2017 年第 17 届 IEEE 通信技术国际会议
2017 17th IEEE International Conference on Communication Technology (IEEE-ICCT2017)

2017 年 10 月 27-30
四川成都

Oct. 27-30, 2017
Chengdu, China

Conference Abstract

Venue:
会议地址：

锦江宾馆/*Sichuan Jinjiang Hotel*

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Welcome Remarks

On behalf of the organizers of ICCT 2017, a series of international technical event held from 1986 to now, it is our great pleasure to extend a warm welcome to all the participants and guests. This year, ICCT 2017 is co-sponsored by Sichuan Institue of Electronics, University of Electronic Science and Technology of China (UESTC), technically supported by Southwest Jiaotong University, Sichuan University, Xihua University and Chengdu University of Information Technology.

This year we received over 620 papers submissions, among which 394 papers are accepted. All these papers are organized into lecture-style oral sessions and poster sessions. In addition, we are honored to have 9 world renowned experts to be our keynote and plenary speakers, including 4 Fellows of IEEE. Not only has each of them made extraordinary contributions to the fields of telecommunication, their diverse expertise and keen visions in both academia and industry are also remarkable. We look forward to their stimulating and scholastic seminars in ICCT 2017.

We feel deeply grateful to all the people that have contributed to make this event possible: the authors who contributed papers, the conference steering committee, the invited speakers, and the diligent reviewers. Thanks are also extended to the conference administrative committee, the volunteers, supporters, and Jinjiang Hotel, for their tirelessly efforts throughout the course of the conference.

Finally, we wish to thank all authors and attendees for participating in conference. We hope you have a fruitful and memorable experience at ICCT 2017 in Chengdu.

ICCT 2017

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- ✧ **Plenary Speech: 30 Minutes of Presentation including Q&A.**

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- ✧ **All participants are required to dress formally. Casual wear is unacceptable.**
- ✧ **National formal dress is acceptable.**

Conference Speakers

IEEE Fellow, Prof. Zixiang Xiong
ISS group leader Department of Electrical and Computer Engineering
Texas A&M University, USA

Zixiang Xiong received his Ph.D. degree in electrical engineering from the University of Illinois at Urbana-Champaign in 1996. He is a professor in the ECE department of Texas A&M University. His main research interest lies in image/video processing, networked multimedia, and multi-user information theory.

Dr. Xiong received an NSF Career Award in 1999, an ARO Young Investigator Award in 2000, and an ONR Young Investigator Award in 2001. He is co-recipient of the 2006 IEEE Signal Processing Magazine best paper award, top 10% paper awards at the 2011 and 2015 IEEE Multimedia Signal Processing Workshops, and an IBM best student paper award at the 2016 IEEE International Conference on Pattern Recognition. He was the Publications Chair of ICASSP 2007, the Technical Program Committee Co-Chair of ITW 2007, the Tutorial Chair of ISIT 2010, the Awards Chair of Globecom 2014, and a General Co-Chair of MMSP'17. He served as an Associate Editor for five IEEE Transactions. He is currently an associate editor for the IEEE Trans. on Multimedia. He has been a fellow of the IEEE since 2007.

Speech Title: On the Energy-delay Tradeoff in Streaming Data

Abstract: We study basic tradeoffs between energy and delay in wireless communication systems using finite blocklength theory. We first assume that data arrive in constant stream of bits, which are put into packets and transmitted over a communications link. We show that depending on exactly how energy is measured, in general energy depends on \sqrt(d^{-1}) or \sqrt(d^{-1}*logd), where d is the delay. This means that the energy decreases quite slowly with increasing delay. Furthermore, to approach the absolute minimum of -1.59 dB on energy, bandwidth has to increase very rapidly, much more than what is predicted by infinite blocklength theory. We then consider the scenario when data arrive stochastically in packets and can be queued. We devise a scheduling algorithm based on finite blocklength theory and develop bounds for the energy-delay performance. Our results again show that the energy decreases quite slowly with increasing delay.

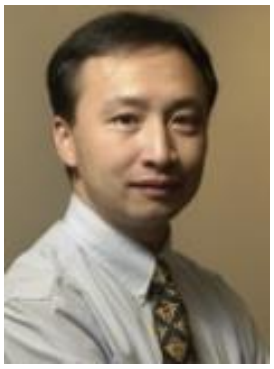
IEEE Fellow, Prof. Leyi Wang
Department of Electrical and Computer Engineering
Wayne State University, USA

Le Yi Wang received the Ph.D. degree in electrical engineering from McGill University, Montreal, Canada, in 1990. Since 1990, he has been with Wayne State University, Detroit, Michigan, where he is currently a professor in the Department of Electrical and Computer Engineering. His research interests are in the areas of complexity and information, system identification, robust control, H-infinity optimization, time-varying systems, adaptive systems, hybrid and nonlinear systems, information processing and learning, as well as medical, automotive, communications, power systems, and computer applications of control methodologies. He was a keynote speaker in several international conferences. He serves on the IFAC Technical Committee on Modeling, Identification and Signal Processing. He was an Associate Editor of the IEEE Transactions on Automatic Control and several other journals, and an Associate Editor of Journal of Control Theory and Applications. He was a Visiting Faculty at University of Michigan in 1996 and Visiting Faculty Fellow at University of Western Sydney in 2009 and 2013. He is a member of a Foreign Expert Team in Beijing Jiao Tong University and a member of the Core International Expert Group at Academy of Mathematics and Systems Science, Chinese Academy of Sciences.

He received Research Initiation Award (1992) and Faculty Internship Award (1994) from the USA National Science Foundation, Best Paper Award from IEEE EIT 2012, Best Poster Award from IEEE SEM 2012, Best Associate Editor Award (2016) from Control Theory and Technology, Outstanding Reviewer Award (2012-2013) from Automatica, Faculty Research Award (1992), College of Engineering Outstanding Teaching Award (1995), President Research Enhancement Award (2003-2005), College of Engineering Faculty Research Excellence Award (2015) from Wayne State University. He is an Eminent Engineer in Tau Beta Pi, a member of Academy of Scholars at Wayne State University, and a Fellow of IEEE.

Speech Title: Embedded and Interacting Network Systems

Abstract: Management of networked systems requires integrated control, communications, and computing. Many network systems form a hierarchical or embedded structure with interactions. In this talk, we report some recent progress on networked systems and their interactions. Using renewable energy systems as an example, we demonstrate how a microgrid, a team of autonomous/semi-autonomous dual-powered trolley buses, and vehicles' internal battery networks, all of which are networked systems themselves, are connected and intertwined.
These interacting networked systems introduce very different network control issues.
(1) Fair distribution to distributed generators, power loss on transmission lines, voltage management on buses are main issues in a DC microgrids. These problems can be formulated as distributed and constrained optimization problems.
(2) Microgrid-supported trolleybus systems need to coordinate on-board battery systems and reduce load fluctuations on the grid. Vehicle dynamics, battery dynamics, and lack of vehicle-to-vehicle communications lead to decentralized dynamic optimal control problems.
(3) On-board battery networks must operate in a balanced manner to maximize their ability in supporting trolleybuses. Battery networks are inherently unobservable and uncontrollable. Switching actions need to be added to achieve stability, performance, optimality, robustness. Consequently, we encounter hybrid network control problems.
In this talk, we will summarize briefly some effort in these directions.



IEEE Fellow, Prof. Shum Ping
Nanyang Technological University, Singapore

Prof Shum received his PhD degree in Electronic and Electrical Engineering from the University of Birmingham, UK, in 1995. In 1999, he joined the School of Electrical and Electronic Engineering, NTU. Since 2014, he has been appointed as the Director of Centre for Optical Fibre Technology and was the chair, committee member and international advisor of many international conferences. He was also the founding member of IEEE Photonics Society Singapore Chapter (formerly IEEE LEOS). He is currently the chairman of OSA Singapore Chapter. Prof Shum has published more than 500 journal and conference papers with his research interests being in the areas of speciality fibres and fibre-based devices. His H-index is 30. In recent few years, his publications have been cited about 500 times per year.

Speech Title: Disruptive Optical Fiber Sensors
Authors: Prof. Shum Ping and Prof. Sun Qizhen

Abstract: Optical fiber-based devices have been widely deployed in recent years. There are many advantages of using fiber as a sensor. These include electrically-passive operation, light weight, immunity to radio frequency interference and electromagnetic interference, high sensitivity, compact size, corrosion resistance, easily multiplexing and potentially low cost. Several novel fiber-based sensors and technologies developed are presented here, including fiber Bragg grating (FBG) based sensors, photonic crystal fiber (PCF) based sensors, specialty fiber-based sensors and distributed fiber sensing systems. FBGs as instinctive sensors, are ingeniously designed as two-dimensional (2D) tilt sensors, displacement sensors, accelerometers and corrosion sensors here; PCF based evanescent field absorption sensor, PCF induced Mach-Zehnder interferometer and Fabry-Perot refractometer for temperature and refractive index sensing are presented; based on localized surface Plasmon resonant (LSPR) effect, nano-sized fiber tip with gold nanoparticles are demonstrated for live cell index bio-sensing applications.

IEEE Fellow, Prof. Koichi Asatani
Kogakuin University, Japan

Koichi Asatani received his B.E.E.E., M.E.E.E. and Ph. D. degrees from Kyoto University in 1969, 1971 and 1974, respectively. From 1974 to 1997, Dr. Asatani was engaged in R&D on optical fiber communication systems, hi-definition video transmission systems, FTTH, ISDN, B-ISDN, ATM networks, IP Networks and their strategic planning in NTT. In 1997 he joined Kogakuin University as Professor, and in 1999 he joined Graduate School of Global Information and Telecommunication, Waseda University as Visiting Professor, both in Tokyo, Japan. He is currently Lecture Professor, Nankai University, Tianjin, China and Professor Emeritus, Kogakuin University. He is Fellow of IEEE and Fellow of IEICE. He was appointed as Distinguished Lecturer of IEEE Communications Society for 2006-2009 and 2011-2012, 2013-2014. He is a founder of Communications QoS, Reliability and Performance Modeling series symposium at ICCs and Globecoms. From 1988 through 2000, he served as Vice-Chairman of ITU-T SG 13 (formerly CCITT SG XVIII), responsible for digital networks including GII, IP networks, NGN and Future Networks. He serves as Chair for National Committee on Next Generation Networks in Japan. He is also serving as Chair, R&D and Standardizations Working Group, Next Generation IP Network Promotion Forum. He is serving as IEEE Communications Society Director, Membership Programs Development for 2014-2015 term. He was also elected as a member of Board of Governor, IEICE, and Chair, IEICE Standards Activities for 2014-2016.

Speech Title: Network Evolution toward 5G and Beyond

Abstract: 5G is one of the hottest topics today. 5G means the next generation after 4G mobile technology. 5G is not limited to mobile communications. It is intended to apply 5G technology to next generation core network as well as mobile access. Any type of applications will be under the scope of 5G technology, such as connected cars, IoT/M2M, smart home, smart energy as well as existing information and communications applications. This keynote touches recent trends in global ICT growth and reviews network technology evolution toward 5G era. Overview of 5G development will be reviewed. Issues and challenges of 5G deployments are discussed.

Prof. Ray Sheriff
University of Bradford, United Kingdom

Ray E. Sheriff is Professor of Electronic Engineering at University of Bradford, where he received his PhD in 1995 and MBA in 2010. He received his BEng (Hons) degree in Electrical and Electronic Engineering from University of Leeds in 1986. Upon graduation, Prof. Sheriff worked in the satellite communications industry before joining University of Bradford as a lecturer in 1991. His research interests include mobile and satellite communications, with an emphasis on network layer solutions. He has participated on a number of large-scale, multi-organisational telecommunications research projects, principally funded under the EC's Framework Programmes. Under the UK's research framework, he was co-investigator on the Engineering and Physical Sciences Research Council (EPSRC) funded Village eScience for Life (VeSel) project, which considered how wireless sensors and Internet technology could be used to improve the quality of life of Kenyan rural farming communities. He has previously played a lead role in the EC's Satellite Communications Network of Excellence (SatNEX). He is a Visiting Professor at Sichuan University and co-Director of the University of Bradford-Sichuan University Joint Innovation Laboratory on Advanced Communications and Signal Processing Technologies. In collaboration with Sichuan University, he recently organised Workshops in Chengdu (2016) and Bradford (2017) for early career researchers on the Employment of ICT in Cities and Homes for the Health and Wellbeing of Older People. He recently concluded a decade's membership of EPSRC's Peer Review College and is now a member of the British Council Newton Fund Engineering and Physical Sciences Researcher Links and Institutional Links Review Panel. He is a member of the Editorial Board of the International Journal of Satellite Communications and Networking, a Chartered Engineer and a Fellow of the Institute of Engineering and Technology (IET).

Speech Title: Employing Communication Technology in Future Cities for the Health and Well-Being of Older People

Abstract: Future cities in China, the UK and around the world face an ever increasing challenge in ensuring the health and well-being of their growing ageing populations. One consequence of the ageing demographic is the rising number of people with dementia, a progressive neurological disorder, the symptoms of which vary from person to person and may include short-term memory loss, confusion in unfamiliar environments and difficulties in communicating. The disease globally affects an estimated 44 million people, and is set to grow to 135 million by 2050, according to Alzheimer's Disease International. In the UK, there are around 850,000 people with dementia; in China, 9 million people have the disease. Countries like China, United States and the UK are now targeting dementia for significant research investment, by exploiting the opportunities made available by advances in information and communication technology. For example, the Chinese government has committed to invest in technology for healthcare products and services in its 'National Planning Guideline for the Healthcare Service System (2015-2020)'. In the UK, the Alzheimer's Society Dementia-Friendly Technology Charter states that every person with dementia should have the opportunity to benefit from technology appropriate to their needs.

The supply of efficient, personal and cost-effective support to meet the growing demands from older people with dementia and other age-related illnesses is vital if our future cities are to provide an inclusive living environment for all members of society. In this respect, technology can provide a step-change in how older people with dementia and their families and carers are able to deal with the everyday challenges posed by the disease. There has been, in recent years, steady progression in the use of assistive technologies about the home, including sensors and monitoring devices for safety features. However, the use of technology to support the older population, and specifically those with dementia, in the outdoors, where older people may feel most vulnerable, remains underexploited, even though a widely-deployed, advanced communication technology infrastructure makes this now a tangible possibility.

This presentation will consider how the opportunities made available through the use of broadband communications, smart mobile applications, big data and the Internet of Things may be exploited for innovative use in indoor and outdoor environments for the health and well-being of older people. In doing so, the presentation will be informed by the outcomes from two interdisciplinary UK-China Workshops, co-organised by Sichuan University and University of Bradford, which were held in 2016 and 2017, in Chengdu and Bradford, respectively. The 3-day workshops enabled in the region of 40 early career researchers, together with experienced mentors from the UK and China, to present their work and develop ideas for inter-disciplinary research in the use of communications technology for the health and well-being of older people, made possible with the support of the National Natural Science Foundation of China and British Council Newton Fund.

Prof. Gang Feng
University of Electronic Science and Technology of China, China

Dr. Gang Feng (M'01, SM'06) received his BEng. and MEng degrees in Electronic Engineering from the University of Electronic Science and Technology of China (UESTC), in 1986 and 1989, respectively, and the Ph.D. degrees in Information Engineering from The Chinese University of Hong Kong in 1998. He joined the School of Electric and Electronic Engineering, Nanyang Technological University in December 2000 as an assistant professor and was promoted as an associate professor in October 2005. At present he is a professor with the National Laboratory of Communications, UESTC. Dr. Feng has extensive research experience and has published widely in computer networking and wireless networking research. Three of his papers have been listed as ESI highly cited papers. His research interests include next generation mobile networks, mobile cloud computing, big data analytics for wireless networking, etc. Dr. Feng is a senior member of IEEE.

Speech Title: AI Enabled Access Control and Handoff Policy for Wireless Networks

Abstract: The next-generation cellular network (5G) is assumed to be the key enabler and infrastructure provider in the ICT era, by catering diverse services including enhanced mobile broadband (eMBB) with bandwidth-consuming and throughput-driving requirements, new services like ultra-reliable low latency service (URLLC) and massive machine-type communications (mMTC).The ever-increasingly complicated configuration issues and blossoming new service requirements will pose great challenges to 5G and beyond. Recent breakthroughs in artificial intelligence (AI) and machine learning (ML), and the availability of powerful computing platforms provide us with technologies to address these challenges by performing tasks once seemed impossible. Therefore, we expect that AI can provide many new and unprecedented opportunities in designing network architectures, optimizing network operations, and managing different user services and content, etc. In this talk, I will first introduce some fundamental concepts in AI and discuss the opportunities and challenges to exploit AI in wireless networks. Specifically, I will elaborate AI based intelligent access control and handoff policy in 5G networks. Case studies with numerical results will be provided to demonstrate the effectiveness and advantages of AI based technologies for improving network performance with reasonable signaling overhead in future wireless networks.

Prof. Yan Zhang
University of Oslo, Norway

Prof. Yan Zhang is Full Professor at the Department of Informatics, University of Oslo, Norway. He received a PhD degree in School of Electrical & Electronics Engineering, Nanyang Technological University, Singapore.

He serves as an Associate Technical Editor of IEEE Communications Magazine, an Editor of IEEE Transactions on Green Communications and Networking, an Editor of IEEE Communications Surveys & Tutorials, an Editor of IEEE Internet of Things Journal, an Editor of Vehicular Technology Magazine, and an Associate Editor of IEEE Access. He serves as chair positions in a number of conferences, including IEEE GLOBECOM 2017, IEEE PIMRC 2016, and IEEE SmartGridComm 2015. He is IEEE VTS (Vehicular Technology Society) Distinguished Lecturer. He serves as IEEE TCGCC Vice Chair. His current research interests include: next-generation wireless networks leading to 5G, reliable and secure cyber-physical systems (e.g., smart grid, transport, and healthcare).

Speech Title: Mobile Edge Computing for Internet of Things

Abstract: In this talk, we will first present the key concepts and architectures related to mobile edge computing in the era of Internet of Things. Then, we mainly focus on edge computing for 5G, Internet of Vehicles and IoT in genenral. In such contexts, we will present our recent studies and experiments related to different computation offloading solutions and resource management schemes.

Prof. Huaxi Gu
XIDIAN UNIVERSITY, China

Prof. Huaxi Gu is a professor affiliated with the State Key Lab of ISN, Xidian University, senior member of Chinese Institute of Electronics, senior member of China Computer Federation. His research interests include networking technologies, network on chip, optical interconnect etc. Prof. Gu is the principal investigator for one key, two general and one youth project from National Natural Science Foundation. He is also PI for the joint projects with Intel Labs China, Shannon lab (HUAWEI), Communication Technology Lab(Huawei), ZTE, and CETC. Prof. Gu has published over 160 journal and conference papers, including more than 60 papers indexed by SCI as the first author / correspondence author. He received Second prize of National Science and Technology Progress Award (in 2016), and First Prize of Science and Technology Award of Shaanxi Province (in 2015). He received the Best Paper Honorable Mention Award from IEEE ISVLSI2009, and Best Paper Award from ACM TURC 2017(SIGCOMM China). Prof. Gu has applied for more than 40 Chinese patents, with 20 patents granted. Prof. Gu served as a TPC member of GLOBECOM2017and PDCAT2016 and the technical reviewer for multiple journals including IEEE Transaction on Computer, IEEE Transaction on VLSI, IEEE Transactions on Cloud Computing, IEEE/OSA Journal of Lightwave Technology, and INFOCOM2016.

Speech Title: Optical interconnect for future computing systems

Abstract: As we enter the Exascale computing era, the interconnection networks will dominate the performance of the computing systems. The conventional metallic interconnect is becoming the bottleneck with limited bandwidth, long delay, and high power consumption. Optical interconnect is a promising candidate to overcome these limitations. This talk will explore the role of optical interconnect in future computing systems, recent developments in network topology, router architecture and the challenges of on-chip optical interconnect.

Sunny Zhang
Principle Engineer and Director of Communication Infrastructure Research
Intel Labs China

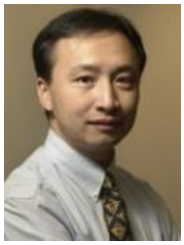
As senior researcher and director of communication infrastructure research in Intel labs China, Sunny is a 15 years veteran on wireless communication system design and high performance computing for communication system, Sunny initialized and led Intel multi-radio coexistence, digital enhanced radio and cloud radio access network(CRAN) effort in Intel. Sunny led team developed the first highly optimized LTE stacks on general purpose CPU, the first scalable and high performance CRAN base band pool reference design. Sunny is also Intel delegate in Future Forum of China. Sunny leads Intel Lab China's 5G research on software defined Radio Access Network architecture, 5G massive MIMO and low latency prototype and virtual reality over wireless network. Sunny and his team received 2 Intel China Awards on CRAN and 5G in 2010 and 2016, and was part of the Intel Achievement Award on vRAN in 2016. Sunny has 30+ patents filed.

Prior joined Intel, Sunny was as the physical layer architect, designed the first passive optical network in 2001. From 2002 to 2004, he was at startup companies in Silicon Valley, and responsible for optical devices and RFID devices design.

Speech Title: Cross layer design for remote immersive interaction over 5G network

Abstract: 5G network will provide high throughput and low latency capability, which are necessary for high quality virtual reality and augmented reality. By adding real time control to VR and AR application, we could support remote immersive interaction, using VR/AR to interact with real world anywhere in real time. The RII application will have several challenges as its high throughput, low latency nature, as well as very high computation and storage demand. The talk will talk about RII challenges to 5G network, and using cross layer design approach in MAC layer, PHY layer, as well as computing and communication co-design in system level to solve the latency, throughput and reliability problem efficiently, as well as introduce the prove of concept work in each area.

