio (CR) as an opportunistic spectrum access technology has emerged to exploit unused frequency band of licensed users. Traditional fixed spectrum allocation approaches result in unused portions of some spectrum resources temporarily, or called 'spectrum holes'. CR technology can flexibly utilize this unused part of spectrum through allowing cognitive devices to sense idle spectrums and use them in the utmost way according to some predefined criteria. To use these radio spectrums more efficiently, power control is playing a key role in the development of cognitive radio networks, which can limit interference power from CR devices to licensed users and satisfy QoS requirement of CR users. However, the existed works about power control in CR network are based on the assumption of good channel state information and well measured parameters, which almost can not be obtained due to estimation errors and nature of random radio environment. Thus robustness of the proposed algorithms must be considered to overcome the parameter uncertainties in practical communication environment. The scope of this paper is to give an overview of the problems of robust algorithms in cognitive radio networks, to present important robust power control algorithms that have appeared in the literatures, to analyze the impact of different uncertainty models on the performance of system, and to show common approaches in robust optimization theory to solve the robust resource allocation problem. Finally, some potential issues for future research in this area are given.

Biography: Zhao Xiaohui, Professor and Dean of the College of Communication Engineering, Jilin University, B.E. and M.E from Jilin University of Technology, China, Ph. D from Université de Technologie de Compiègne, France, Post Doctor Researcher, Southeast University, China, Senior Visiting Scholar and professor in Laboratoire d'Informatique, Université de Paris 6, France, and Visiting Scholar of Université de Paris 9, France. His research interests are signal processing theories and applications in communications. He has published more than 100 papers and is a member of 4 editorial committees for Chinese Journal of Electronics, Journal on Communications, Journal of Signal Processing, and The Journal of China Universities of Posts and Telecommunications respectively.