Day 1, Friday, Oct. 27, 2017 Arrival Registration & Academic Visit	
09:30-17:00	Sign in and Collect Conference Materials (South Lobby / 南大堂)
13:30-17:00	Visit UESTC Historical Exhibition and Electronic Science and Technology Museum (Gather at South Lobby of Jinjiang Hotel at 13:15 and Set out at 13:30) Refer to Page 113 to know more about Electronic Science and Technology Museum

Day 2, Saturday, Oct. 28, 2017 Conference Speeches and Authors Presentations Morning: Jinjiang Hall (North Wing, 2F) / 锦江厅 (北楼2楼)		
08:30-8:40	Welcome Message from Sponsors	
	Welcome Message from Technical Program Chair	
08:40-9:20		Keynote Speech 1 Fellow of IEEE, Prof. Shum Ping Nanyang Technological University, Singapore Speech Title: Disruptive Optical Fiber Sensors
9:20-10:00		Keynote Speech 2 Fellow of IEEE, Prof. Zixiang Xiong Texas A&M University, USA Speech Title: On the Energy-delay Tradeoff in Streaming Data
10:00-10:20	Coffee Break	
10:20-11:00		Keynote Speech 3 Prof. Ray Sheriff University of Bradford, United Kingdom Speech Title: Employing Communication Technology in Future Cities for the Health and Well-Being of Older People

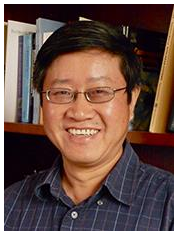
11:00-11:40		**Keynote Speech 4** **Prof. Feng Gang** **University of Electronic Science and Technology of China, China** **Speech Title: AI Enabled Access Control and Handoff Policy for Wireless Networks**
11:40-12:00	**Group Photo**	
12:00-13:00	**Lunch** **Garden Restaurant (East Wing, 9F) / 花园餐厅，东楼9楼**	

Authors Presentations							
13:00-16:00	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7
16:00-16:15	**Coffee Break**						
16:00-16:30	**Poster Session 1** **(Outside Jinjiang Hall)**						
16:15-18:45	Session 8	Session 9	Session 10	Session 11	Session 12	Session 13	Session 14
19:00-20:30	**Welcome Banquet** **(Awarding Ceremony and Charming Chengdu Show)** **Jinjiang Hall (North Wing, 2F) / 锦江厅 (北楼2楼)** Refer to Page 117 to know more about Show.						

Day 3, Sunday, Oct. 29, 2017

Conference Speeches & Authors' Presentations

Morning: Jinjiang Hall (North Wing, 2F) / 锦江厅 (北楼2楼)

08:30-9:10		**Keynote Speech 5** **Fellow of IEEE, Prof. Leyi Wang** **Wayne State University, USA** **Speech Title: Embedded and Interacting Network Systems**
9:10-9:50		**Keynote Speech 6** **Fellow of IEEE, Prof. Koichi Asatani** **Kogakuin University, Japan** **Speech Title: Network Evolution toward 5G and Beyond**

9:50-10:20	Coffee Break				
10:20-11:00		Keynote Speech 7 Prof. Yan Zhang University of Oslo, Norway Speech Title: Mobile Edge Computing for Internet of Things			
11:00-11:30		Plenary Speech 1 Prof. Huaxi Gu XIDIAN UNIVERSITY, China Speech Title: Optical interconnect for future computing systems			
11:30-12:00		Plenary Speech 2 Sunny Zhang Principle Engineer and Director of Communication Infrastructure Research Intel Labs China Speech Title: Cross layer design for remote immersive interaction over 5G network			
12:00-13:00	Lunch Garden Restaurant (East Wing, 9F) / 花园餐厅，东楼9楼				
Authors Presentations					
13:00-16:00	Session 15	Session 16	Session 17	Session 18	Session 19
16:00-16:15	Coffee Break				
16:00-16:30	Poster Session 2 (Outside Jinjiang Hall)				
16:15-19:00	Session 20	Session 21	Session 22	Session 23	Session 24
19:00-20:30	Dinner Garden Restaurant (East Wing, 9F) / 花园餐厅，东楼9楼				

Day 4, Monday, Oct. 30, 2017

One day Tour

Considering intensive distribution of tourist attractions, different tour preferences, and convenient traffic, to make better use of your precious time on Oct. 30, you're free to arrange your own discovery tourism in Chengdu-the land of abundance. *Conference committee provides Oct. 30's entrance ticket of Chengdu Research Base of Giant Panda Breeding for participants*. If you'd like to visit Panda Research Base, please collect ticket on conference registration desk. For more recommended attractions, please visit Page 118.

SESSION 1

< Coding Theory and Technology >

13:00–16:00
Chamber of Mist (West Wing, 2F) /馨雨阁，西楼2楼

Session Chair: Prof. Wen-Kang Jia, Fujian Normal University, China

CT032 **13:00-13:15**	Improved Non-Uniform Selecting Encoding Algorithm for Fountain Codes with Short Code-Length Danfeng Zhao, Linmin Huang, Mingshen Liang, Guiyang Lun Harbin Engineering University, China Presenter: Linmin Huang, Harbin Engineering University, China Abstract: Fountain codes are rateless and they can transmit information reliably and efficiently without knowing a priori knowledge of the channel. However, the performance of fountain codes decreases dramatically when code length is shortened. In order to improve the transmission reliability of fountain codes with short code-length, the adjustment among sets non-uniform selecting (ASNS) encoding algorithm is proposed. In ASNS algorithm, the robust soliton degree (RSD) distribution is modified to avoid source symbols imperfect coverage, and some operations on source symbols collections are done to change the probability of source symbols involved in encoding. Simulation consequences show that, under different channel conditions, the proposed ASNS algorithm can achieve much lower decoding failure rate than traditional uniform selecting algorithm and the doping and non-uniform selecting (DNS) algorithm with code-length at 100 and 500.
CT035 **13:15-13:30**	Throughput Analysis of Full-Duplex Network Coding in Two-Way Relay Channel Li Weizheng, Tu Xiumei Nanjing University of Technology, China Presenter: Li Weizheng, Nanjing University of Technology, China Abstract: In two-way relay channel (TWRC), terminal nodes exchange information assisted by a relay node. To exchange 1bit information over TWRC, the traditional save-and-forward scheme takes 4 time slots. The traditional network coding scheme can reduce the number of time slots to 3 since its relay node can mix the information from tow terminal nodes and then broadcast them in 1 time slot. Further, the physical network coding (PNC) and analog network coding (ANC) schemes, which allow terminal nodes send the signal simultaneously, only need 2 time slots to complete the information exchange. In this paper, by combining physical network coding and full-duplex (FD) techniques, the proposed scheme full-duplex physical network coding (FD-PNC) and full-duplex analog network coding (FD-ANC) can nearly reduce the required time slots to 1. Therein, full-duplex technology can make the nodes send and receive the signal at the same time and in the same frequency band by eliminating the self interference signal. Considering the channel error, we analyze their achievable throughput under the symmetric channel. We believe that taking full-duplex technology into network coding research may open many possibilities for future work.
CT081 **13:30-13:45**	Stabile Rateless Codes Design Based on Efficiency-Fairness Principles Yunji Li, Deng Jie, Guizhou Institute of Technology, China Presenter: Yunji Li, Guizhou Institute of Technology, China Abstract: This paper proposes an ideal model to comprehensively describe rateless codes. The model indicates that the stability is one of the important characteristics of rateless codes. Then, a novel coding scheme based on efficiency-fairness principles is proposed to improve the stability which is mainly determined by the minimum variable-node degree. The coding scheme can be splitted into two stages. The first stage mainly raises efficiency by reducing the redundant information, increasing the number of recovered messages and improving the order recovery, meanwhile taking into account the balance of variable-node degrees. The second stage focuses on fairness by raising and balancing the variable-node degrees. Simulation results show that the rateless codes from the proposed scheme have good stability. In additional, they have significant better performance than existing schemes in terms of capacity, order and uniformity recovery.

CT082 **13:45-14:00**	A Rateless Coding Scheme Based on Efficiency-Fairness Principles Yunji Li, Deng Jie Guizhou Institute of Technology，China Presenter: Yunji Li, Guizhou Institute of Technology, China Abstract: LT codes have excellent average performance in capacity-achievability. It is difficult to ensure the LT codes always have stable excellent performance. This paper proposes an ideal model to make a more comprehensive description for rateless codes. A novel coding scheme based on efficiency-fairness principles is proposed to improve the stability which is mainly determined by the minimum variable-node degree. The coding scheme is composed of two stages. The first stage mainly considers efficiency, which aims to reduce redundant information, increase the number of recovered packets and improve the order recovery performance as much as possible. The second stage focuses on fairness, which aims to balance the variable-node degree. The simulation results show that the scheme has higher minimum variable-node degree and significant improvement in performance of code rate, order and uniformity recovery compared with existing schemes.
CT227 **14:00-14:15**	A Low-Complexity Min-Sum Decoding Algorithm For LDPC Codes Huan Li, Jing Guo, Chen Guo, Donglin Wang University of Chinese Academy of Sciences, China Presenter: Huan Li, University of Chinese Academy of Sciences, China Abstract: This paper proposes a low-complexity LDPC decoding algorithm with simplified check nodes updating. The proposed algorithm simplifies the result of second-minimum in check nodes based on the first-minimum computation instead of computing it directly. In order to obtain approximate result, effective corrected coefficients are utilized, which can reduce the complexity by eliminating the complex computations. Complexity analysis is provided and the results indicate that the complexity of proposed algorithm is much lower than the general NMS algorithm and MS-based simplified algorithms. Simulation results show that the performance of proposed algorithm can closely match the NMS algorithm with the same number of iterations.
CT466 **14:15-14:30**	Low-Complexity Decoding Architecture for Rate-Compatible Puncturing Polar Codes Xinyi Wang, Dai Jia, Ce Sun, Jingxuan Huang, Zesong Fei Beijing Institute of Technology, China Presenter: Xinyi Wang Beijing Institute of Technology Abstract: Polar codes are the first family of codes which can achieve the channel capacity. Motivated by the demand of high speed transmission for 5G communications, researchers are keen to explore efficient decoding architecture for polar codes. In this paper, we propose a low-complexity decoding architecture for rate-compatible puncturing polar (RCPP) codes with two different puncturing methods, quasi-uniform puncturing (QUP) and shortening. By removing the redundant processing elements for the recursive calculation of log-likelihood ratio, the proposed decoding architecture significantly reduces the space complexity and latency with no BLER performance loss. Moreover, we illustrate that the proposed decoding architecture reduces more complexity if two puncturing methods are employed simultaneously, with negligible BLER performance loss.
CT468 **14:30-14:45**	Iterative Decoder for Coded SEFDM Systems Baoxian Yu, Shutao Zhang, Xianhua Dai and Han Zhang Sun Yat-sen University, China Presenter: Baoxian Yu, Sun Yat-sen University, China Abstract: Spectrally efficient frequency division multiplexing (SEFDM) can offer a spectral gain in comparison with OFDM. This paper considers the framework for coded SEFDM systems with iterative decoding. We show that with block interleaving and channel coding, sequential errors in SEFDM are effectively reduced, and in turn, the decoded data can be used as feedback at the receiver to recover the orthogonality between sub-carriers. With the complementary advantages of channel coding and block interleaving, the feedback of the iterations converges within only 2-3 iterations. Simulation results show that the proposed SEFDM with iterative decoding can offer an indistinguishable performance as that of coded OFDM, while achieving a higher spectral efficiency of up to 20%.

CT488 **14:45-15:00**	Memory Based LT Code with Shifted Degree Jingxuan Huang, Zesong Fei, Dai Jia, Ce Sun and Xinyi Wang Beijing Institute of Technology, China Presenter: Jingxuan Huang, Beijing Institute of Technology, China Abstract: A new memory based LT encoding scheme is proposed to improve communication reliability and decrease latency at the same time. The robust Soliton distribution (RSD) is shifted as the output symbol degree distribution in the proposed method. The input symbol degree distribution is also changed based on memory. Analysis shows the proposed method has faster decoding convergence speed than the conventional memory based LT code. Simulation results validate the analysis and show BER performance. Compared with regular LT code and the conventional memory based LT code, the proposed method has better BER performance.
CT494 **15:00-15:15**	ZERO-FORCING HYBRID PRECODING BASED ON QR-DECOMPOSITION IN MILLIMETER WAVE SYSTEMS Sichen Gu, Xu Liu, Xinkai Chen Nanjing University of Posts and Telecommunications, China Presenter: Sichen Gu, Nanjing University of Posts and Telecommunications, China Abstract: Millimeter Wave system has attracted much attention because it provides more spectrum resource to offer considerable capacity improvement and supports massive multiple-input multiple-output (MIMO) by its shorter wave length. In traditional precoding methods, the signal is processed digitally at baseband. However, the large number of RF chains cause high hardware cost and power consumption in mmWave systems. Hybrid precoding, which uses both analog processing in the RF domain and digital processing in the baseband, is an alternative to reduce the number of RF chains and control the cost. In this paper, transmit precoding in mmWave systems with hybrid architecture and large antenna arrays is considered. A zero-forcing hybrid precoding algorithm based on QR-decomposition for mmWave system is proposed. According to the matrices obtained based on the QR-decomposition of the ZF matrix, OMP is used to design analog processing matrix at RF domain and digital processing matrix at baseband. Numerical results are presented on the performance of spectral efficiency and show that the performance of the proposed hybrid method is close to that of the full digital ZF precoding algorithm with less RF chains used in mmWave systems.
CT502 **15:15-15:30**	Concatenations of Polar Codes with outerNonbinary LDPC Codes Xiaoguang Li, Qingping Yu, Zhiping Shi, Yiming Li, Qinhuai Yan National Key Lab of Science and Technology on Communications, UESTC, China Presenter: Qingping Yu, National Key Lab of Science and Technology on Communications, UESTC, China Abstract: To improve the performance of polar codes with finite length, a scheme of concatenating polar codes as inner codes and non-binary low-density parity-check (NBLDPC) codes as outer codes is first proposed in this paper, which utilizes the excellent error performance of NBLDPC codes to improve the performance of polar codes at finite length. In addition to this, a novel decoding scheme is proposed, named as BP+Segment-SCL decoding, in which segment successive cancellation list (Segment-SCL) decoding and belief propagation (BP) decoding are employed for polar codes and NBLDPC codes, respectively, and an early stopping criteria is employed to reduce decoding complexity. Simulation results show that our proposed NBLDPC Polar codes with BP+Segment-SCL decoding scheme can achieve 0.35dB gain, compared to RS-Polar codes with Generalized Minimum Distance (GMD) decoding, while with comparable decoding complexity and latency. NBLDPC-Polar codes also outperform pure polar codes with successive cancellation (SC) decoding at high SNRs.
CT544 **15:30-15:45**	An Efficient Post Processing Scheme to Lower the Error Floor of LDPC Decoders Wenjie Li, Jun Lin and Zhongfeng Wang Nanjing University, China Presenter: Wenjie Li, Nanjing University, China Abstract: Low-Density Parity-Check (LDPC) codes have extensive applications in numerous communication systems. However, iterative LDPC decoders may suffer from error floor. In this paper, a low complexity post processing scheme (PPS) is proposed to significantly improve the error correction performance of a Min-Sum based LDPC decoder in the error floor region. Instead of using trapping set

	elimination algorithms, the proposed PPS introduces perturbations so that a decoder can escape from undesired local maximums. After decoding failure, for these unreliable code bits, the proposed PPS generates carefully modified soft messages, which are employed in the following decoding iterations. Numerical results demonstrate that the presented PPS significantly lowers the error floor for simulated LDPC codes.
CT547 **15:45-16:00**	A Reduced Complexity Decoding Algorithm for NB-LDPC Codes Suwen Song, Jun Lin, Jing Tian, and Zhongfeng Wang Nanjing University, China Presenter: Suwen Song, Nanjing university, China Abstract: Non-binary low-density parity-check (NB-LDPC) codes perform much better than their binary counterparts, when codeword length is moderate or high-order modulation is used. However, the implementation of a NB-LDPC decoder usually suffers from excessive hardware complexity and large memory requirement. Many new algorithms and decoding schedules have been introduced in recent literatures to reduce the decoding complexity in further. However, the complexity of current decoding algorithms for NB-LDPC codes is still high. In this paper, a two-extra-column trellis min-sum algorithm (TEC-TMSA) is proposed. The TEC-TMSA combines the two-extra-column method and the trellis min-sum algorithm in an intelligent way. Since only the minimum value of a row needs to be sorted out for configuration constructions, the computational complexity of the proposed TEC-TMSA is much lower than that of the TMSA. Furthermore, we develop a novel location-fixed selection scheme, which significantly decreases the number of required comparison operations in the TEC-TMSA with negligible performance loss.

SESSION 2

< Computer Science and Applied Technology >

13:00–16:00

Chamber of Osmanthus (West Wing, 2F) /桂香居，西楼2楼

Session Chair: Assoc. Prof. Ruo Ando, National Institute of Informatics, Japan

Opening Speech **CT506** **13:00-13:15**	A user mode implementation of filtering rule management plane using key-value Ruo Ando, Yuuki Takano and Shinsuke Miwa National Institute of Informatics, Japan Presenter: Ruo Ando, National Institute of Informatics, Japan Abstract: With the rapid advance of network virtualization technology which realizes SDN (Software Defined Network) and Cloud computing, current networking environment has become more flexible, diversified and complex. At the same time, complex networking environment sometimes imposes a great burden on network administrators for coping with complicated filtering rules. In this paper we present a user mode support for centralized filtering rule management base. Proposed system enables us to handle fine grained traffic engineering functionality for diversified environment of Cloud and SDN. Our architecture adopts KV (Key-Value) based Datastore for handling a large scale of filtering rules. By leveraging Datastore for centralized access control of instances on virtualized environment, we can provide alternative access control framework for reducing the burden of managing complicated and dynamic filtering policy on instances (virtual machine) on virtualized networking environment. Besides, KV representation can simplify the filtering rule set and provide generic interfaces for querying. In experiment, we have prototyped a lightweight management plane for IP filtering. Access filtering rules including target IP address, prefix and gateway is represented as radix tree. It is shown that proposed method can achieve reasonable utilization in filtering IP packets.

CT050 **13:15-13:30**	Random Forest Algorithm under Differential Privacy Zekun Li, Shuyu Li Shaanxi Normal University, China Presenter: Zekun Li, Shaanxi Normal University, China Abstract: Trying to solve the risk of data privacy disclosure in classification process, a Random Forest algorithm under differential privacy named DPRF-gini is proposed in the paper. In the process of building decision tree, the algorithm first disturbed the process of feature selection and attribute partition by using exponential mechanism, and then meet the requirement of differential privacy by adding Laplace noise to the leaf node. Compared with the original algorithm, Empirical results show that protection of data privacy is further enhanced while the accuracy of the algorithm is slightly reduced.
CT219 **13:30-13:45**	Topic mover's distance based document classification Xinhui Wu and Hui Li Key Laboratory of Wireless-Optical Communications of Chinese Academy of Science, Department of Electronics Engineering and Information Science, University of Science and Technology of China, P. R. China Presenter: Xinhui Wu, Key Laboratory of Wireless-Optical Communications of Chinese Academy of Science, Department of Electronics Engineering and Information Science, University of Science and Technology of China, P. R. China Abstract: We propose the Topic Mover's Distance (TMD), a new topic-based distance metric for documents, which is inspired from recently proposed Word Mover's Distance (WMD). Similar to WMD, TMD metric measures the similarity between two documents as the minimum amount of distance that the topics in one document need to travel to the topics in the other document. In our scheme, topics are the basic units to modeling documents, which are clustered from a general word-word co-occurrence matrix by Poisson Infinite Relational Model (PIRM) and vectorized by Glove embedding algorithm. Experiments for document classification on six real world datasets show that compared with word-based WMD, the proposed TMD can achieve much lower time complexity with the same accuracy.
CT229 **13:45-14:00**	A Secret Sharing Scheme from Hadamard Matrix Huaixi Wang and Chen Wang and Nina Shu Hefei Electronic Engineering Institute, China Presenter: Chen Wang, Hefei Electronic Engineering Institute Abstract: In this paper, we propose a secret sharing scheme based on Hadamard matrix and prove its security properties. This secret sharing scheme enjoys both the lower computation complexity and the lower space complexity. This secret sharing scheme can be widely used in many light-weight computation and storage devices, such as smart phones, sensors in Internet of things.
CT230 **14:00-14:15**	Continuous Blood Pressure Prediction Using Pulse Features and Elman Neural Networks Yuemeng Wang, Yujuan Si, Lixun Liu, Jiajia Zhang Jilin University, China Presenter: Yuemeng Wang, Jilin University,China Abstract: The present study designs an algorithm to improve the accuracy of continuous blood pressure (BP) prediction. Pulse wave transmission time has been widely used for continuous BP prediction. However, because of the limitation of the linear model and the complexity of signal acquisition traditional method is often troubled with low BP prediction accuracy. In this paper, Elman neural networks (Elmans) are used to construct the continuous blood pressure measurement model. Continuous measurement of blood pressure is achieved by a single channel pulse signal (PPG). Based on the time-related features of Elman, we apply a method using the feature input matrix by the pulse wave feature points at time t-1 and time t. We select the SBP and DBP at time t as the output matrix of the model; finally establish the Elman continuous blood pressure measurement model. Twenty physiological data segments of two hours selected from the MIMIC II database are used to evaluate the performance. Compared with straightforward use of the PWTT-based linear regression model and the back propagation neural network model, the proposed model achieves higher measurement accuracy.

CT232 **14:15-14:30**	A Novel Document Distance Based on Concept Vector Space Lin Li, Hui Li University of Science and Technology of China, China Presenter: Hui Li, University of Science and Technology of China Abstract: A novel metric to measure the distance between documents is proposed in this paper. By utilizing the recent results in word embeddings which can present semantical information between words by real-value vectors, we model a document as a concept vector space, where the concepts are a series of key words extracted based on the text by dependency parsing and linguistic knowledge. A new document distance is defined on the concept vector space to measure the relatedness or similarity between two documents, which can be used in many natural language processing (NLP) task such as document classification, news clustering, etc. The proposed metric has no hyperparameters to tuning and is easily to compute. Further we give a demonstration on a few real world document classification datasets based on k-nearest neighbor (kNN) algorithm. The experiment results show that the new document distance can lead to an impressive quality improvement on document classification.
CT271 **14:30-14:45**	ICA Based Causality Inference between Variables Hongxia Chen XIDIAN University, China Presenter: Hongxia Chen, XIDIAN University, China Abstract: Several approaches have been proposed to discover the causality of the fixed or time-invariant causal model recent years. However, in many practical situations, such as economics and neuroscience, causal relations between variables might be time-dependent. The paper aims to estimate the time-dependent causal model with more generally non-Gaussian noise from purely observational data. It is shown that, under appropriate assumptions, the model can be identified and can be estimated by the proposed independent component analysis based two stage method. Experimental results on artificial data show the effectiveness of the proposed approach.
CT309 **14:45-15:00**	Asterisk Server Performance Under Stress Test Debajyoti Pal, Tuul Triyason, and Vajirasak Vanijja KMUTT, Thailand Presenter: Dr. Tuul Triyason, KMUTT, Thailand Abstract: VoIP has gained tremendous popularity in the recent times. However, security and Quality of Service (QoS) are two factors that severely affect its performance. The Session Initiation Protocol (SIP) servers must have enough hardware configurations as well as they should be properly configured to get a good voice quality. In this paper we investigate the effects of hardware configuration of the Asterisk (SIP) server that it might have on the QoS of VoIP. In particular, we load the server gradually with bulk calls and check the performance of CPU and RAM. We also scan the network packets and continuously monitor the call quality. In essence, we try to investigate a threshold value for the number of bulk calls that can be generated by our hardware configuration that will guarantee a good QoS. Therefore, one can conclude about the hardware configuration requirements of the Asterisk SIP server by analyzing the QoS of the generated calls. We also take into account the network loading conditions and try to combine the effects of both to come to a realistic value on the number of calls that can be generated.
CT335 **15:00-15:15**	Android Based Automated Scoring of Multiple-choice Test Hendra Tjahyadi,Yoga G. Budijono, Samuel Lukas, Dion Krisnadi Pelita Harapan University, Indonesia Presenter: Hendra Tjahyadi, Pelita Harapan University, Indonesia Abstract: In this paper design and implementation of an Android based automated scoring of multiple-choice test is reported. This application is designed as a more affordable alternative for more popular solutions which usually composed of a software and Optical Mark Recognition Scanner. Two main parts are involved in the design process, namely the answer sheets design and the image processing procedure. Moreover, there are 4 main stages in the image processing procedure: (i)input taking stage, (ii) early processing stage, (iii) identifying stage, and (iv) evaluating stage. After those stages are implemented, tests are conducted to find the best distance and angle of the smart phone to the answer sheet in taking the answer sheet's images and to evaluate the accuracy in identifying right answers and gives valid scoring.

	The experiment results show that the best distance and angle with 95% of identification success rate is between 20 to 50 centimetres with 45 to 90 degrees angle, and when the answer sheet's image is correctly identified, the identification of valid scoring success rate is 100%.
CT347 **15:15-15:30**	Application Feature Extraction using both Dynamic Binary Tracking and Statistical Learning Gang Lu, Jing Du, Ronghua Guo, Ying Zhou, Haipeng Fu Chinese Luoyang Electronic Equipment Center, China Presenter: Gang Lu, Chinese Luoyang Electronic Equipment Center, China Abstract: While application feature extraction is popular in recent researches of traffic classification, only a few studies have extracted application features by synthetically analyzing packet payloads, port allocation and flow-level statistics. In this paper, we apply the techniques of both dynamic binary tracking and statistical learning in application feature extraction. Specifically, we first accurately capture the payload contents by reversely debugging an application in an automatic way, and then recursively cluster those contents to generate protocol signatures. Afterwards, we perform port statistical analysis to generate a port association rule. To identify the encrypted applications, we present a feature selection algorithm for selecting the optimal features from the time series statistics of the first ten packet sizes of each TCP flow. Compared with three typical feature selection algorithms, we validate that our proposed feature selection algorithm is more effectiveness. Additionally, we propose a scheme to synthetically apply protocol signatures, port association and flow statistics in traffic classification. By evaluating our method on the identification of Thunder flows, we show that the combination of protocol signatures, port association and flow statistics is promising in traffic classification.
CT390 **15:30-15:45**	Research on Personalized Recommendation Algorithm Combined with Time Factor Hao Wen, Yuehui Jin, TanYang Beijing University of Posts and Telecommunications, Beijing, China Presenter: Hao Wen, Beijing University of Posts and Telecommunications, Beijing, China Abstract: The traditional collaborative filtering algorithm is widely used in the field of recommendation. This method recommends items to users based on what items other similar users have chosen, aiming to recommend the top N items that users most likely favorite. However, it often provides unsatisfactory results, because it ignores some contextual information such as social tagging and time changing. Tags are some keywords to annotate or categorize items. Incorporating contextual information in recommender systems can improve accuracy of recommendation and enhance the overall experience of users. For improving the current collaborative filtering algorithms, we propose an algorithm based on tensor factorization and combined with time change. This algorithm uses three typical entities, i.e., users, items and tags, to build recommendation model, it is presented as a three-dimensional tensor. The latent relation is performed by Higher Order Singular Value Decomposition (HOSVD) algorithm. Besides, the algorithm considers the change of user interests over time. We highlight the importance of users' recent data followed the Ebbinghaus memory curve, calculate data weight according its time. Then, the weight value is brought into the three-order tensor model. Finally, the algorithm makes the recommendation of items to users. Experimental results show that this approach has improvements compare to collaborative filtering algorithm and HOSVD algorithm in F1-Measure with two real world datasets.
CT438 **15:45-16:00**	Improving Learning Algorithm Performance for Spiking Neural Networks Qiang Fu, Yuling Luo, Junxiu Liu, Jinjie Bi, Senhui Qiu, Yi Cao, Xuemei Ding Guangxi Normal University, China Presenter: Qiang Fu, Guangxi Normal University, China Abstract: This paper proposes three methods to improve the learning algorithm for spiking neural networks (SNNs). The aim is to improve learning performance in SNNs where neurons are allowed to fire multiple times. The performance is analyzed based on the convergence rate, the concussion condition in the training period and the error between actual output and desired output. The exclusive-or (XOR) and Wisconsin breast cancer (WBC) classification tasks are employed to validate the proposed optimized methods. Experimental results demonstrate that compared to original learning algorithm, all three methods have less iterations, higher accuracy, and more stable in the training period.

SESSION 3

< Data Transmission and Security >

13:00–16:00
Chamber of Willow (West Wing, 2F) / 舒柳园，西楼2楼

Session Chair: Prof. Hua WANG, Beijing Institute of Technology, China

CT049 **13:00-13:15**	Research on network invulnerability based on DWS model considering cascading failure in power data network Runze Wu, Yingjie Zou, Bing Fan, Liwu Yao North China Electric Power University, China Presenter: Yingjie Zou, North China Electric Power University, China Abstract: With the analysis of the actual structure property of data network in power grid, a network model based on a layered structure named DWS is introduced in this paper. In this DWS layered network featured with the tree structure, aiming to meet the requirements of network operation reliability, we combine the relative access distance with node degree for the nodes for lower levels to add redundant connections correspondingly. In order to evaluate the network invulnerability under the change of weight factor for relative access distance, the load redistribution and the impact of different node capacity redundancy are also considered to illustrate the typical cascading failure process. To note that, the scale in the remaining effective connected components after the deliberate attack is the major measurement of structural invulnerability. In the simulation, it has been illustrated that, with the improvement in the weight of relative access distance and in the capacity redundancy, the cascading failure impact on the layered network structure in the condition of heavy load is decreased obviously, which shows the better structural invulnerability and ensures the applicability of the data network model which we proposed.
CT124 **13:15-13:30**	A Novel Temporal-spatial Analysis System for QAR Big Data Huabo Sun, Yang Jiao, Jingru Han, Chun Wang China Academy of Civil Aviation Science and Technology, China Presenter: Huabo Sun, China Academy of Civil Aviation Science and Technology, China Abstract: The current analysis restricts to the statistics of different exceedance events in flight operational quality assurance (FOQA). Statistical methods lack effective correlation to flight data at different time and space, and lack deep-level mining and application of flight quality monitoring information. For questions raised above, this paper presents a novel approach for FOQA based on temporal geography information system (T-GIS). We construct a time-snapshot-> time series-> space-time evolution model, and design a dynamic spatiotemporal statistical analysis algorithm. The results show that the system can be used to deal with large flight data to find the unsafety events spatial-temporal distribution of the whole civil aviation industry. It also provides a new research idea to raise the level of FOQA.
CT256 **13:30-13:45**	Capacity Enhancement of Hamming+k Data Hiding By Pixel Overlapping Approach Cheonshik Kim, Dongkyoo Shin, Chin-Nung Yang, Yung-Shun Chou National Dong Hwa University, Taiwan Presenter: Chin-Nung Yang, National Dong Hwa University, Taiwan Abstract: A steganographic scheme, matrix coding based data hiding (MCDH), is constructed from covering function. MCDH may enhance embedding efficiency, and meanwhile decreases the number of modified bits. A we-known MCDH is based on Hamming code HC(n, n(k), i.e., using a covering function COV(1, n=2k(1, k), referred to as Hamming code data hiding (HDH). Since then, HC(n, n(k)+1 DH (H1DH) was introduced, and it had a better embedding efficiency, when compared with HDH. However, both HDH and H1DH have demerit of small embedding rate. To overcome this problem, we adopt pixel overlapping approach, optimal pixel adjustment process (OPAP), and Least Significant Bit (LSB) substitution to construct the Hamming+k with m overlapped pixels DH (Hk_mDH). Experimental results reveal that the proposed scheme exhibits a good embedding rate compared with previous schemes. Also, the theoretical estimation of average mean square error for these Hamming-like DHS are given to demonstrate the advantage of our Hk_mDH.

CT275 **13:45-14:00**	A Target Detection Algorithm Based on Signal - Data Joint Processing under Blanket Jamming Jie Bai, Guohong Wang, Xiangyu Zhang, Dianxing Sun Naval Aeronautics University, China Presenter: Yang Lin, Naval Aeronautics University, China Abstract: Aiming at the problem that the target detection probability of pulse radar is low under the blanket jamming environment, a target detection algorithm based on signal - data joint processing is proposed. Firstly, the radar echo signal is pre-processed by blind source separation in the signal layer to improve the signal-to-interference ratio and solve the cross-interference problem between the target echoes. Then, according to the different properties of Linear frequency modulation(LFM)signal in different conversion orders in the Fractional Fourier transform(FRFT)domain, the LFM signal is narrowband filtered and the doppler frequency is estimated to filter out the energy of most interference and noise, and provide the aiming information of the target radial velocity for the data layer processing respectively. Finally, in the data layer, M / N logic method is used to deal with all the points, and combined with the radial velocity decision algorithm to achieve the target track detection. The simulation results show that the algorithm can effectively detect the target under the strong suppression interference environment.
CT346 **14:00-14:15**	Anti-jamming Power Control Game for Data Packets Transmission Long Yu, Yusheng Li, Chen Pan and Luliang Jia PLA University of Science & Technology and Nanjing Telecommunication Technology Research Institute, China Presenter: Long Yu, PLA University of Science & Technology and Nanjing Telecommunication Technology Research Institute, China Abstract: In this paper, we investigated the anti-jamming power control game problem in which the user aims to maximize the throughput of data packets transmitted successfully. Stackelberg game is utilized to model and analyze the anti-jamming problem. The closed form expressions of the optimal power for both the user and jammer are derived. Simulation results are conducted to validate our theoretical analysis.
CT353 **14:15-14:30**	A Clustering Algorithm for Binary Protocol Data Frames based on Principal Component Analysis and Density Peaks Clustering Xiaoyong Yan, Qing Li, Siyu Tao National Digital Switching System Engineering and Technological Research Center, China Presenter: Xiaoyong Yan, National Digital Switching System Engineering and Technological Research Center, China Abstract: Binary protocols lack session flow characteristics and its frequent patterns extracting is difficult. In order to achieve binary protocol data frames identification, an unsupervised clustering algorithm based on improved principal component analysis (PCA) and density peaks clustering (DPC) is proposed. We improve PCA by determining the dimensionality for PCA based on information gain. The improved PCA can remove redundant information and retain the characteristics of original data. Meanwhile, we improve DPC based on distance index weighting. The improved DPC can select cluster centers automatically and enhance the distinction between cluster centers and other data frames effectively. Experimental results show that the proposed algorithm works effectively for binary protocol data frames clustering.
CT370 **14:30-14:45**	A Novel Way to Calculate PDMOL Based on the Coding Parameters and Network Conditions Lin Du, Chang Tian, Zemin Wu, Lei Hu PLA Army Engineering University, China Presenter: Lin Du, PLA Army Engineering University, China Abstract: In order to solve the problem that the whole reference video is required for calculation in model PDMOSL, we focus on the impact of coding parameters and network conditions on the model, especially the influence of the QP, frame rate and packet loss rate. Based on our findings, we proposed a novel way to calculate PDMOSL without the need of reference video, and only two parameters are need. The proposed way can reduce the time complexity and is applicable to practical systems, especially for network nodes.

CT426 **14:45-15:00**	A New Design on Degree Distribution of LT Code Based on Poisson and Moved-RSD Distribution Zhang Meng, Feng Lifang University of Science and Technology Beijing, Beijing, China Presenter: Meng Zhang, University of Science and Technology Beijing, Beijing, China Abstract: In this paper, a Poisson-Moved-Robust Solition Distribution (PMRSD) degree distribution is proposed based on Poisson distribution and the Moved Robust Solition Distribution (Moved-RSD). In the encoder, Poisson distribution is utilized to construct enough encoded data packets of small-degree, and Moved Robust Solition Distribution is used to generate encoded data packets of big-degree. The decoder can achieve completely decoding without interrupted because it is assured that the encoded data packets can contain all information of source data packets. The simulation results show that, comparing to New-Switch degree distribution-based LT code, the new PMRSD degree distribution-based LT code has advantages in improved decoding efficiency, reduced decoding overhead and bit error rate (BER).
CT461 **15:00-15:15**	Instantly Decodable Network Coding for Order-Constrained Applications over Wireless Broadcasting Pengfei Wang, Dongmei Zhang, Xiang Zheng, Kui Xu, Wei Xie PLA Army Engineering University, China Presenter: Pengfei Wang, PLA Army Engineering University, China Abstract: In this paper, we study the in order packets delivery in wireless broadcasting systems using instantly decodable network coding (IDNC). Our concern is that the successful delivery of packet depends on the current correctly received packet and all the packets they have received earlier. The delivery time, as the number of undelivered packets at each transmission, is defined as a suitable metric for such scenario. However, the problem of minimizing the delivery time is quite intractable and existing literatures dedicated to finding a suboptimal solution. This paper suggests a novel method for solving this problem by formulating the delivery time minimization problem as an optimization problem with respect to encoding vector. And then, a partial enumeration iterative (PEI) algorithm has been presented to solve the optimization problem. Simulation results testify that our proposed algorithm achieves lower delivery time and provides quicker packet delivery as compared to existing algorithms.
CT505 **15:15-15:30**	Signatures Reconstruction Based on Parametric Scattering Model and the Application in Communication Shan Cui, Sheng Li, Hua Yan Science and Technology on Electromagnetic Scattering Laboratory, China Presenter: Shan Cui, Science and Technology on Electromagnetic Scattering Laboratory, China Abstract: Electromagnetic signal of target are formed from typical geometric shapes, these typical reflectors can be described as parametric scattering model. The signatures reconstruction method transforms the electromagnetic scattering field of each typical reflector in local coordinate system to the target coordinate system, considering distance difference and occlusion issue, calculates the total electromagnetic scattering field, the root-mean-square error, energy ratio and similarity between theory simulation data and synthesis scattering data fit well. The transmitting procedure only needs the parameters of these typical reflectors, the receiving terminal regenerates the original signal of all the viewing angles and all the frequency. So this signal processing method can be used for communication to improve information compression efficiency.
CT517 **15:30-15:45**	Exploring the Impact of Processing Guarantees on Performance of Stream Data Processing Syed Muhammad Abrar Akber, Changfu Lin, Hanhua Chen, Fan Zhang and Hai Jin Huazhong University of Science and Technology, China Presenter: Syed Muhammad Abrar Akber, Huazhong University of Science and Technology, China Abstract: Processing semantics ensure tuple processing guarantees during system recovery from failures. It determines whether particular tuples are re-processed or not upon system recovery. Processing semantics facilitate to maintain real-time response as well as correctness of results in stream data processing. Existing literature is in real deficit to provide sufficient resources exclusively on processing semantics. This work focuses on reviewing processing semantics in stream data processing systems. This article aims at exploring the impact of processing guarantees on performance of stream data processing. We summarize current research directions to guarantee processing semantics, based on prominent stream processing engines. Furthermore, we compare throughput for a couple of representative stream processing engines under all possible processing guarantees. Our experiments show that at-most once processing guarantee provides the highest throughput among other guarantees. Lastly, challenges for further research are also discussed in this paper.

CT529 **15:45-16:00**	A Fuzzy Clustering Algorithm Based on Complex Synaptic Neural Network Rongrong Li and Jimin Sun CETC54, China Presenter: Rongrong Li, CETC54, China Abstract: This paper presents a new fuzzy clustering algorithm to solve the problem that the fuzzy c-means (FCM) clustering algorithm has a poor accuracy of clustering. The adopted methodology used the minimum support tree principle to get the initial clustering center and extended Lagrange multiplier method to solve the problem of noise sensitive of the FCM algorithm. Besides, the Hopfield neural network is used to calculate the cluster center and complex synaptic neural network is used to obtain the membership grades. In the experiment, the proposed algorithm is simulated and compared with the commonly used clustering algorithm. The clustering accuracy is higher than that of other algorithms. The analysis proves that the algorithm has universal guiding significance in theory and engineering practice.

SESSION 4

< Communication and Information System >

13:00–16:00
Chamber of Moon (West Wing, 2F) /霁月室, 西楼2楼

Session Chair: Assoc. Prof. Benjamin Ng, Macao Polytechnic Institute, China

Opening Speech **CT362** **13:00-13:15**	Performance of SC-FDMA-based Multiuser Massive MIMO System in the Presence of Phase Noise Benjamin K. Ng, Thomas Choi, Chan Tong Lam Macao Polytechnic Institute, Macao Presenter: Benjamin Ng, Macao Polytechnic Institute, Macao Abstract: In this paper, we investigate the performance of an uplink SC-FDMA-based massive MIMO system, which consists of single-antenna-equipped users and base station (BS) employing a large antenna array, in the presence of phase noise. Both transmitter and BS receiver phase noises are considered, while at the BS receiver, two scenarios, namely the synchronous and non-synchronous oscillators, are studied. Using a maximum-ratio-combining (MRC) receiver and a simplified phase noise model assuming perfect channel estimates, we analytically show that the multiple access interference and inter-carrier interference diminish as the number of BS receive antennas grows extremely large, while a common phase error (CPE) affects the desired signals in the distributed-mapping-based SC-FDMA system. Simulations show the performance of the synchronous and non-synchronous scenario for both the localized and distributed mapping. It is also shown that the distributed mapping and non-synchronous scenario demonstrate significant improvement when phase noise compensation is applied to correct the CPE component.
CT010 **13:15-13:30**	High-Order Modulation for Small Cell Networks: A High Level Analysis Minqi Chen, Jun Zou, Mao Wang Nanjing University of Science and Technology, China Presenter: Minqi Chen, Nanjing University of Science and Technology, China Abstract: Emerging wireless communication transmission technologies, such as small cell networks, continue to improve receive signal-to-interference-plus-noise ratio (SNR) in a cellular system such as the LTE. It has come to the point that 64 QAM, the modulation order that is believed to be sufficient for a cellular system, seems to be no longer enough in order to convert the SNR advantage to an actual spectral efficiency and benefit from it. This article analyzes the feasibility and potential performance gain of the 256 QAM modulation scheme in an LTE small cell network when taking transceiver hardware limitation and scheduling signaling overhead into consideration. The discussion pertains to LTE, but it applies to any other wireless communication system as well.

CT021 **13:30-13:45**	A Dynamic Multiuser Detection Scheme for Uplink SCMA System Yuxi Tan, Zehua Gao, Siyan Gao, and Feng Gao Beijing University of Posts and Telecommunications, China Presenter: Yuxi Tan, Beijing University of Posts and Telecommunications, China Abstract: As one of nonorthogonal multiple access techniques for the fifth generation mobile communications, sparse code multiple access(SCMA) can provide a better link performance than other schemes in different network scenarios. However, SCMA employs message passing algorithm (MPA) as its receiver decoding scheme which leads to higher computing complexity and restricts it's application to low latency networks. Based on this, a dynamic message passing algorithm (DMPA) is presented in this paper for reducing calculation complexity of original MPA. In DMPA, reliability of variable node can be calculated by the pseudo posterior probability after predetermined iterations, and then messages are propagated merely in subgraph of original factor graph which can result in a significant reduction in complexity. Simulation results show that DMPA can reduce decoding complexity about 37% than MPA with negligible bit error rate (BER) degradation.
CT179 **13:45-14:00**	High-Throughput Interleaving Scheme in Free Space Optical Communication System Dai Zhang, Shiqi Hao, Qingsong Zhao, Lei Wang, Qi Zhao and Xiongfeng Wan State Key Laboratory of Pulsed Power Laser Technology, Electronic Engineering Institute, China Presenter: Dai Zhang, State Key Laboratory of Pulsed Power Laser Technology, Electronic Engineering Institute, China Abstract: Interleaving scheme has found its applications in free space optical (FSO) communication system to cope with successive burst errors caused by atmospheric turbulence. However, the high data transfer rate of FSO communication requires high throughput interleaving, which poses unique challenges for the existing interleaver. In this paper, we present a novel interleaving scheme by using combinations of byte-wise interleaver and serializer/deserializer (SerDes) structure. A straightforward model is established to derive tight approximate expressions of post forward error correction (FEC) bit error rate (BER) over the atmospheric turbulence channel. Simulation results show that the proposed scheme has advantage of better BER performance in coping with successive burst errors over the existing interleaving schemes, and it also has a relatively high throughput capacity which is applicable to the FSO communication system.
CT339 **14:00-14:15**	Aerostat virtual network and navigation method Weiyi Chen, Yingkui Gong, Xiaoguang Zhang, Pengke Deng, Qingbo Gan Academy of Opto-Electronics, Chinese Academy of Sciences, China Presenter: Weiyi Chen, Academy of Opto-Electronics, Chinese Academy of Sciences, China Abstract: Aerostat is a special vehicle that floats on a certain height in the space. It divided into two categories: airships and tethered balloons,which can work a long time in a particular range of space. It is worth mentioning that install the task load on the aerostat, that can make it has fixed-point remote sensing, information acquisition, communication, navigation and other functions. But the high dynamics of the aerostat cause difficulties in their networking. Based on this, this paper presents the design of virtual aerostat network, that to carry out communication, navigation, remote sensing and other functions of the multi-task mode application. The simulation results show that the construction of a virtual aerostat network can effectively realize the task of navigation, communication. It can enhance the ability to perform high-performance emergency tasks, as well as to have a significant regional application advantages.
CT371 **14:15-14:30**	Discrete Phase-Only Hybrid Beamforming Method In MIMO System Based On Genetic Algorithm Zixun Zhuang, Zaixue Wei, Nanxi Li and Lin Sang Beijing University of Posts and Telecommunications, China Presenter: Zixun Zhuang, Beijing University of Posts and Telecommunications, China Abstract: Recently, with the severe spectrum shortage in the traditional cellular bands, the study on relatively large-scale antenna systems in the millimeter wave bands is attracting an increasing attention. In these systems, every antenna needs to be linked to a RF chain, so the hardware complexity, energy consumption and cost are all high. Hybrid analog/digital beamforming (BF) is a good method to solve this problem. This paper proposes a discrete phase-only BF algorithm based on genetic algorithm (GA) for hybrid analog/digital BF system. With the proposed algorithm, we can minimize the average transmit

	power by adjusting the discrete phase-only BF weights under the SINR constrains. Due to the limitation of the discrete phases, the algorithm can reduce the implementation complexity of the system while achieving a good performance. We also study on the impact of the discretization precision and different GA parameters on the transmit power. It can provide a guidance for future practical application of multi-antenna multiuser millimeter wave systems.
CT405 **14:30-14:45**	A Research on Anti-jamming Method Based on Compressive Sensing for OFDM Analogous System Cui Chen and Yongning Zhuo University of Electronic Science and Technology of China, China Presenter: Cui Chen, University of Electronic Science and Technology of China, China Abstract: The intentional or unintentional interferences often bring performance losses to the broadband communication systems such as OFDM (Orthogonal Frequency Division Multiplexing) systems. Traditional interference suppression methods based on compressed sensing usually firstly recover the jamming signal then remove it from the received signal, which employs the sparse features in jamming signal's frequency spectrum. However, those methods are ineffective to the impulsive interference. In this paper, we propose a novel scheme to directly recover the transmitted signal. Rather than using the spectrum sparseness of jamming signals, we exploit the sparseness existed in transmitted signal brought by the channel coding, and use the redundant dictionary to accomplish the sparse recovery process at the recevier. That makes our method uesful for pulse jamming or narrow band jamming signal. The simulation results shows the feasibility and universality of the proposed scheme.
CT406 **14:45-15:00**	Energy Efficiency Maximization for MIMO-OFDMA Systems with Imperfect CSI Jing Mao, Chen Chen, Xiaoning Zhang and Haige Xiang Peking University, China Presenter: Jing Mao, Peking University, China Abstract: Unlike the previous work on efficiency (EE) for multiple input multiple output (MIMO) orthogonal frequency division multiple access (OFDMA) systems with assuming the availability of perfect channel state information (CSI), this paper investigates robust resource allocation to improve the system EE under imperfect CSI. Considering the estimation error and the feedback delay, we formulate a combinatorial problem involving subcarrier assignment and power allocation to maximize the EE subject to a transmit power constraint and a minimum rate constraint. By relaxing the integral constraints, we develop a joint subcarrier and power allocation algorithm which can be implemented by one-dimension search. The simulation results demonstrate that the proposed algorithm can achieve a comparable EE performance with the optimal algorithm. Moreover, with taking imperfect CSI into account, the proposed algorithm can achieve higher EE when compared with a nonrobust algorithm.
CT442 **15:00-15:15**	Encryption at Physical Layer Based on Chaotic System and Three-dimensional Modulation in Massive MIMO Systems SixinWang, Wei Li, Jing Lei National University of Defense Technology, China Presenter: Sixin Wang, National University of Defense Technology, China Abstract: The development of massive multiple input and multiple output (MIMO) brings various advantages in the fifth generation (5G) wireless communication systems, which can achieve high spectral efficiency and energy efficiency. In this paper, considering the security and energy efficiency in massive MIMO, a physical layer security approach named chaotic antenna-index three-dimensional modulation (CATM) encryption scheme is proposed, which adds an additional dimension to the conventional two-dimensional modulation techniques. For security, the keys generated by chaotic system are used to protect information bits, antenna combination and mapping mode (ACMM). Both analytical and simulation results show that the proposed CATM scheme offers not only considerable security but also higher reliability and energy efficiency than conventional massive MIMO.

CT480 **15:15-15:30**	Personal trajectory based Social-aware D2D communication Networks Wei Chen, Huawei Chen University of Electronic Science and Technology of China, China Presenter: Wei Chen, UESTC, China Abstract: As an important part of future wireless communication technology, D2D communication can reduce the pressure of increasing demand for limited radio resources and improve the performance of wireless communication. To further promote the transmission efficiency of D2D communication, researchers combine social networks with it to establish a two-tier model that typically includes social domain and physical domain. This paper presents a personal trajectory based social aware content share solution to D2D communication. Personal trajectory data contains both physical and social information which contacts two domains of the model. The solution of this paper also considers the classification of share contents. Simulation results show that proposed solution improve the performance of D2D transmission.
CT489 **15:30-15:45**	A Dynamic Scheduling Scheme for CoMP in Downlink FD-MIMO Transmission Chengyu Lu, Binyan Lu, Yong Wang, Shu Fang University of Electronic Science and Technology of China, China Presenter: Chengyu Lu, University of Electronic Science and Technology of China, China Abstract: Full dimension MIMO (FD-MIMO) technique has attracted considerable attention in both academia and industry as a potential candidate technology in 5G. It is able to enhance the performance of wireless communication system such as throughput, spectral efficiency and energy efficiency due to the exploitation of additional spatial freedom degrees. Meanwhile, coordinated multiple points (CoMP) technique is also a promising technology in Long Term Evolution (LTE). Through coordinated processing, the throughput of cell-edge users can be improved significantly. In this paper, we propose a dynamic scheduling scheme with signal leakage to noise ratio (SLNR) precoding for CoMP in downlink FD-MIMO transmission. First, the possible CoMP UE is searched dynamically with low signal to interference plus noise ratio (SINR) that requires coordination with other base-stations (BS). Second, the possible CoMP BS is searched semi-dynamically to provide enough gain for users. Simulation results show that the proposed scheme achieves almost the same performance as the full joint processing (JP) scheme, but with a significant reduction of computational complexity.
CT929 **15:45-16:00**	Target angle tracking algorithm based on the covariance matrix for bistatic MIMO radar Zhang Zhengyan, Zhang Jianyun Electronic Engineering Institute, China Presenter: Zhang Zhengyan, Electronic Engineering Institute, China Abstract: The problem of tracking the direction of arrivals (DOA) and the direction of departure (DOD) of multiple moving targets is considered in bistatic multiple input multiple output (MIMO) radar. A low complexity angle tracking algorithm in bistatic MIMO radar is proposed. The proposed algorithm derived the difference between previous and current covariance matrices. And the relationship between the different of covariance matrices and the different of target angle is derived. The performance of the proposed algorithm is improved by averaging the covariance matrix elements. Last DOD and DOA is got by least square method. This algorithm avoids the decomposition of the covariance matrix and reduces the computational complexity, which realizes DOA and DOD of the adjacent moment automatic association. The simulation results demonstrate effectiveness of the proposed algorithm. The algorithm provides the technical support for the practical application of MIMO radar.

SESSION 5

< Modern Information Theory and Signal Analysis >

13:00–16:00
Chamber of Dew (West Wing, 2F) /浣花轩，西楼2楼

Session Chair: Prof. Gang Li, Zhejiang University of Science & Technology, China

Opening Speech **CT122** **13:00-13:15**	Design of Robust Projection Matrix Using Prior Information for Signal Compression Gang Li, Aihua Yu, Zhihui Zhu, and Beiping Hou Zhejiang University of Science & Technology, Hangzhou, China Presenter: Gang Li, Zhejiang University of Science & Technology, China Abstract: This paper deals with designing optimal projection matrix for signal compression. With prior information taken into account, a novel measure is proposed, which allows us to design optimal robust projection matrix such that the sparse representation error is minimized and the clean signal is sensed as much as possible. An analytical solution is derived for the optimal projection matrix. Simulation and experiments, carried out using synthetic data and real image signals, show that the CS system with the proposed projection matrix outperforms the prevailing ones in terms of reducing the effect of sparse representation errors.
CT047 **13:15-13:30**	Analysis on Frequency Diversity and Anti-jamming Characteristic of TDCS Signal Rong Shi, Yu Du Science and Technology on Electronic Information Control Laboratory, China Presenter: Rong Shi, Science and Technology on Electronic Information Control Laboratory, China Abstract: The idle spectrum can be utilized to avoid the slowly changing jamming in the traditional TDCS (Transform Domain Communication System), but its performance is seriously reduced in the frequency rapidly changing jamming conditions. In order to solve this problem, the soft spectrum spreading effect from CCSK (Cyclic Code Shift Keying) in TDCS signals is analyzed in detail. The frequency diversity characteristic in the signal transmission process is revealed. Therefore the diversity receiving is naturally requested, and a selective combining processing method for the undisturbed subcarriers is proposed. It enhances the anti-jamming ability of the system. The effect on the receiving performance is also analyzed. The simulation results verify the validity of above analysis and the practicability of this method.
CT089 **13:30-13:45**	A Hybrid Algorithm for Fast Parameter Estimation of LFM Signal Song Jun, Sun Ni, Gao Yue Nanjing Forestry University, China Presenter: Jun Song, Nanjing Forestry University, China Abstract: According to the characteristics of linear frequency modulation (LFM) signal, the new algorithm determines the optimal delay time and delay length in the autocorrelation sequence based on the sequence convolution method. The sinusoidal parameter estimation algorithm of time autocorrelation sequence is also improved. Under the conditions of different initial frequency, coefficient of frequency modulation, amplitude and other parameters, the more accurate coefficient of frequency modulation k and initial frequency f0 are obtained in the hybrid algorithm, at the same time, the computational complexity of the algorithm is low. The simulation results show that the accuracy of LFM signal estimation is still close to the Cramer-Rao Bound (CRB) at lower signal-to-noise ratio, which reflects the effectiveness and stability of the hybrid algorithm.

CT117 **13:45-14:00**	Hybrid Blind Symbol Rate Estimation for Linearly Modulated Signals Mohammed El Hadi LAKHDARI, Hua WANG, Mohamed BOUCHOU Beijing Institute of Technology, China Presenter: Mohamed BOUCHOU, Beijing Institute of Technology, China Abstract: In this paper, a hybrid two-stage algorithm for blind symbol rate estimation is proposed, which applies for raised cosine pulse shaped, linearly modulated signals. In the first stage, the inverse (fast) Fourier transform (IFFT) of the averaged power spectrum is used to extract a coarse estimate based on the evaluation of the related baseband signal. In the second stage, a Maximum-likelihood (ML) based algorithm is used for the fine estimation due to its high accuracy. A prior estimation of the carrier frequency is proposed to allow for working in blind environment at low signal-to-noise ratio (SNR) levels. The performance of the proposed algorithm verified by simulation shows a high efficiency with less complexity comparing to the methods published in the open literature.
CT170 **14:00-14:15**	Non-data-aided Frequency Offset Estimation for Binary CPM Signals Yang Wang and Shilei Zhou The 54th Research Institute of CETC, China Presenter: Yang Wang, Science and Technology on Communication Networks Laboratory, The 54th Research Institute of CETC, China Abstract: Frequency offset estimation for binary continuous phase modulation (CPM) signals is investigated in this paper and a feedforward non-data-aided (NDA) and non-timing-aided frequency offset estimation algorithm is proposed. In the algorithm a new autocorrelation function is used for frequency estimation. The delay value in the function is carefully selected depending on the parameters of the CPM signal. And then the frequency offset is estimated based on the integration of the autocorrelation function which is independent of the timing delay. Simulation results show that the proposed algorithm performs well for CPM signals with higher modulation index and has better performance than the existing feedforward NDA and non-timing-aided frequency estimation algorithm. Additionally, the performance gain is more significant when the signal-to-noise ratio gets higher.
CT306 **14:15-14:30**	A Modified Unambiguous Acquisition Algorithm for BOC (n, n) Signal Kun Zheng, Xiaolin Zhang, Yunjing Wang Beihang University, China Presenter: Kun Zheng, Beihang University, China Abstract: For the unambiguous acquisition problem of Binary Offset Carrier (BOC) modulated signal caused by its multi-peak autocorrelation function (ACF), a modified unambiguous acquisition algorithm for BOC (n, n) signal based on reconstructed correlation function is proposed. The algorithm uses the cross-correlation of BOC signal and pseudo random noise (PRN) code, through the shift, modulus, addition and square operations to implement. Theoretical analysis and simulation results show that the algorithm can completely eliminate side peaks and double the main peak value without changing its width, and it also has lower algorithm complexity, larger peak-to-average power ratio and higher acquisition accuracy than traditional acquisition algorithms.
CT325 **14:30-14:45**	Low Complexity Max-Log-MAP Demapper for M -PAM Signals with Nonuniform Constellations Xudong Zhong, Yuanzhi He, Hao Yin and Jingchao Wang Army Engineering University, Nanjing 210007, China Presenter: Xudong Zhong, Arm Engineering University, China Abstract: Constellation shaping is beneficial for approaching the Shannon capacity limit. However, the nonuniform signal caused by constellation shaping could increase the complexity of the signal demodulation. The reflective symmetry of the uniform PAM constellation can be exploited to reduce the demapping complexity. However, nonuniform PAM signals lose this symmetry because of the distribution of constellation points, which increase the amount of demapping calculation. A low complexity max-log-MAP demapping algorithm is proposed for demodulating nonuniform -PAM signals in this paper. We divide decision boundaries into two parts: ordinary ones and special ones. We find the symmetry of the received symbols and derive the analytic expressions for all boundaries. Based on this, the complexity of the proposed algorithm is lower than other similar works, and the proposed algorithm can be further simplified with acceptable performance loss.

CT382 **14:45-15:00**	Study on GNSS-based detection technology of bistatic radar reflection signals of smallsatellites Jun Xie, Jianjun Zhang and Ming Xue China Academy of Space Technology, China Presenter: Jianjun Zhang, China Academy of Space Technology, China Abstract: Because small satellites have characteristics of small size, light weight, low power consumption, low cost, all-time, all-weather uniform global coverage of large amounts of data, the GNSS-based reflection signal bistatic radar detection technology of small satellites is becoming a hot research. According to the characteristics of GNSS signals, the reflected signal to the target spacecraft is analyzed theoretically, and the small satellites cylinder model which can react the characteristics of the target spacecraft is established. Through the analysis of simulation results, the validity of the model is verified, but also it provides a basis for optimum design of GNSS-R relative navigation system.
CT392 **15:00-15:15**	Signal Characterization for Indoor Close-range Free-space Optical Communications Kun Yan, Ming Cheng, Hsiao-Chun Wu and Xiangli Zhang Guilin University of Electronic Technology, China Presenter: Kun Yan, Guilin University of Electronic Technology, China Abstract: In this paper, the characteristics of indoor closerange free-space optical communications are studied. A visiblelight communication (VLC) prototype system using white lightemitting diodes (LEDs) is established. Signals are probed from the real-world conditions. Both the propagation model and the statistics of the background noise in different scenarios are analyzed thereupon. Various signal distortions are observed from the experiments over the established prototype. Such distortions have never been addressed in the existing literature, which has provided only the basic simple signal model for free-space optical communications. We devise a new comprehensive framework to analyze the LED transmitter, the receiver, and the free-space VLC channel. Accordingly, the theoretical system performance such as bit-error-rate (BER) can be analyzed accurately using our proposed analytical framework. In order to evaluate the effectiveness of our proposed new system analysis, the measured BERs from the prototype, the theoretical BERs based on the existing analysis, and the theoretical BERs based on our proposed new analysis are compared. It is proved that our new analysis can lead to much more reliable system performance measures.
CT481 **15:15-15:30**	Tracking Reference Signal Design for Phase Noise Compensation for SC-FDMA Waveform Yuhang Guo, Yushu Zhang, Hongwen Yang Beijing University of Posts and Telecommunications, China Presenter: Yuhang Guo, Beijing University of Posts and Telecommunications, China Abstract: For 5G systems operating in the millimeter-wave range, the impact of the phase noise in oscillators can get higher than that in low band. In 3GPP TSG RAN1 Meeting# 86bis, agreement is achieved that the reference signal for phase tracking is supported for both 5G downlink and uplink. The preliminary design of tracking reference signal (TRS) for orthogonal frequency division multiplexing (OFDM) waveform has been done. But when the same method applies to single carrier frequency division multiple access (SC-FDMA) waveform, the peak-to-average power ratio (PAPR) of transmit signal gets huge growth. Therefore how to design the TRS for SC-FDMA waveform becomes one issue. In this paper, we propose some TRS patterns to track and compensate the phase noise based on SC-FDMA waveform, which fits for practical 5G system. The TRS and data can be mapped in a frequency division multiplexing (FDM) manner, similar as simultaneously physical uplink control channel (PUCCH) and physical uplink shared channel (PUSCH) transmission in LTE. Further the link level performance for different TRS design patterns and generation sequences are discussed, which indicate that using new patterns, the impact of phase noise can be effectively improved with little PAPR growth.
CT497 **15:30-15:45**	Direct Position Determination for Digital Modulation Signals with Unknown Symbols Wan-ting Yu, Hong-yi Yu, Jian-ping Du, and Ding Wang National Digital Switching System Engineering & Technological Research Center, China Presenter: Wan-ting Yu, National Digital Switching System Engineering & Technological Research Center, China Abstract: Regardless of fact that the advantages of the Direct Positioning Determination (DPD) algorithm outweighs the traditional two-step positioning method, the current DPD algorithms are often

	limited in the actual scene due to its focus on totally unknown or known signal waveforms. Considering the signal waveform is difficult to be completely known especially in passive location, a novel direct position determination algorithm for digital modulation signal with unknown symbols (MDPD) is proposed in this paper based on maximum likelihood criterion. The MDPD is a centralized location approach combining the symbol estimation and position determination to further improve the positioning precision of the partially known signals. Monte Carlo simulations validate that the MDPD algorithm outperforms both the DPD with unknown signals and the common indirect approach particularly in low signal-to-noise ratio (SNR), while those methods converge to the Cramér-Rao low bound in high SNR.
CT524 **15:45-16:00**	Print anti-replication technology based on AM/FM hybrid halftone Chen Fangfang, Cao Peng, Zhu Jianle, Huo Peijun Beijing Institute Of Graphic Communication, China Presenter: Chen Fangfang, Beijing Institute Of Graphic Communication, China Abstract: The anti-replication technology based on the half-tone shading image has the characteristics of low cost and good anti-replication performance. In this paper, combined with this anti-replication technology and the halftone image screening technology, using frequency modulation (FM) dot as a carrier hides the information such as words, numbers, symbols in the shading image of the amplitude modulation (AM) dot. After special screening processing, can achieve the effect that eyes can't distinguish. At the same time, in the replica, we can clearly see the information hidden in the shading pattern. In the process of implement this technology, it can achieve better hiding effect and anti-reproduction performance through the shading image with special texture and the special AM/FM screening processing. This technology can be widely used in the copyright protection of labels, securities and books.

SESSION 6

< Network Architecture Design and Performance Analysis >

13:00–15:45

1.2 Four Seasons Hall (West Wing, 1F) / 四季1.2厅, 西楼1楼

Session Chair: Prof. Yaw-Chung Chen, National Chiao Tung University, Taiwan

Opening Speech **CT039** **13:00-13:15**	A Cut-Through Scheduling for Delay Optimization in TD-LTE Relay Enhanced Networks Wen-Kang Jia, Yaw-Chung Chen National Chiao Tung University, Taiwan Presenter: Yaw-Chung Chen, National Chiao Tung University, Taiwan Abstract: The relaying is the most important feature as a practical solution in LTE technologies to improve performance and to extend coverage. This paper contributes to the performance on cut-through forwarding mode in relaying framework for applying in TD-LTE standard referred to as 3GPP release 10 and above, it provides lower forwarding latency per hop by rescheduling the alignment of sub-frame duration between each superordinate relay node and subordinate relay node. We demonstrate a significant performance improvement through simulation, the results show that the proposed scheme features lower forwarding latencies for both uplink and downlink in terms of one-way end-to-end delay as compared to legacy synchronous relaying of the relay enhanced TD-LTE networks.
CT036 **13:15-13:30**	An improved echo state network based on variational mode decomposition and bat optimization for Internet traffic forecasting Lina Pan, Jianjun Cheng, Huiyuan Li, Yufan Zhang, Xiaoyun Chen Lanzhou University, Lanzhou, China Presenter: Lina Pan, Lanzhou University, China Abstract: Internet traffic forecasting plays an important role in network resource allocation, planning and anomaly detection. Developing an accurate and robust Internet traffic forecasting model is very essential.

	However, Internet traffic usually exhibits nonlinear and multi-scale data characters. Thus, Internet traffic forecasting is also a huge challenge. Echo state network (ESN) is a novel time series forecasting approach and is able to approximate any complex nonlinear relationship. Considering the fact that standard ESN easily suffers from the influences of initial random weights, this paper develops bat algorithm (BA) to overcome this drawback. In addition, variational mode decomposition (VMD) is utilized to decompose the original Internet traffic series into several band-limited intrinsic mode functions (BLIMFs) for capturing the multi-scale data characters. Based on decomposition result, the training set is reconstructed. Verified by four data sets, the proposed model defeats six popular forecasting methods. The simulation results indicate that the proposed model is an effective and robust alternative for Internet traffic forecasting.
CT060 **13:30-13:45**	What to expect in Next Generation RAN Architecture: A survey Yang Li, Sana Salous China Academy of Electronics and Information Technology, China Presenter: Yang Li, China Academy of Electronics and Information Technology, China Abstract: 5G research is being carried out around the world to meet growing application requirements. Under such background, the research on evolution of Radio Access Network (RAN) architecture has become one of the hottest topics. In this paper we first review the current research results of the main participants, including 3GPP, IEEE, NGMN, IMT-2020, China Mobile, and SK Telecom. Then, the main features of next generation RAN architecture and relevant technologies are discussed.
CT144 **13:45-14:00**	A Hierarchical Divisive Algorithm for Topology Discovery in Multi-subnet Networks Jun Tao, Yunsheng Yan, Yang Shen, Jiashan Wan Anhui Institute of information technology, China Presenter: Yunsheng Yan, Anhui Institute of Information Technology, China Abstract: Current progress in network techniques and the complexity of network structures require network administrators to spend more time and attention on maintaining a network system under normal operations. With our continuously increasing dependence on networks, it is difficult to know how to effectively manage all of the equipment in a network and to be certain of whether the network is operating correctly. To make a comprehensive survey of current administrators' management modes, administrators must understand the rules for the network's equipment and the entire topological structure of the network; such an understanding will allow them to rapidly and efficiently address an increasingly complicated network environment. This paper presents a hierarchical divisive algorithm for topology discovery that can work on a network layer and a link layer, which are widely used by network administrators today. This approach involves an automatic exploration through a random network node and possesses the features of cross-layer and multiple protocols to support the exploration of a multi-subnet network, to enable a faster and more effective explorative ability of a topological resource. The implementation shows how to automatically discover the entire network's topology and all of the network's equipment link nodes from the integration of a network-managed system to prove that our proposal is effective.
CT358 **14:00-14:15**	Influence of Plasma on Antenna and Design of Tunable Matching Network Xiangning Zhong, Yongjun Xie, Qincheng Luo College of Electronical and Information Engineering, China Presenter: Xiangning Zhong, College of Electronical and Information Engineering, China Abstract: To solve the "black-out" problem of hypersonic vehicle, the impact of plasma on monopole antenna is analyzed in this paper with a tunable matching network proposed subsequently. The plasma sheath around the vehicle with a speed of 20Ma and a height of 60km is simulated through fluid theory to obtain the plasma distribution around the vehicle. Then, the monopole antennas with different electron concentration are discussed, which are compared with the case of free space. The results demonstrate that the center frequency and the surface current of antenna vary in different degrees for different electron concentration. Finally, to effectively improve the performance of antenna, a tunable matching network is designed by matching the impedance of the plasma and changing the capacitance of the varactors.

CT396 **14:15-14:30**	Modeling and analysis of Maglev communication system based on colored Petri nets Yibo Jiao, Xiangqian Liu, Yibo Cui Beijing Jiaotong University, China Presenter: Yibo Jiao, Beijing Jiaotong University, China Abstract: Magnetic levitation communication system is an important subsystem of maglev system, which can guarantee maglev train to operate efficiently, safely and in real time. In this paper, the hierarchical model of magnetic levitation communication system is established by using colored Petri nets, and the factors such as equipment response time and rainfall weather are taken into account, and the model is analyzed from the angle of the data transmission delay and data transmission interval. The results show that the real-time performance of maglev communication system meets the needs of practical application.
CT424 **14:30-14:45**	Analysis of Area Spectral Efficiency and Energy Efficiency in Heterogeneous Ultra-Dense Networks Yong Luo, Zhiping Shi, Yanxia Li, Yiming Li University of Electronic Science and Technology of China, China Presenter: Yong Luo, UESTC, China Abstract: With the exponential increasing of the mobile traffic from the wireless equipment, the cellular networks face a great challenge to meet the every-increasing throughput demand. A potential way is Ultra-Dense deployment of the small-cell in the existing macro-cell. By modeling the base stations (BSs) from both macro-cells and small-cells as homogeneous Poisson Point Process (PPP), we analytically evaluate the area spectral efficiency (ASE) and energy efficiency (EE) of downlink wireless system using stochastic geometry theory. It is shown that the ASE is increasing with the small cell density. It means that deploying more small-cells in the macro-cell coverage area is a feasible way to improve the system throughput. However, with the increasing of small cell density, the EE goes to an optimal point and then start to decrease. We introduce a firefly-inspired algorithm named Firefly Algorithm(FA) to analyze the ASE and the EE impacted by the BSs density and the transmitting power.
CT452 **14:45-15:00**	On the Spectral Efficiency of Full-Duplex Massive MIMO Heterogeneous Network with MRC Method Zhexian Shen, Kui Xu, Xiang Zheng, Dongmei Zhang, WenFeng Ma PLA Army Engineering University, China Presenter: Zhexian Shen, PLA Army Engineering University, China Abstract: In this paper, we focus on a full-duplex (FD) two-tier heterogeneous network (HetNet) where both macro base station (MBS) and pico base stations (PBS) are equipped with large-scale uniform linear antenna array (ULA). FD and massive multi-input multi-output (Massive MIMO) techniques are utilized to achieve better Quality of Service (QoS) and higher throughput. The asymptotic uplink and downlink signal-to-interference-plus-noise ratio (SINR) of the received signal using maximum ratio combination/transmission (MRC/MRT) precoding method is analyzed. In order to solve the problem that severe cross-layer interference worsens signals and constrains the performance of the HetNet, a geometric programming (GP) based power control scheme is proposed to suppress the interference and improve the SE of the HetNet. Simulation results show that by utilizing the proposed power control scheme in uplink and downlink transmission, the cross-layer interference can be greatly suppressed and the SE of the HetNet can be effectively enhanced.
CT500 **15:00-15:15**	A cellular NoC architecture based on butterfly network coding (CBNoC) Jiaxun Zhang,Yiou Chen, Rui Xiao, Xiang Ling National Key Laboratory of Science and Technology on Communications, University of Electronic Science and Technology of China, China Presenter: Jiaxun Zhang, National Key Laboratory of Science and Technology on Communications, University of Electronic Science and Technology of China, China Abstract: The intra-chip communication latency and power consumption become the main bottleneck of the development of multi-core processors. Network-on-Chip (NoC) paradigm is proposed to meet these stringent requirements. Since the wireless network interconnection can achieve high speed data transmission with low power consumption, this paper proposes a cellular NoC architecture based on multiple butterfly network coding clusters with low latency. Data packets and control packets are transmitted on the wireless channel and the wired channel, separately. We also design a Z-X-Y path routing algorithm to achieve the shortest routing. Experiment results prove that, compared with Mesh,

	the proposed architecture can achieve at least 8% average latency reduction with slight resource increment.
CT549 **15:15-15:30**	Task Scheduling in Fog Enabled Internet of Things for Smart Cities Qianyu Liu, Yunkai Wei, Supeng Leng and Yijin Chen University of Electronic Science and Technology of China, China Presenter: Qianyu Liu, University of Electronic Science and Technology of China, China Abstract: Internet of Things (IoT) is an essential information infrastructure for smart cities in data sensing, collecting, merging, transmitting, or even reverse controlling. Whereas, the devices in IoT are fundamentally different in processing abilities. Combined with fog computing, some stronger nodes in IoT who have better computing capabilities can be taken as fog nodes to help other weak nodes in task processing, such as data analysis, computing, etc. Consequently, a new problem is raised that how to schedule the tasks among different fog nodes, so as to achieve minimum task makespan and communication cost. In this paper, we proposed an Adaptive Doublefitness Genetic Task Scheduling (ADGTS) algorithm. By the collaborative scheduling of tasks and fog resources, ADGTS can optimize the task makespan and communication cost simultaneously, as well as flexibly adapt to different importance of makespan and communication cost in practical applications. The simulation results show that the proposed algorithm has obviously better performance than traditional Min-Min algorithm in task makespan, and can balance the performance of task makespan and communication cost additionally.
CT561 **15:30-15:45**	Topology Inference for CSMA/CA Wireless Network based on Inter Frame Space Shengxiang Li, Guangyi Liu, Ou Li, Siyuan Ding National Digital Switching System Engineering & Technological R &D Center, China Presenter: Shengxiang Li, National Digital Switching System Engineering & Technological R &D Center, China Abstract: In this paper, we propose a novel approach called Wntiifs to infer the topology of CSMA/CA wireless network without the need to cooperate in the network or decode the network's messages. The approach divides RF frames observed into session atoms according to an inter frame space threshold, and ensures that a session atom consists only of frames transmitted by two nodes. Then, it extracts the link in each atom in different observation time window. Finally, it merges the links in different time window to reconstruct the complete network topology. Experimental results demonstrate that, compared with the existing wireless network topology inference algorithms, Wntiifs is of higher topology inference accuracy.

SESSION 7

< Digital Communication and Wireless Technology >

13:00–16:00

3.4 Four Seasons Hall (West Wing, 1F) / 四季3.4厅，西楼1楼

Session Chair: Prof. Ray Sheriff, University of Bradford, United Kingdom

CT103 **13:00-13:15**	Virtual Network Embedding in Flexi-grid Optical Networks Rongping Lin, Chunhui Du, Shan Luo University of Electronic Science and Technology of China, China Presenter: Rongping Lin, University of Electronic Science and Technology of China, China Abstract: Network virtualization technology makes multiple virtual networks (VNs) that provide heterogeneous services share the same substrate network. Virtual network embedding (VNE) maps VNs to the substrate network, and allocates network resources. In this paper, we provide VNE algorithms for efficient management of flexi-grid networks, where virtual link mapping in flexi-grid networks satisfies continuity and contiguity constraints of the spectrum assignment. We provide a column generation algorithm for the VNE problem. Numerical results show the functionality and the efficiency of the algorithm.

CT184 **13:15-13:30**	Dynamic Analysis of VANET Using Temporal Reachability Graph Huifang Feng, Junpeng Zhang, Junxia Wang, Youji Xu Northwest Normal University, China Presenter: Junpeng Zhang, Northwest Normal University, China Abstract: The topology dynamic is one of the important characteristics of vehicular ad hoc network (VANET). The study of the temporal topology of VANET plays a significant role in network protocol development and management. The temporal model of VANET as temporal reachability graph model is built. This model not only describes the packet transmission time, but also can capture the store-and-forward mechanism in VANET. The relations of the packet transmission time and the maximum tolerated delay time to the density, global efficiency and link duration are analyzed. The results show that compared to the static network, the temporal network can capture the information transmission process in VANET better, and the decrease of packet transmission time or the increase of maximum tolerated delay time contributes to the improvement of transmission efficiency of VANET.
CT187 **13:30-13:45**	Relay Selection Schemes for Store-Carry and Forward Relaying Based on Optimal Stopping Schemes Hao Zheng, Xiangming Li, Jie Yang Beijing Institute of Technology, China Presenter: Hao Zheng, Beijing Institute of Technology, China Abstract: New challenges have been brought by applications with high device density, such as the large number of supportable devices and long device battery lives. The store-carry and forward scheme can be used to address these issues, but its performance relies on the schemes of relay selection or routing. Existing methods using utility metric are able to mitigate this problem to some extent, but still suffer from incomplete information as the device density increases. By formulating the relay selection problem into two optimal stopping problems from energy efficiency and time efficiency, respectively, the energy-optimal forwarding and time-energy forwarding are proposed, which allow each source device to select the best relay based on the information it can acquire. Simulation results show that the proposed schemes can provide better performance in terms of the energy consumption and transmission delay compared to both random transmission and epidemic routing.
CT190 **13:45-14:00**	Hybrid Channel Access with CSMA/CA and SOTDMA to Improve the Performance of MANET Yinling Fu, Zhizhong Ding Hefei University of Technology, China Presenter: Yinling Fu, Hefei University of Technology, China Abstract: MANET (Mobile Ad-hoc Network) has great potential applications in emergency communications since it is a flexible and infrastructure-less network. Currently, the radio access technologies supporting Ad-hoc network mainly employ CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance based MAC protocol, which cannot guarantee a prompt channel access for those commanders in emergency communication due to the access collisions. Moreover, although SOTDMA (CSMA and Self-Organized Time Division Multiple Access) is proposed to maintain a stable transmission for MANET, the network throughput rate of SOTDMA is less than CSMA/CA with small nodes. In this paper, according to the network throughput rate, a hybrid channel access strategy is proposed and implemented, which can combine the advantages of CSMA\CA and SOTDMA to maintain high and stable network throughput rate automatically or manually. To further improve the performance of hybrid channel access, a new time synchronization scheme with NMEA data and PPS (Pulse Per Second) is proposed in this paper since clock synchronization is a key factor affecting throughput rate of SOTDMA. Considering the network switching process consuming large energy, the paper presents a new parameter called residual energy number, which considers the energy consumption rate and the energy remaining amount as a parameter of power control to increase the stability of hybrid channel access.
CT216 **14:00-14:15**	A New Method for Detecting and Early-warning In-Band Interference of the GSM-R Network Hong Du, Chengyu Wen and Wenzao Li Chengdu University of Information Technology, CHINA Presenter: Hong Du, Chengdu University of Information Technology, CHINA Abstract: The Global System for Mobile Communications-Railway (GSM-R) network is currently used in railway systems of many countries. Interferences sensing and early-warning is an important problem

	to guarantee reliability and robustness of GSM-R network. This paper proposes a new method for in-band interference detecting and early-warning of GSM-R network. The method is based on the statistical features of the instantaneous frequency histogram in time domain, which are obtained by a learning procedure. The simulation result shows that the new method can sense weaker interference than GMSK decoder and spectrum sensing; the experiment result prove validity of the method in practice.
CT380 **14:15-14:30**	A NLOS Mitigation and Localization Algorithm Based on the Constraint Least Square Optimization Sunan Li, Jingyu Hua, Feng Li, Zhijiang Xu, Jiamin Li Zhejiang University of Technology, China Presenter: Sunan Li, Zhejiang University of Technology, China Abstract: The non-line-of-sight (NLOS) error significantly reduces the accuracy of trilateration positioning algorithm in wireless sensor networks (WSN). Therefore, by considering the WSN including both the static nodes (SN) and the mobile nodes (MN), this paper proposes a localization algorithm aiming at the NLOS mitigation, where the NLOS corrupted localization is modeled as a constraint least square (CLS) problem. Among this algorithm, the localization residual is employed to construct the cost function, and a grouping strategy is exploited to further improve the positioning accuracy. The simulations demonstrate that the proposed algorithm can effectively reduce the accuracy loss in scenarios with large NLOS errors or SN numbers.
CT454 **14:30-14:45**	Full-duplex Relay for Enhancing Physical Layer Security in Wireless Sensor Networks: Optimal Power Allocation for Minimizing Secrecy Outage Probability Wei Li, Kexiong Liu, Sixin Wang, Jing Lei, Erbao Li, Xiaoqian Li National University of Defense Technology, China Presenter: Wei Li, National University of Defense Technology, China Abstract: In this paper, we address the physical layer security problem for Wireless Sensor Networks in the presence of passive eavesdroppers, i.e., the eavesdroppers' channels are unknown to the transmitter. We use a multi-antenna relay to guarantee physical layer security. Different from the existing work, we consider that the relay works in full duplex mode and transmits artificial noise (AN) in both stages of the decode-and-forward (DF) cooperative strategy. We proposed two optimal power allocation strategies for power constrained and power unconstrained systems respectively. For power constrained system, our aim is to minimize the secrecy rate outage probability. And for power unconstrained systems, we obtain the optimal power allocation to minimize the total power under the quality of service and secrecy constraints. We also consider the secrecy outage probability for different positions of eavesdropper. Simulation results are presented to show the performance of the proposed strategies.
CT470 **14:45-15:00**	Rate Compatible Modulation with Unequal Error Protection Property Dai Jia, Jingxuan Huang, Xinyi Wang, Zesong Fei, Jingming Kuang Beijing Institute of Technology, China Presenter: Dai Jia, Beijing Institute of Technology, China Abstract: In this paper, we propose a novel modulation scheme for rate compatible modulation (RCM) to provide flexible unequal error protection (UEP) property. In the proposed scheme, the whole data sequence is divided into several sets, where different sets have different error protection requirements. By analyzing the error probability, we propose a weight selection method to improve the BER performance of RCM scheme with UEP property. The proposed method average the squared weight coefficient of all information bits in a certain set by carefully selecting the information bits. Simulation results show that the proposed scheme provides flexible UEP property. Moreover, the BER performance of the proposed weight selection method outperforms the original random selection method, significantly.
CT543 **15:00-15:15**	Social-Aware Collaborative Caching for D2D Content Sharing Can Zhang, Dan Wu, Liang Ao, Yueming Cai PLA Army Engineering University, China Presenter: Can Zhang, PLA Army Engineering University, China Abstract: With the rapid growth of wireless content demands, Device-to-Device (D2D) content sharing technology is proposed to effectively alleviate the pressure of base stations and improve the quality of service of users. However, due to the limited storage capacity of devices, the various content demands

	are difficult to be satisfied. Hence, caching schemes are needed. In particular, the collaborative caching, which can increase the utilization ratio of the storage capacity, attracts much attention. Moreover, we introduce the social popularity to improve the availability of preset contents, and then, we propose the social-related download rate by combining the physical and social information. Guided by this, we model the social-aware collaborative caching problem in a D2D content sharing scenario by maximizing the sum of social-related download rate over the constraint of limited storage capacity. Due to its intractability, it is computationally reduced to the maximization of a monotone submodular function, subject to a partition matroid constraint. Subsequently, the social-aware collaborative caching algorithm based on greedy algorithm is designed to achieve a suboptimal solution within a factor 1/2 approximation guarantee and polynomial-complexity.
CT575 **15:15-15:30**	Caching Scheme Based on User Clustering and User Requests Prediction in Small Cells Dachun Huang, Xiaoxiang Wang, Dongyu Wang Beijing University of Posts and Telecommunications, China Presenter: Dachun Huang, Beijing University of Posts and Telecommunications, China Abstract: In order to cope with the relentless data tsunami brought by the growth of mobile video service, this paper proposes a two-stage caching scheme. Considering the characteristic of the ultra-dense network that many users may be in the overlapping coverage of multiple small cells, we cluster those users with k-medoids clustering algorithm and the users of the same cluster access to the same matching small cell in the first phase. In the second phase, a cache algorithm is proposed to make cache decision of video files on the basis of predicting the future requests of the users in the same small cell by collaborative filtering algorithm. At last, the simulation results show that the gain of the proposed caching scheme over the existing caching schemes in the cache hit rate and the average delay.
CT905 **15:30-15:45**	Spatial Compression Scheme for Improving the Lifetime of Wireless Sensor Networks Jiasheng Zhou, Siguang Chen, Yuting Wang and Weifeng Lu Nanjing University of Posts and Telecommunications, China Presenter: Jiasheng Zhou, Nanjing University of Posts and Telecommunications, China Abstract: How to reduce the number of transmissions or prolong the lifetime of wireless sensor networks (WSNs) has become a research focus. Based on the spatial correlation of sensor readings, in this paper, we propose a spatial compression scheme for improving the lifetime of wireless sensor network to address this issue. This scheme can prolong the lifetime of network significantly by combing LEACH protocol and spatial compression. Meanwhile, the reconstruction precision of original data is high for exploring the spatial correlation of sensor readings fully. Moreover, based on the layered network architecture, the proposed scheme can improve the network loading by selecting the cluster head randomly. Finally, the simulation results confirm that the lifetime of the proposed scheme is longer than other related schemes, and the original data can be reconstructed with high precision.
CT928 **15:45-16:00**	Minimizing Event Delay for Traffic Monitoring Using Mobile Patrol Charging Robot in Wireless Rechargeable Sensor Networks Yinan Zhu Zhejiang University of Technology, China Presenter: Yinan Zhu, Zhejiang University of Technology, China Abstract: Wireless rechargeable sensor networks (WRSNs) have overcome the problems of energy shortage in conventional sensor networks. This energy harvesting technique for sensors can be applied to traffic monitoring. In this paper, we first introduce a novel system scenario for driverless vehicles where the patrol robot is considered as charging vehicle for energy provision and designed to handle accidents or other events. Two optimization mathematic models are formulated: OPT-MED for minimum event delay and OPT-MEP for minimum event possibility. Heuristic algorithms are presented to solve the optimization problems. Our simulation results demonstrate the superior performance compared to greedy algorithm.

SESSION 8

< Principles and Techniques of Communication Systems >

16:15–18:45

Chamber of Mist (West Wing, 2F) /馨雨阁，西楼2楼

Session Chair: Assoc. Prof. Bin WANG, Northeastern University at Qinhuangdao, China

CT020 **16:15-16:30**	Broadcasting Algorithm Based on Successful Broadcasting Ratio of Neighbor Nodes in Mobile Ad Hoc Networks Lei Jinying, Yu Yanping, Yu Yan, Yan Zhengqing Zhejiang Gongshang University, China Presenter: Yanping Yu, Zhejiang Gongshang University, China Abstract: To address the broadcast storm and the broadcast unreliability problem, a broadcast algorithm based on successful broadcasting ratio of neighbor nodes (BSRN) which is a hybrid algorithm combining mechanisms of probability based algorithms and neighbor knowledge based algorithms is proposed. The broadcast forwarding probability is determined according to the average successful broadcasting ratio of neighbor nodes. As a result, the broadcast reliability is enhanced. Meanwhile, the redundant transmissions are reduced and thus broadcast storm is mitigated. The simulation results show that BSRN can increase the reachability and reduce delay.
CT071 **16:30-16:45**	Construction of Compressed Sensing Matrix Based on Complementary Sequence Li Shufeng, Wu Hongda, Jin Libiao, Wei Shanshan Communication University of China, China Presenter: Wu Hongda, Communication University of China, China Abstract: We propose a new construction method for deterministic sensing matrix, using complementary sequence, which is called Compressed Sensing Matrix Based on Cyclic Complementary Sequence. Simulation results show that the reconstruction of this matrix better than sparse sensing matrices and Toeplitz matrices. Once the complementary sequences are given, each element in the matrix can be determined, and thus the uncertainty caused by using random matrices shall be avoided; moreover, the cyclic property of the matrix proposed makes it easier for hardware implementation and avoid the deficiency of taking up large storage space, which is universal for random matrices, and thus makes the matrix more practical.
CT118 **16:45-17:00**	Automatic Digital Modulation Recognition based on Stacked Sparse AutoEncoder Mohamed BOUCHOU, Hua WANG, Mohammed El Hadi LAKHDARI Beijing Institute of Technology, China Presenter: Mohamed BOUCHOU, Beijing Institute of Technology, China Abstract: In this paper, a modulation recognition algorithm based on Stacked sparse Auto-Encoder (SSAE) is proposed for the classification of common digitally modulated signals. To this end, a set of eight features including, two instantaneous features and six higher order cumulants features are extracted from the intercepted signal; these features are then fed to the SSAE for classification. Unlike the majority of classifiers used in AMR algorithms, which relies only on the supervised learning scenario, the stacked sparse autoencoder benefits from both, unsupervised and supervised learning approaches. In fact, the main advantage of the SSAE is that it can automatically learn new features to separate the input data during the unsupervised pre-training phase. These new features are used as initialization parameters in the supervised training phase to enhance the convergence of the SSAE to optimal results, as well as improve the noise resistance of the eight features extracted before. Results show that the overall success rate reach 100 % at 5dB SNR. The performance of the proposed algorithm is compared to an SVM-based method, and it is found that the probability of correct classification in our method is considerably improved.

CT208 **17:00-17:15**	An Encryption Algorithm Based on Multi-connection Transmission Shiqi Zhou, Rongheng Lin, Hua Zou Beijing University of Posts and Telecommunications, Beijing, China Presenter: Shiqi Zhou, Beijing University of Posts and Telecommunications, China Abstract: Encryption is the most important method to enhance security of network transmitting. SDN (Software Defined Networking) Security Transmission Service can provide multi-connection transmitting service, which scatters data to multiple network connections for transmission so that data on different connections are isolated from each other. Based on the service, encrypting the isolated data prevents overall data from intercepted and deciphered. In the above scenario, we propose an encryption algorithm that uses the data themselves as encryption keys, and use the data isolation effect of multi-connection transmission to distribute the encrypted ciphertext to different network transmission paths, which is equivalent to using a rather random sequence as an encryption key for each data fragment without sharp increase in transmitting data, so that data transmitted on every connection are ensured to be safe. After compared with other encryption algorithms such as DES, AES and RSA, it is proved that in the multi-connection transmitting scenario this algorithm has better encryption effect and operating efficiency, which provides an effective guarantee for network security.
CT249 **17:15-17:30**	Research on the Miller loop optimization of SM9 bilinear pairings Ping Zhen, Yinzi Tu, Bingbing Xia, Jie Gan, Xiaoke Tang Beijing Smartchip Microelectronics Technology Company Limited, China Presenter: Ping Zhen, Beijing Smartchip Microelectronics Technology Company Limited, China Abstract: SM9 is identity-based cryptography designed by bilinear pairing, which can effectively solve the certificates management problems of the PKI and constitutes an important part of Chinese commercial cryptography system. Due to the high complexity of bilinear pairing, SM9 still faces the problem of low efficiency, especially in resource-constrained environments, so performance becomes the key factor that hinders its wide application. This paper has explicitly analyzed detailed computation process of Miller loop in SM9 bilinear pairings and proposed the optimization methods for the point addition, point doubling and line function computation on BN curves. Furthermore, we compare the computational cost of Miller loop under the projective coordinate system and the Jacobian coordinate system and the results show that the latter can improve the efficiency by 5% than the former. The research is very important to optimize the SM9 the performance.
CT252 **17:30-17:45**	An Influence Factor Based Caching Node Selection Algorithm in D2D Networks Tao Fang, Hua Tian, Yang Yang, Xin Liu, Ducheng Wu, Xueqiang Chen PLA Army Engineering University, China Presenter: Tao Fang, PLA Army Engineering University, China Abstract: This paper investigates the problem of caching node selection in D2D networks, in which there are some users or nodes to help others tansmit files. Every node can be a cache node to cache some files for others. We propose the concept of the influence factor which can be used to describe the similarity relationships of files between all nodes. Then we model the problems and redefine the user's overheads about getting files. To minimize the system overheads, we propose a caching node selection algorithm based on the influence factors. We mathematically analysis the effectiveness of this algorithm. The simulation results shows the proposed algorithm is better than the two intuitive algorithms in our envisioned scenario by the simulation.
CT373 **17:45-18:00**	Interference Cancellation Based on Compressive Sensing Framework for Ultra DenseNetwork Jing Jiang and Yuan Chen Xi'an University of Posts and Telecommunications, China Presenter: Yuan Chen, Xi'an University of Posts and Telecommunications, China Abstract: The ultra dense deployment of small cells introduces novel technical challenges that the interference obviously increase with the network density. We propose compressive sensing-based interference cancelation algorithm for Ultra-Dense Network. Specifically, the inherent sparsity of channel impulse response is exploited. It is regarded as the spare basis in compressive sensing framework. Then we cancel the interference in the compressive domain which the number of the interferers is far less in every delay-tap of channel impulse response than every sampling of frequency domain channel. Finally Basis Pursuit De-Noising based algorithm is used to formulate the data

	detection as the signal reconstruction in compressive domain. Simulation results demonstrate that the proposed compressive sensing-based interference cancellation yields observable performance gains compared to traditional interference cancellation algorithms.
CT522 **18:00-18:15**	An Innovative Low-Complexity Detection Algorithm for Spatial Modulation Guo Bai, Yufan Cheng, Wanbin Tang, Jieping Wang National Key Laboratory of Science and Technology on Communications of UESTC, China Presenter: Guo Bai, National Key Laboratory of Science and Technology on Communications of UESTC, China Abstract: Spatial modulation (SM) technology, as an efficient multi-antenna transmission scheme, has widely used in MIMO communication systems in recent years. However, the computational complexity of the maximum likelihood (ML) detection algorithm which has the optimal detection performance is very high. In this paper, we propose an innovative phase-search-based (PSB) low-complexity detection algorithm. This algorithm uses a polar coordinate system. In the detection process, in order to reduce the computational complexity, the subtraction of the angular distance replaces the multiplication of the Euclidean distance. In this paper, the principle and the computational complexity of this algorithm are given and the detection performance is simulated under Rayleigh fading channel. The Results of theoretical analysis and simulation verification demonstrate that the proposed algorithm greatly reduces the computational complexity, while ensuring the Bit Error Rate (BER) performance.
CT391 **18:15-18:30**	Non-Uniform Bandwidth Reservation for Real-Time Streaming Applications Based on Meter Table Huang Liaoruo, Shen Qingguo, Zhou Feng, Shao Wenjuan, Cui Xiaoyu The PLA Army Engineering University, China Presenter: Huang Liaoruo, The PLA Army Engineering University, China Abstract: Real-time streaming applications like VoIP, video conference and VoD need bandwidth reservation to provide deterministic service quality in long distance transmission. In this paper, we leverage the meter table of Openflow and propose a non-uniform bandwidth reservation method which can significantly improve the maximum number of reservation requests that network can accommodate. Different from the traditional flat and uniform bandwidth reservation along the end-to-end path, based on the network programmability provided by Openflow, this method reserves different bandwidth at each link according to the available resources and provides deterministic end-to-end service quality at the same time. With our method, the reserved bandwidth at bottle neck link can be significantly reduced and more user requests can be accepted compared with the traditional way. Through simulations, it is showed that our method outperforms the traditional reservation method in most scenarios for real-time streaming applications.
CT483 **18:30-18:45**	A Low-Complexity Soft Output Detection Algorithm for Spatial Modulation Systems Guoquan Li, Guoyong Xiang, Yongjun Xu, Yanglu Ou, Jiacheng Wang, Hongyu Zhu Chongqing University of Posts and Telecommunications, China Presenter: Guoyong Xiang, Chongqing University of Posts and Telecommunications, China Abstract: spatial modulation (SM) is a promising multiple-input multiple-output (MIMO) transmission technology, which exploits the indices of transmit antennas to encode information into the spatial dimension and needs less radio frequency chains. To detect the transmitted information, the maximum likelihood (ML) algorithm is often adopted which has high computational complexity. Some low-complexity detection algorithms only con- sider hard-decision cases with no channel coding. In this paper, a low-complexity soft output detection algorithm is proposed for coded spatial modulation systems. Its computational complexity doesn't increase with the modulation order and hence much lower than the soft output ML detection algorithm. Simulation results demonstrate that the bit error rate (BER) performance is near to the ML detection with obvious complexity reduction. By sorting the detection metrics and selecting less transmit antenna indices as search candidates to compute soft bit information, further reduction of computational complexity could be obtained.

SESSION 9

< Object Detection and Recognition >

16:15–18:45

Chamber of Osmanthus (West Wing, 2F) /桂香居，西楼2楼

Session Chair: Assoc. Prof. Chan-Tong Lam, Macao Polytechnic Institute, China

Opening Speech **CT403** **16:15-16:30**	A Real-Time Traffic Congestion Detection System using On-Line Images Chan-Tong Lam, Hanyang Gao and Benjamin Ng Macao Polytechnic Institute, China Presenter: Chan-Tong Lam, Macao Polytechnic Institute, China Abstract: The heavily-loaded traffic system in Macao is characterized by narrow and complex street networks, along with many traffic bottlenecks. In this paper, we propose an economical real-time traffic congestion detection system using on-line images provided by the local government. The proposed system mainly consists of the detection of vehicles using the on-line images and the estimation of traffic congestion based on the estimated number of vehicles. For the detection of vehicles, we study a method of using the signs on the road and experiment the technique of using the Haar-like features. We find that Haar-like features can be used for the detection of vehicles using the on-line images from different camera locations. For the traffic congestion estimation, a threshold for the image correlation coefficient of the consecutive images is used, along with a threshold for the number of vehicles detected. Two different levels of congestion are considered, namely NORMAL and CONGESTED, although the number of congestion level can be easily extended. Experimental results show that the proposed system can estimate the traffic congestion correctly and in real-time at low cost. Compared with traditional traffic congestion estimation systems, this system provides a more economical solution with potential commercial applications for the local residents and for the tourists in Macao.
CT073 **16:30-16:45**	Pedestrian Detection Based on Visconti2 7502 Chengwei Yi, Qiaodi Zhou, Qinghua Sheng, Hui Wang Hangzhou Dianzi University, China Presenter: Chengwei Yi, Hangzhou Dianzi University, China Abstract: Pedestrians are the important participants in traffic. pedestrian detection system is used to monitor the road condition of pedestrians in real time and provide warning information to prevent potential accidents, and is the significant component of the Advanced Driver Assistance Systems. How to detect pedestrians in real time and accurately is a hot topic. Aiming at the that the traditional research mainly stays in the research of algorithm and the poor real-time performance, or high cost. In this paper, a driver assistance system based on Toshiba Visconti2 series vehicle image recognition processor is proposed, which uses monocular camera to capture image, CoHOG to extract pedestrian features and SVM classification for real-time pedestrian detection, TBD for pedestrian tracking. The experimental results show that the system can effectively detect the pedestrian and meet the real-time requirement, the whole system is low cost and portable to use in vehicle environment absolutely.
CT087 **16:45-17:00**	Real-Time Accurate Pedestrian Circular Tracking with UAV Tao Zhong, Zhen Yang, Tao Zhang, and Huilin Xiong Shanghai Jiao Tong University, China Presenter: Tao Zhong, Shanghai Jiao Tong University, China Abstract: In this paper, we present a solution for accurate pedestrian circular flight using an UAV (unmanned aerial vehicle), which means UAV flies circularly around a specified walking pedestrian with a fixed distance. The proposed method consists of two parts, one is the visual inspect of the pedestrian, the other is the vision guided UAV control. In the first part, we generate and update feature queues and use Locality-constrained Linear Coding (LLC) method to match the specified target. In the second part, we control the UAV's flight based on the visual detection of the specific target, aiming to let the UAV flying circularly around the target. Experiments adopting a Parrot Bebop 2 (UAV) are carried out to verify the effectiveness of the proposed method.

CT215 **17:00-17:15**	Coding-based Hough Transform for Pedestrian Detection Linfeng Jiang, Huilin Xiong Shanghai Jiao Tong University, Shanghai, China Presenter: Linfeng Jiang, Shanghai Jiao Tong University, China Abstract: In this paper, we present a coding-based Hough transform framework for pedestrian detection in natural images. In traditional Hough transform methods for pedestrian detection, the voting element is represented by a linear combination of codebook entries with uniform probability, which often leads to uncertainty of the reconstruction error in the Hough voting process. To minimize the reconstruction error, we construct a new Hough transform framework to encode the voting element by using the locality-constrained linear coding (LLC) algorithm. Consistently, the voting element casts weighted votes into the Hough image according to its coding coefficients. We evaluated the proposed method on two publically available datasets, namely, the INRIA pedestrian, and TUD Brussels datasets. Experimental results demonstrated the effectiveness of the proposed method.
CT221 **17:15-17:30**	An IFF Identity Authentication Scheme of Security and Guarantee System Deng Jie, Ren YongJin,Yunji Li Guizhou Institute of Technology, China Presenter: Jie Deng, Officer's College of CAPF, China Abstract: In view of technology backward of the friend or foe identification and having not a subtle and effective internal communication mechanism in the current security system on duty, which leads to a serious security threat on personnel life and the major task to be defeated. This paper presents an IFF identity authentication scheme of security and guarantee system based on elliptic curve encryption; it is effective to solve these problems, such as internal confidential files to be stolen, vital data to be destroyed and legal camouflage of identity by hacking into the police service systems. The scheme is suitable for the identification of the light weight mobile terminal in infinite network environment, which has the characteristics of high security, high efficiency and bandwidth saving.
CT223 **17:30-17:45**	The performance of corrected learning network for object recognition Xingcheng Luo, Jianhua Deng, Ruihan shen, Qunfang Zhou, Junjie zhang, kaiyuan zhang University of Electronic Science and Technology of China, China Presenter: Xingcheng Luo, UESTC, China Abstract: Today, artificial intelligence (AI) has become more and more popular in daily life, such as face recognition, speech recognition, automated driving. In this paper, corrected neural model is proposed, where the deep learning framework Caffe is used to verify the proposed model. In this case, a face dataset and a car dataset collected from multiple perspectives are employed. Results show that the proposed corrected network model has great contributes to improve the accuracy of object recognition.
CT235 **17:45-18:00**	ECG Beats Classification via Online Sparse Dictionary and Time Pyramid Matching Nanyu Li, Yujuan Si, Duo Deng, Chunyu Yuan Zhuhai College of Jilin University, China Presenter: Yujuan Si, Zhuhai College of Jilin University, China Abstract: Recently, the Bag-Of-Word (BOW) algorithm provides efficient features and promotes the accuracy of the ECG classification system. However, BOW algorithm has two shortcomings: (1). it has large quantization errors and poor reconstruction performance; (2). it loses heart beat's time information, and may provide confusing features for different kinds of heart beats. Furthermore, ECG classification system can be used for long time monitoring and analysis of cardiovascular patients, while a huge amount of data will be produced, so we urgently need an efficient compression algorithm. In view of the above problems, we use the wavelet feature to construct the sparse dictionary, which lower the quantization error to a minimum. In order to reduce the complexity of our algorithm and adapt to large-scale heart beats operation, we combine the Online Dictionary Learning with Feature-sign algorithm to update the dictionary and coefficients. Coefficients matrix is used to represent ECG beats, which greatly reduces the memory consumption, and solve the problem of quantitative error simultaneously. Finally, we construct the pyramid to match coefficients of each ECG beat. Thus, we obtain the features that contain the beat time information by time stochastic pooling. It is efficient to solve the problem of losing time information. The experimental results show that: on the one hand, the proposed algorithm has advantages of high reconstruction performance for BOW, this storage method is

	high fidelity and low memory consumption; on the other hand, our algorithm yields highest accuracy in ECG beats classification; so this method is more suitable for large-scale heart beats data storage and classification.
CT260 **18:00-18:15**	A Fast Near-duplicate Keyframe Detection Method Based on Local Features Xidao Luan, Yuxiang Xie, Yanming Guo, Jingmeng He, Lili Zhang, Xin Zhang Changsha University, China Presenter: Lili Zhang, National University of Defense Technology, China Abstract: Fast near-duplicate keyframe detection is the basis of similar video content and video topic analysis. Traditional solutions based on local features are time-consuming and unsuitable for real-time applications. Considering there are little changes on the angles between similar video keyframes, a fast near-duplicate keyframe detection method based on local features is proposed. Firstly, the feature points are detected in various scales of image pyramids by adopting FAST (Features from Accelerated Segment Test) detection method. Secondly, each feature point is described by BRIEF algorithm. Thirdly, the similar keyframes are recognized based on the pattern entropy. Experiments prove that the proposed method is accurate and efficient, and is suitable for real-time applications of similar video keyframes detection.
CT537 **18:15-18:30**	Design and Realization of Deep Learning Coprocessor Oriented to Image Recognition Lin Li, Shengbing Zhang, Juan Wu Northwestern Polytechnical University, China Presenter: Lin Li, Northwestern Polytechnical University, China Abstract: In order to explore efficient design of the dedicated deep learning processor oriented to image recognition, this paper presents a deep convolutional neural network coprocessor which is applied in embedded image recognition system or SoC. In particular, the calculation of nonlinear active function and local response normalization are designed in PEs of the coprocessor based on approximate calculation so that the parallel computing in multiple PEs could be used instead of traditional serial computing based on additional ALU. In order to verify the function and performance of the coprocessor, two representative convolutional networks LeNet-5 and AlexNet are deployed on coprocessor respectively, and two datasets MNIST and CIFAR10 are used for training and testing. The prototype system of the coprocessor is implemented on XC6VLX240T of Xilinx, and the peak performance is up to 19.2GOP/s when it operates at 100MHz. The experiment results show that the test accuracy of the coprocessor is consistent with the deep learning framework Caffe, and the design of coprocessor meets the requirements of image recognition.
CT538 **18:30-18:45**	Driver identification using histogram and neural network from acceleration data Nuttun Virojboonkiate, Peerapon Vateekul, Kultida Rojviboonchai Chulalongkorn University, Thailand Presenter: Nuttun Virojboonkiate, Chulalongkorn University, Thailand Abstract: Sensor technology has continuously improved in term of size and cost. It encourages car companies to embed various types of sensors in their cars. The most common sensors that can be found are location sensor and acceleration sensor. The sensors generate a lot of useful data which could be applied for many future applications such as car tracking or emergency warning. One of the most interesting applications among others is analyzing the driver behavior. There are some previous works using this information to define types of drivers that are related to levels of accident risk. However, the driver behavior not only can separate the type of drivers but also can identify driving characteristic of an individual driver. The driver identification benefits a security application and it can eliminate the global car theft issue. Because the driver behavior cannot be repeated or copied like other anti-theft systems so this is an essential solution to stop increasing the number of stolen cars every year. In this paper, we propose a methodology to identify each driver and classify group of drivers using only accelerating behavior with machine learning technique. In order to identify an individual driver, the acceleration data have been transformed to a histogram in order to represent the accelerating behavior then we utilize a neural network model. We evaluate our methodology with data that have been collected from the acceleration sensors installed on 13 shuttle buses in our campus for more than 10 months. The results show the accuracy of the proposed methodology up to 88.3% for driver identification and up to 92% for driver classification.

SESSION 10

< Network Resource Allocation and Management >

16:15–18:30

Chamber of Willow (West Wing, 2F) / 舒柳园，西楼2楼

Session Chair: Prof. Du Xu, University of Electronic Science and Technology of China, China

CT059 **16:15-16:30**	Service-Driven Resource Allocation Based on Energy Efficiency in UUDN Xiuzhen Jiang, Xi Li, Hong Ji Beijing University of Posts and Telecommunications, China Presenter: Heli Zhang, Beijing University of Posts and Telecommunications, China Abstract: By introducing the concept of the network serving user, user-centric ultra dense network (UUDN) is proposed as a promising approach of 5G. The access point group (APG), which consists of one or several APs, is dynamically organized to serve each user in UUDN. The APs within an APG need to cooperate to serve a user, and then the resource allocation is much different compared to that in traditional cellular networks. How to effectively allocate the resource among APs within an APG is a crucial issue to serve a user. Considering user's different service flow and system energy efficiency, in this paper we propose a service-driven resource allocation scheme for UUDN to maximize the energy efficiency. This scheme can jointly allocate power and sub-carriers among the serving APs to satisfy user's demand. Besides, it adjusts the number of APs dynamically to serve users according to their service flow. Simulation results show that compared with the existing algorithms, the proposed scheme has better performance in satisfying user's demand and improving system energy efficiency.
CT080 **16:30-16:45**	Particle Swarm Optimization Based Power Allocation for D2D underlaying Cellular Networks Ran Chen, Jun Xu Electronic Information School, Wuhan University, China Presenter: Jun Xu, Wuhan University, China Abstract: In this paper, we study the power allocation problem for device-to-device (D2D) underlaying cellular networks. In order to manage interference and improve the throughput of the cellular network, the particle swarm optimization (PSO) based power allocation algorithm is proposed. The main idea of the algorithm is to allocate the transmit powers of users efficiently so as to maximize the overall throughput of cellular network while satisfying the minimum rate requirement of each user. Simulation results demonstrate the efficiency of D2D communication in improving the network throughput, and the proposed PSO-based power allocation algorithm outperforms the fixed and random power allocation algorithms.
CT084 **16:45-17:00**	Resource allocation in heterogeneous networks: a modified many-to-one swap matching Gang Liu, Hangsheng Zhao, Dali Li PLA University of Science & Technology, China Presenter: Gang Liu, PLA University of Science & Technology, China Abstract: With the rapid increase of wireless service, applying wireless heterogeneous networks is considered as a promising technique to increase the resource utilization rate. However, it is difficult to achieve rational spectrum resource allocation when macro-cellular users and femtocellular users exist in a network which will introduces the serious cross-interference and inter-interference. To solve this problem, a modified swap matching algorithm based on stable matching theory is proposed to allocate the resource. In the algorithm, femtocellualr users continuously exchange their matched resources under the given conditions, and reach a stable swap matching finally. Simulation results show that the given modified swap matching algorithm can achieve a better solution than traditional swap matching algorithm and the modified Gale-Shapley matching algorithm and increase the resource utilization rate with a lower computation complexity.

CT495 **17:00-17:15**	Effective Adaptive Rate Allocation for DP-LDPC Image Transmission System based on Source and Channel Characteristics Li Deng, Zhiping Shi, Shujun Zhang, Rui Tang and Liuyue Gan National Key Laboratory of Science and Technology on Communications, University of Electronic Science and Technology of China, China Presenter: Li Deng, National Key Laboratory of Science and Technology on Communications, UESTC, China Abstract: Image transmission issue with high entropy frames is a great challenge for joint source channel coding (JSCC) system based on double protograph low-density parity-check codes (DP-LDPC) due to its sensitivity to source statistics. Aiming at this question, we proposed an effective rate allocation scheme with the premise of unfixed total rate to allocate the source coding rate and channel coding rate for each frame based on source and channel characteristics. In this scheme, two kinds of objective utility function (OUF) models and corresponding rate allocation methods are provided, including the single objective utility function (SOUF) model with global search method and the multi-objective utility function (MOUF) model with fuzzy logic control (FLC) method. Simulation results indicate that both models are effective for DP-LDPC system with high entropy frames, and the MOUF model with FLC method has better adaptive capacity to time-varying channel and better balance on transmission efficiency, image quality and fairness of allocation. The proposed methods offer some new solutions for high entropy frame problem of DP-LDPC image transmission system.
CT240 **17:15-17:30**	Energy-aware Resource Allocation Scheme for Device-to-Device Communication Based on NOMA Underlaying Cellular Networks Bingshan Li, Heli Zhang, Hong Ji, Xi Li Beijing University of Posts and Telecommunications, China Presenter: Heli Zhang, Beijing University of Posts and Telecommunications, China Abstract: In this paper, power-domain NOMA is applied to D2D communications, and then an optimization problem to maximize the system total energy efficiency (EE) is formulated while guarantying the quality of service (QoS) of both cellular users and D2D users. This optimization problem is a mixed integer fractional programming (MIFP) with a large-scale solution space. Then in order to solve the problem with low complexity, a novel energy aware resource allocation scheme based on Improved Differential Evolution algorithm (EARAS-IDE) is developed. It is a joint physical resource block (RB) allocation and power control scheme. Finally, extensive simulation results show that the proposed EARAS-IDE algorithm with a low complexity is able to converge quickly and approximate the optimal solution after introducing the dynamic mutation factor F. Additionally, compared with OMA scheme, the NOMA scheme achieves higher EE performance gains at the cost of slightly increased receiver complexity.
CT421 **17:30-17:45**	A Novel Cell Zooming Strategy Towards Energy Efficient based on Load Balancing in Random Heterogeneous Networks Yang You, Jie Sheng,Qiaoming Zhu, Canyan Zhu, Dong Ma Soochow University, Suzhou, China Presenter: Jie Sheng, Soochow University, China Abstract: This paper presents an energy efficient aware continuous cell zooming strategy based on load balancing in green network. Firstly, we derive a two-layer Poisson Voronoi Tessellation (PVT) random heterogeneous network (HetNets) model. Secondly, we periodically adjust the user equipment (UE) among cells to realize load balancing of the HetNets. According to base station cooperation, transferring or switching UE which in light-load or heavy-load at the same time. Finally, the radius of cells can be adjusted adaptively to achieve cell zooming. The performance of this work is examined under different user densities and ratios compared with some reference algorithms. Numerical evaluations show that our proposed algorithm can optimize system performance, ensure UE's quality of service (QoS) and improve energy efficient.

CT458 **17:45-18:00**	Resource Allocation for AF-OFDMA System Using Combinatorial Auction Hanan Al-Tous and Imad Barhumi UAE University, UAE Presenter: Hanan Al-Tous, UAE University, UAE Abstract: We propose a combinatorial auction-based subcarrier assignment algorithm for single-relay amplify-and-forward (AF) orthogonal-frequency-division-multiple-access (OFDMA) relaying systems. The proposed algorithm is based on a one-shot multiple-item auction, where each user submits bundles of subcarriers and their corresponding bids. Bundles are generated based on the Shapley and the pair-wise Synergy-Shapley values computed for the user's data rate. After receiving all bids, the winner-determination-problem (WDP) is solved using the structured search algorithm to allocate the subcarriers, then the power is allocated optimally at the source and relay nodes to maximize the sum rate. The effect of the number of submitted bundles/bids on the throughput and fairness indices is investigated. The proposed combinatorial auction outperforms in the throughput and fairness indices an auction algorithm without bundling strategies even though for the case where users are allowed to bid for few bundles in addition to the singleton bid. Numerical results are used to show the advantages of the proposed algorithm.
CT467 **18:00-18:15**	Uplink Scheduling and Power Allocation with M2M/H2H Co-existence in LTE-A Cellular Networks YingQing He, Ning Li, Wei Xie, Cong Wang PLA Army Engineering University, Nanjing, China Presenter: YingQing He, PLA Army Engineering University, Nanjing, China Abstract: with the development of radio technology, more and more devices connect to the radio cellular network. Since the radio resource is limited, how to provide effective resources allocation scheme is proved to be a challenge. Long Time Evolution-Advance (LTE-A) becomes an important candidate for its' universal connectivity and ubiquitous coverage in M2M/H2H co-existence communication. In this paper, we first formulate the uplink resources allocation problem into the sum-throughput optimization problem, then introduce the Lagrange dual function of original problem, decompose it into sub-problem and solve the sub-problem independently for each RB. Finally, we use the Ellipsoid method to update Lagrange dual multiplier and obtain the near-optimal resources allocation solution. We also give the simulation results of the proposed algorithm, and the results of Lagrange dual algorithm are better than greedy algorithm and more close to optimal solution.
CT490 **18:15-18:30**	Power Allocation for Energy Efficiency Maximization in Distributed MIMO System overRayleigh Channels Junya Chu, Xiangbin Yu, Benben Wen, Guangying Wang Nanjing University of Aeronautics and Astronautics, Jiangsu, China Presenter: Xiangbin Yu, Nanjing University of Aeronautics and Astronautics, Jiangsu, China Abstract: In this paper, we investigate the energy efficiency and power allocation problem for distributed MIMO system over composite Rayleigh channels. Given the maximum transmit power limitation per distributed antenna (DA) port, an adaptive power allocation scheme is developed to maximize the energy efficiency, and corresponding constrained optimization problem is firstly formulated. Because of the non-convex nature of the problem, we transform the constrained optimization problem into a standard convex optimization problem through the fractional programming theory. Then, the optimal solution is derived for the optimized problem by means of the Newton method. To avoid the iteration from the Newton method, another optimal solution is also derived based on Cardan formula. Simulation results show that the proposed scheme is valid, and the scheme with Cardan formula can obtain the same energy efficiency as that with Newton method, but it has lower complexity than the latter.

SESSION 11

< Cognitive Radio and Spectrum Technology >

16:15–18:45

Chamber of Moon (West Wing, 2F) /霁月室，西楼2楼

Session Chai: Assoc. Prof. Qiang Li, University of Electronic Science and Technology of China, China

CT085 **16:15-16:30**	Cyclostationarity Based Spectrum Sensing Method With Uncertain Arrivals of Primary Users Wang Jun, Huang Fengying, Chen Zhe, Song Zhenyi, Xu Yang Fuzhou University, China Presenter: Jun Wang, Fuzhou University, China Abstract: Spectrum Sensing is the key technology of Cognitive Radio (CR). This paper proposes a new cyclostationarity based spectrum sensing method with uncertain arrivals of primary users. The method first divides the spectrum sensing period of a SU into several intervals according to the reciprocal of cyclic frequency, then computes the test statistic from these intervals based on Likelihood Ratio Test (LRT), calculates the threshold based on Newman-Pearson (N-P) criteria and finally makes the decision. Simulation results demonstrates the validity and the superiority of the proposed method when the PU comes uncertainly, compared with the conventional cyclostationarity based spectrum sensing method.
CT160 **16:30-16:45**	An Efficient Spectrum Sensing Algorithm Based on Overlap-FFT Architecture Zipeng Zhang, Yubai Li University of Electronic Science and Technology of China, China Presenter: Zipeng Zhang, University of Electronic Science and Technology of China, China Abstract: In this paper, the detection performance of the energy detection algorithm in frequency domain based on overlap-Fast Fourier Transform (overlap-FFT) architecture are analyzed through theoretical derivation and simulation. Firstly, the Monte Carlo method is used to verify the effectiveness of the theoretical analysis of the detection performance under the overlap-FFT scheme when the overlap ratio . Then, a method of estimating the probability of detection when the overlap ratio is proposed according to the simulation of detection performance in the case of different overlap ratios. Finally, the simulation based on OFDM signals verifies that overlap-FFT technology can effectively improve the frequency domain energy detection performance, and its detection probability is higher than the FSM(frequency smoothed method) algorithm based on cyclic stationary feature detection.
CT188 **16:45-17:00**	Robust Energy Efficiency Power Allocation Algorithm for Cognitive Radio Networks with Rate Constraints Mingyue Zhou, Hao Yin, Hongzhi Wang Changchun University of technology, China Presenter: Hao Yin, Changchun University of Technology, China Abstract: Most of traditional power allocation algorithms in the cognitive radio networks (CRNs) are often based on the assumption of perfect channel estimation. We investigate the power allocation algorithm by considering channel gain uncertainty where a primary ad-hoc network working in parallel with a secondary ad-hoc network. Reducing interference and saving energy are essential in radio resource management of cognitive radio networks. The objective is to minimum transmit power while guaranteeing both acceptable transmission data rate for secondary users (SUs) and interference constraints for primary users (PUs). Imperfect channel state information is considered by ellipsoid sets and the problem can be formulated to a second-order cone programming problem. We can solve the robust power allocation problem by a distributed algorithm efficiently. Numerical results verify that the proposed algorithm with rate constraints can get higher transmission performance for SUs.
CT197	A photonics channelization approach for broadband RF spectrum measurement based on I/Q coherent detection and spectrum stitching technique Guangyu Gao, Jianjun Zhang, Lihua Lei, Ju Zhou Qian Xuesen Laboratory of Space Technology, China Academy of Space Technology

17:00-17:15	Presenter: Guangyu Gao, China Academy of Space Technology, China Abstract: A novel channelization approach is proposed to realize a competitive photonics-based broadband RF spectrum measurement (BRSM) system with better completeness and cost-effectiveness based on a single OFC, I/Q coherent detection and improved FFT-based DSP. This photonics-based approach removes the need of complex tunable optical filters through optical direct conversion, and reduces the bandwidth requirement of hardware in each channel to half of the width of each spectrum slice. Relying on the coherence of the spectrum slices and the CE and spectrum stitching algorithm, a broadband and complex RF spectrum can be detected and reconstructed in a high fidelity. As a proof of concept, a two-channel architecture is analyzed in simulation to demonstrate the abilities in detecting and reconstructing the broadband RF spectrum. The operation bandwidth is up to 40GHz, and the analysis bandwidth per channel is ≤12.5GHz. The high degree of fidelity in the spectrum reconstruction are demonstrated with regression analysis of spectrum and coherence analysis of waveform between reconstructed signal and origin signal.
CT236 **17:15-17:30**	Dynamic Spectrum Access for D2D Networks: A Hypergraph Game Approach Xucheng Zhu, Xin Liu, Yuhua Xu, Yuli Zhang, Lang Ruan, Yang Yang PLA Army Engineering University, China Presenter: Xucheng Zhu, PLA Army Engineering University, China Abstract: In this paper the spectrum access problem in dynamic D2D networks is researched based on the hypergraph game solution. The traditional binary graph based interference model cannot describe the cumulative interference relations, which are common in D2D networks. Therefore, we use the hypergraph model to depict the complex interference among the low powered and densely located D2D pairs. Consider the dynamic nature of the D2D communication, each D2D pair may frequently change between the active and silent state. Therefore, the network topology changes dynamically according to the combination of active D2D pairs. In order to reduce the cost and the delay caused by frequently updating access policies, we make the allocation of spectrum access aiming at optimizing the expectation of long-term network performance. We formulate the spectrum access problem as a local congestion game to minimize the expectation of the MAC layer interference level, which can consequently optimize the network performance. Afterwards, a distributed learning algorithm was used to search the pure strategy Nash equilibrium of the game. The simulation results validate the superiority of the hypergraph game solution.
CT245 **17:30-17:45**	Context-aware Group Buying in D2D Networks: An Overlapping Coalition Formation Game Approach Lang Ruan, Jin Chen, Yu Qiu, Xin Li, Yuli Zhang, Xucheng Zhu, Yuhua Xu PLA Army Engineering University, China Presenter: Lang Ruan, PLA Army Engineering University, China Abstract: The price of spectrum resources buying are costly due to its rareness in D2D networks. Although there were several group buying strategies introduced to enhance the buying power of SUs, the user's own specific resource requirements were not being considered. In order to reduce the overhead of spectrum acquisition, this article presents an approach of context-aware group buying, and model the problem as overlapping coalition formation (OCF) games based on users' data (spectrum resource). The proposed OCF games is proved to have stable coalition partition through Nash equilibrium (NE). Then we introduced context-aware algorithm based on SAP, simulation result shows the proposed method has better performance comparing with other methods.
CT455 **17:45-18:00**	An Optimal estimation algorithm of sampling frequency offsets in NG-DSL Systems Shi Tang, Xudong Hong and Xianhua Dai Sun Yat-sen University, China Presenter: Shi Tang, Sun Yat-sen University, China Abstract: This paper presents a new method for estimating sampling frequency offsets (SFO) in NG-DSL systems. NG-DSL relies crucially on the synchronization of sampling frequency, and it requires much higher precision SFO estimators than common orthogonal frequency-division multiplexing (OFDM) systems used in wireless communication as sampling desynchrony. An efficient pilot-aided optimal weighted SFO estimation algorithm is proposed. It achieves higher estimation precision and faster convergence speeds. The new algorithm is more suitable for NG-DSL systems.
CT491	NC-OFDM RadCom System for Electromagnetic Spectrum Interference Yixuan Huang, Dan Huang, Qu Luo, Shiyong Ma, Su Hu, Yuan Gao

18:00-18:15	UESTC, China Presenter: Yixuan Huang, UESTC, China Abstract: A joint radar and wireless communication system is an important trend for future intelligent transportation networks. However, traditional orthogonal frequency division multiplexing (OFDM) radar and communication (RadCom) system is not feasible for complex electromagnetic. A new based on non-contiguous OFDM (NC-OFDM) RadCom system is proposed. Following the concept of cognitive radio (CR), NC-OFDM system is able to flexibly allocate spectrum resources, and NC-OFDM system can effectively adapt to dynamic spectrum environment. Simulation results demonstrate that, the NC-OFDM RadCom system is feasible for the purpose of target detection and wireless communication simultaneously.
CT507 **18:15-18:30**	Low Complexity Trace Based Spectrum Sensing Algorithms: Complex Signal Xi Yang, Kejun Lei, Weiqiang Tan, Yinhang Zhang, Shu Li, and Hao Wu Hunan University, China Presenter: Kejun Lei, Hunan University, China Abstract: In this paper, the multi-antenna spectrum sensing for complex signals are considered. The totally-blind and half-blind spectrum sensing algorithms based on the trace of the sample covariance matrix (SCM) with low computing complexity are proposed. The former can carry out spectrum sensing without prior knowledge of the noise variance, wireless channel and primary signal, and the latter only requires prior knowledge of the noise variance. The analytical expressions for the probability of false alarm and the theoretical detection thresholds for them are also presented. A performance comparison between the proposed methods and other existing methods, such as the energy detector (ED), the covariance absolute value based method, the generalized likelihood ratio test (GLRT) based method and the eigenvalue based methods, is demonstrated. Simulation results show that the new methods can produce reliable sensing results, especially the totally-blind method exhibits higher detection probability than other existing detection techniques.
CT523 **18:30-18:45**	A Frequency Estimation Algorithm for PSK-Modulated Carrier Signal Based on Iterative Weighting Guo Bai, Yufan Cheng, Wanbin Tang, Shiyang Zhou, Xuezhe Wang National Key Laboratory of Science and Technology on Communications of UESTC, China Presenter: Guo Bai, National Key Laboratory of Science and Technology on Communications of UESTC, China Abstract: In this paper, we propose a frequency estimation algorithm for PSK-Modulated carrier signal based on iterative weighting. The existing frequency estimation algorithms based on phase difference are difficult to guarantee the estimation accuracy and estimation range at the same time. However, in the proposed algorithm, the estimation accuracy and estimation range are both guaranteed at the same time by iterative weighting (IW) which outperforms existing alternatives. In this paper, the Cramer-Rao Lower Bound (CRLB) of PSK-modulated carrier signal and the weighting factors are given. The estimation performance is simulated under the Additive White Gaussian Noise (AWGN) channel. The results show that the Root Mean Square Error (RMSE) performance of the proposed algorithm is close to the CRLB in the whole frequency range and the computation complexity is low.

SESSION 12

< Channel Coding and Analysis >

16:15–18:45

Chamber of Dew (West Wing, 2F) /浣花轩，西楼2楼

Session Chai: Assoc. Prof. Jianjun Zhang, China Academy of Space Technology, China

CT079 **16:15-16:30**	A Distributed Anti-jamming Channel Selection Algorithm for Interference Mitigation-based Wireless Networks Luliang Jia, Yuhua Xu, Yuli Zhang, Youming Sun, Yonggang Zhu, Xiping Dai College of Communication Engineering, PLA University of Science & Technology, China

	Presenter: Luliang Jia, PLA University of Science & Technology, China Abstract: In this paper, we investigate the anti-jamming channel selection problem in interference mitigation-based wireless networks. Due to the specific traffic demands, the number of active users is variable. Then, an anti-jamming dynamic game is formulated, and then it is proved to be an exact potential game admitting at least one pure strategy Nash equilibrium (NE). Moreover, a distributed anti-jamming channel selection algorithm (DACSA) is proposed. Finally, the simulation results are conducted to show the performance of the proposed DACSA scheme.
CT115 **16:30-16:45**	A channel analysis method for ground-air wireless communication system Wei Zhiqiang, Bi Haixia, Zhou Zichao Xi'an Electronic Engineering Research Institute, China Presenter: Wei Zhiqiang, Xi'an Electronic Engineering Research Institute, China Abstract: Based on the propagation mode of electromagnetic wave and characteristics of channel fading for wireless communication systems, analysis on different wireless channel models which are applicable for different communication areas aiming at ground-air wireless communication system is made. However, these models only adapt for one communication scenario. To adapt for different communication scenarios in a same system, a comprehensive method which integrates different models is proposed in this paper. Comparisons are carried out between the simulated and field test link remaining powers. Results demonstrate the effectiveness of the proposed method. Link remaining powers under different communication scenarios can be obtained through this method, which will support the system design to a great extent.
CT180 **16:45-17:00**	Study on Modeling Method of Leaky Coaxial Cable Network Channel in Underground Coal Mine Yannan Shi, Jiangong Liu, Zhonghua Liu, Shenyue Li China University of mining and technology (Beijing), China Presenter: Yannan Shi, China University of Mining and Technology (Beijing), China Abstract: To study the high speed data communication and fault diagnosis of the leaky coaxial cable (leaky cable) network in underground coal mine, a method based on multipath propagation for establishing the leaky cable network channel model is proposed. The multipath propagation of the leaky cable network and the transfer characteristic of the leaky cable are analyzed. The transfer function between the network terminals is solved based on the multipath propagation, and the channel model of the leaky cable network is established. The results have been verified successfully by comparing the measurement results with simulations based on the model, which is obvious that simulation and measurement differ only in minor details.
CT330 **17:00-17:15**	Covert Timing Channel Detection Method Based on Random Forest Algorithm Guang xin Fu, Qing bao Li, Ping Zhang, Zhi feng Chen State Key Laboratory of MEAC, China Presenter: Guangxin Fu, State Key Laboratory of MEAC, China Abstract: Network stealth events emerging in endless stream, covert timing channel is one of the most difficult means to prevent. In order to further improve the detection rate of the covert timing channel under the condition of small embedded information length. In this paper, the detection method based on SVM is analyzed. On the basis of the above analysis, adds a variety of statistical features, and a detection method based on random forest algorithm is proposed. The Inter-Packet Delay sequence of the covert timing channel is described from the statistical features of each order, and the above characteristics are used as the communication fingerprint of the covert channel. Then, the classifier based on the random forest algorithm is trained according to the communication fingerprint of the sample, and the classifier is used to judge whether the channel to be detected is the normal channel. The experimental results show that the method can effectively detect the covert timing channel in the case where the length of the embedded information is small. Compared with existing related works, this method has a certain rate of improvement, and the importance of the proposed statistical features are evaluated.
CT338 **17:15-17:30**	Performance Analysis of Improved 64-ary Triangular Quadrature Amplitude Modulation in AWGN Channel Meng Wang, Yongfeng Zhang, Yu Sun, Jiming Yin, Lu Zhang Dalian Maritime University, China

	Presenter: Meng Wang, Dalian Maritime University, China Abstract: It's well known that the improved 64-ary triangular quadrature amplitude modulation (TQAM) who provides considerable power gain over square quadrature amplitude modulation (SQAM) at the expense of slight increase in detection complexity was proposed. In this paper, we derive the general formula calculating the average energy per symbol and exact analytical expression formula for the SER in additive white Guassian Noise (AWGN) of the improved 64-ary TQAM. We also analyze the symbol error rate (SER) and the bit error rate (BER) of the improved 64-ary TQAM and compare them with the error performance of the SQAM and TQAM by simulation. Theoretically, analysis and simulation results show that the improved 64-ary TQAM can provide advantages of 0.6dB and 0.2dB in signal to noise ratio over the SQAM and the TQAM at a target symbol error rate of .
CT366 **17:30-17:45**	Saturated Throughput Analysis of Vehicular Ad Hoc Networks over Rayleigh-Fading Channels Wuwen Lai, Ning Guan, Han Liu, and Hua Wang Beijing Institute of Technology, China Presenter: Wuwen Lai, Beijing Institute of Technology, China Abstract: Throughput is a key network performance for disseminating infotainment services in Vehicular Ad Hoc Networks (VANETs). However, when throughput is analyzed by Markov chain, wireless channel conditions and vehicle speed are not taken into account in modeling Medium Access Control (MAC) operations. In this paper, we propose an improved Markov chain model combining the above two factors to calculate the transmission probability. The saturated throughput is evaluated with considering MAC operations, wireless channel conditions, and vehicle speed. Compared with the basic model, our proposed model can accurately evaluate the saturation throughput with consideration of the aforementioned three factors simultaneously.
CT410 **17:45-18:00**	Security-Reliability Tradeoff for Cooperative Multi-relay and Jammer Selection in Nakagami-m Fading Channels Yijun Yang, Jin Chen, Yuzhen Huang, Ximing Wang PLA Army Engineering University, China Presenter: Yijun Yang, PLA Army Engineering University, China Abstract: In this paper, we analyze the security-reliability tradeoff (SRT) performance of the multi-relay cooperative networks over Nakagami-m fading channels. By considering the reliability of the first phase from the source to relay, a cooperative jamming (CJ) assisted secure transmission scheme is investigated to improve the security performance of the considered system. Specifically, we derive the approximate closed-form expression of the outage probability (OP) and exact closed-form expression of the intercepted probability (IP) for the CJ scheme to evaluate the SRT performance of the system. Finally, the simulation results verify the validity of our theoretical derivations and the advantage of the CJ scheme compared to the traditional scheme with no cooperative jammer.
CT451 **18:00-18:15**	Security Performance Analysis for Cooperative Communication System Under Nakagami-m Fading Channel Lei Peng, Guozhen Zang, Qian zhou, Yuanyuan Gao, Chenjing Xi PLA Army University, Nanjing, China Presenter: Lei Peng, PLA Army University, Nanjing, China Abstract: In this paper, we investigate the secure transmission problem of cooperative communication systems where a potential malicious eavesdropper is existing. Based on the more general Nakagami-m fading channels, we adopt a strategy to improve the system security performance by decoding and forwarding signals at the relay as well as sending interference signals simultaneously. In this model, the outage probability and the intercept probability which represent reliability and security respectively are derived, meanwhile, the influence of the power allocation of each node on the system performance is discussed. Simulations are provided to analyze the tradeoff between reliability and security of the system, and the variation in tradeoff performance under different power allocation.

CT530 **18:15-18:30**	Channel Reciprocity Improvement of Secret Key Generation with Loop-back Transmissions Linning Peng, Guyue Li, Aiqun Hu Southeast University, China Presenter: Linning Peng, Southeast University, China Abstract: Secret key generation from wireless channel is an emerging technique to provide secure keys for message encryption. However, the measured channel state information (CSI) requires high reciprocity in order to obtain symmetric keys. In this paper, we propose a novel loop-back transmission scheme for time division duplex (TDD) systems, which is named as LB-TDD. The proposed LB-TDD scheme can effectively reduce the CSI non-reciprocity due to the hardware fingerprint interference and system synchronization offset. We initially discuss the benefits and optimizations of using LB-TDD for CSI reciprocity enhancement. After that, a secret key generation method based on orthogonal frequency division multiplexing (OFDM) probing signals is introduced. Finally, a channel model and a practical universal software radio peripheral (USRP) system is setup for both simulation and experimental verification. Evaluation results show that our proposed LB-TDD scheme can effectively eliminate CSI non-reciprocity for secret key generation.
CT567 **18:30-18:45**	The Influence of the Branch loads on the Chinses Low-Voltage Power Line Communication Channel Tao Liu China University of Petroleum (Beijing), China Presenter: Tao Liu, China University of Petroleum (Beijing), China Abstract: This paper presents a noval analysis for the transfer function of Chinese electrical power lines for broadband power line communication (PLC). In this approach, the power line is approximated as a transmission line. The PLC model based on physical and topological channel properties is used, especially include a two non-equidistant branches topology. We use Ansoft HFSS for direct modeling a frequency-domain multiple branches power line network model based on transmission line theory. This study presents analysis for the disturbances generated by simulative Chinese household applications.

SESSION 13

< Antenna Design and Application >

16:15–18:45

1.2 Four Seasons Hall (West Wing, 1F) / 四季1.2厅，西楼1楼

Session Chair: Assoc. Prof. Haiyan Jin, University of Electronic Science and Technology of China, China

CT159 **16:15-16:30**	Design of a Miniaturized Triple-Frequency Microstrip Antenna Qiang Gao, Jie Jin Qiang Gao, Huainan Normal University, China Presenter: Qiang Gao, Huainan Normal University, China Abstract: A new miniaturized triple-frequency microstrip antenna is proposed. The proposed antenna mainly consists of two circular rings, a circle, a horizontal rectangular strip, three vertical rectangular strips and a defected ground plane. The proposed antenna can generate three separate impedance bandwidths to cover all the 2.4/5.2/5.8GHz Bluetooth/WLAN (Wireless Local Area Network)/RFID (Radio Frequency Identification Devices) operating bands and the 2.5/ 3.5/5.5GHz WiMAX (Worldwide Interoperability for Microwave Access) operating bands. By adding a vertical rectangular strip and a circle along the microstrip direction, the antenna excites two resonant modes and is with miniaturized structure. Because of the introduction of the cambered ground plane with a circular defect, the third wide band with better impedance matching is obtained. Result shows the proposed antenna has good performance.

CT174 **16:30-16:45**	Analysis and Development of Components of Dipole Linear Antenna Array Lei Wang University of Birmingham, China Presenter: Lei Wang, University of Birmingham, China Abstract: The paper will discuss the wide usage of dipole antenna and the associated problems of the construction dipole in a towing system. Focusing on ways to improve and develop components of dipole linear antenna. Dipole antenna parameter values will be designed and calculated before creating model on software. The properties of dipole antenna will be discussed and analyzed in the paper; the principal two being S parameters and antenna patterns. I will then focus on the single half-wavelength dipole antenna. Creating two elements of dipole linear antenna array models and simulations will be produced with CST software. In the papers final phase, simulation results of S11 parameter and antenna pattern will be compared and analysed according to different cases.
CT181 **16:45-17:00**	Antenna Selection in Switched Phased Array Architecture for Secure Millimeter Wave Communication Jiangqi Fan, Meng Wu Nanjing University of Posts and Telecommunications, China Presenter: Jiangqi Fan, Nanjing University of Posts and Telecommunications, China Abstract: Compared to traditional antenna arrays system, large-scale antenna arrays with multiple transmit antennas can achieve more accurate beam control ability, and decrease sidelobe leakage. However, sensitive eavesdropping receiver can still receive sidelobe signals and recover it, resulting in the unsafe transmission of information. For secure transmission, traditional directional modulation modulate signals in the RF end, but increasing system complexity. In this paper, we use switched phased array transmission architecture in millimeter-wave frequencies to study physical layer security through antenna selection, which disturb undesired direction constellation and have no effect in desired direction. We also proposed an antenna selection algorithm based on iterative fast Fourier transform (FFT) technique, which selects optimized antenna structure with a low sidelobe to constitute codebook for antenna switching. Compared with the traditional genetic algorithm, the proposed algorithm has lower sidelobe level and computational complexity. The simulation results verify the feasibility and effectiveness of the proposed scheme and algorithm.
CT257 **17:00-17:15**	Theoretical Model for Patterns of VICTS Antenna Jun Gao, Xue Lei, Junmo Wu, Tianpeng Li National Digital Switching System Engineering and Technological R&D Center, China Presenter: Jun Gao, National Digital Switching System Engineering and Technological R&D Center, China Abstract: A theoretical model for array patterns of variable inclination continuous transverse stub (VICTS) antenna is proposed. The theoretical model is utilized to reveal the nonlinear relationship in beam scanning between the angular position of beam and the rotation angle of the radiation layer. A dynamic coordination system is used to simplify the theoretical model and reduce errors. Based on the dynamic coordination system, array pattern of VICTS antenna with arbitrary amplitude distribution and arbitrary aperture shape can be calculated by the theoretical model. Both the full-wave simulations and computation of the theoretical model are carried out. The calculation errors of the angular position of beam between the proposed method and the full-wave simulation are less than 1(. By using the proposed method, the problem of nonlinear and dynamic beam steering in the VICTS antenna servo control system can be solved.
CT270 **17:15-17:30**	A novel tunable patch antenna using graphene stacks array Hanqing Liu, Peiguo Liu, Qihui Zhou, Ke Wang and Yuwei Chen National University of Defense Technology, China Presenter: Hanqing Liu, National University of Defense Technology, China Abstract: With the ability of tuning chemical potential, the graphene conductivity can be dynamically adjusted over a wide range. In this paper, we theoretically demonstrate the novel tunable terahertz (THz) tunable patch antenna based on the graphene stacks array. According to the simulation results, the proposed antenna shows a perfect tunability on the reflection coefficient, from 2.8 to 3.4 THz when the chemical potential increase from 0.1 to 0.5 eV. What' more, the gain and directivity of antenna also display a adjusted phenomenon with the chemical potential. And we further discuss the structural

	parameters of graphene stacks array which also affect the tunable characteristic, and then analyze the results with the distribution of electric field on the top surface of antenna. These results could be very potential applications in other voltage-sensitive devices, tunable sensors and absorbers, switches.
CT437 **17:30-17:45**	Performance 3-D ISAR Imaging in Compact Antenna Test Range via Compressed Sensing Jingcheng Zhao, Mengyu Zhang Beihang University, China Presenter: Jingcheng Zhao, Beihang University, China Abstract: A previous work proposed 3 time efficient sampling schemes for 3-D inverse synthetic aperture radar (ISAR) imaging, yet the dynamic range of these schemes is less than 10dB. In order to enlarge imaging dynamic range, a target recovery method based on compressed sensing (CS) is used instead of matched filtering. The dynamic range of point spread function (PSF) based on the new method is more than 60dB, a target with a 30dB RCS range can be perfectly reconstructed. With efficient sampling schemes and CS imaging method, both time efficiency and imaging performance can be achieved.
CT465 **17:45-18:00**	Maximum Combination Spatial Modulation Chi-Min Li and Yu-Jia Li National Taiwan Ocean University, Taiwan Presenter: Chi-Min Li, National Taiwan Ocean University, Taiwan Abstract: Spatial Modulation (SM) is a variant of the Multiple-Input Multiple-Output (MIMO) technique with only one antenna transmits signal at a time. It has the advantage of inter-antenna interference avoidance. Therefore, most of the antennas are idle during the signal transmission. Many literatures have been proposed to use multiple antennas to improve the bit error rate (BER) and bandwidth efficiency for the SM. In this paper, we propose a maximum combination spatial modulation (MCSP) to improve the Bit Error Rate (BER) performance of the related SM methods. Results show that the proposed method can improve the BER and can also increase the throughput for the conventional SM method.
CT504 **18:00-18:15**	Transmit Antenna Selection with Precoding for Spatial Modulation MIMO Systems Kaili Zheng, Shu Fang, Yu Zeng, Yanqiu Zhang University of Electronic Science and Technology of China, China Presenter: Kaili Zheng, University of Electronic Science and Technology of China, China Abstract: Spatial Modulation (SM) is an efficient transmission technique for multiple input multiple output (MIMO) wireless systems, which is proposed to implement MIMO systems with low complexity and cost. In order to obtain transmit diversity gain, transmit antenna selection (TAS) technique is adopted in SM systems to achieve better performance. In this paper, we present a novel transmit antenna selection method with precoding for multiple input multiple output SM-MIMO systems, denoted as TASP. The proposed TASP scheme is totally different from the existing TAS schemes. Because it is not just a common TAS scheme, but it can also combine with all of the existing TAS schemes to further improve their performance. The simulation results show that the proposed TASP scheme brings a clear superiority in performance than conventional space shift keying (SSK), SM and the capacity optimized antenna selection (COAS) scheme. It also shows performance improvement when combining with other TAS schemes.
CT168 **18:15-18:30**	Channel Estimation Based on Turbo Equalization in Massive MIMO Systems MeiyanJu, Yueheng Li, Guoping Tan, Dan Liu Hohai University, China Presenter: Meiyan Ju, Hohai University, China Abstract: This paper proposes an iterative channel estimation based on turbo equalization in uplink massive multiple-input multiple-output (MIMO) systems. The turbo receiver first uses a matched detector and then linear minimum mean square error (MMSE) equalization is performed. Thanks to the recovered symbols of users in the local cell, a matched estimation after intra-cell interference cancellation is proposed without requiring much computation. Simulation results confirm the superiority of the proposed estimator over the existing pilot-based and data-aided channel estimators.

CT311 **18:30-18:45**	Research on Multi - wavelength Optical Frequency Comb Technology Based on SatelliteSpectrum Sensing Jianjun Zhang, Ming Xue China Academy of Space Technology, Qian Xuesen Laboratory of Space Technology, Beijing, China Presenter: Ming Xue, China Academy of Space Technology, Qian Xuesen Laboratory of Space Technology, Beijing, China Abstract: Optical frequency comb is a kind of light source with combing frequency comb, which has important application in UWB, high precision frequency standard, precision ranging, microwave photonics arbitrary waveform generator, dense wavelength division multiplexing and other related fields. In this paper, we study the generation and application of optical frequency comb from the perspective of spectrum sensing, analyze the current situation of optical frequency combs at home and abroad, construct a multi-wavelength optical frequency combing model based on satellite spectrum sensing, conduct a theoretical analysis, and set up an experimental link and verify the correctness of the program, which provide technical support for ultra-wideband spectrum sensing covering over 100Ghz.

SESSION 14

< Information Engineering and Speech Processing >

16:15–18:45

3.4 Four Seasons Hall (West Wing, 1F) / 四季3.4厅, 西楼1楼

Session Chair: Prof. Rong Shi, Science and Technology on Electronic Information Control Laboratory, China

CT101 **16:15-16:30**	End-to-End Speech Emotion Recognition Based on Neural Network Bing Zhu, Wenkai Zhou, Yutian Wang, Hui Wang, Juan Juan Cai Communication University of China Presenter: Wenkai Zhou, Communication University of China, China Abstract: Speech has lots of emotional information and speech emotional recognition is one of the top topic in AI field. Traditional research extracted speech feature first and then to classified the emotions by sorting algorithms. However, all kinds of feature extracting algorithms lost some original speech information to some extent, so the accuracy rate is reduced. In this paper, we present an end-to-end speech emotion recognition system which based on neural network without feature extraction. Experimental testing of the proposed scheme was performed using the DMO-DB (German) and CASIA (Chinese) emotional speech datasets, recognition rates reached 74.12% and 44.5% respectively.
CT262 **16:30-16:45**	A screening scheme based on energy for speech key-frame Yingjie Meng, Xiaoyu Teng, Huiran Liu, Sanshuai Cui, Zhiyuan Wang Lanzhou University, China Presenter: Xiaoyu Teng, Lanzhou University, China Abstract: The research of the existing screening algorithm for speech frame has a great deal of shortcomings, such as its applicability and complexity. Worse still, those frames which are screened by algorithm can't achieve the requirement of express and the screening process greatly damages the original signal. This paper presents a strategy for screening speech key-frame and designs a screening scheme for key-frames based on the strategy. This scheme refers to the speech's logarithm energy and the weighted-zero-crossing rate. The detail process of screening scheme: firstly, screening frames according to the logarithm energy of the speech signals. Meanwhile, combine the speech amplitude and zero-crossing rate for frames screening. Finally, calculate the similarity of the two screening results, and getting the key-frame set. In addition, the scheme has been analyzed and validated from those aspects like continuity, characterization and applicability, in order to verify the effectiveness and availability. The results illustrate that these frames which have been screened by this scheme have advantages of continuity, characterization etc.

CT302 **16:45-17:00**	Deep Neural Network Based Monaural Speech Enhancement with Sparse and Low-Rank Wenhua Shi, Xiongwei Zhang, Meng Sun,Xia Zou, Yanmin Wei, Gang Min and Changyan Zheng Army Engineering University of PLA, China Presenter: Wenhua Shi, Army Engineering University of PLA, China Abstract: Taking into account of the sparse and low-rank structure of noisy speech spectrogram and good temporal-spectral preservation characteristics of deep neural network (DNN), a novel monaural speech enhancement framework combining DNN with sparse and low-rank matrix analysis is proposed in this paper. Sparse representation of target speech is obtained via sparse and low-rank decomposition on the noisy speech spectrogram. DNN is used to estimate the non-linear function which maps the sparse and the magnitude spectrum features of the noisy speech to the magnitude spectrum of the target speech. Network parameters are optimized by back-propagating the reconstruction error using MMSE criterion. Evaluations in terms of PESQ and LSD show that the proposed method is superior to the supervised NMF and the regression DNN based speech enhancement method.
CT363 **17:00-17:15**	The Influence of leadership styles on Accounting Information Systems Quality and its Impact on Information Quality Survey on State-Owned Enterprise Meiryani, Bambang Leo Handoko, Sasya Sabrina, Edwin Hendra Bina Nusantara University, Indonesia Presenter: Meiryani, Bina Nusantara University, Indonesia Abstract: Quality accounting information system is an integrated information system, to improve the quality of accounting information systems (AIS) required leadership that will improve the quality of accounting information systems. This research was conducted at 61 for companies in the State-Owned Enterprises, survey respondents was the head of the accounting department, chief financial officer and the head (branch manager). This study used an explanatory cross-sectional survey, and tests the data used by Structural Equation Model (SEM) approach to analysis tools Partial Least Square (PLS). The results found the leadership style at state-owned companies affect the use of accounting information systems and found accounting information system affect the quality of information.
CT377 **17:15-17:30**	Research on User Identification Algorithm Based on Massive Multi-site VPN Log Bingbing Lu, Huaping Zhang, Bin Liu, Zhonghua Zhao Beijing Institute of Technology, Beijing, China Presenter: Bingbing Lu, Beijing Institute of Technology, Beijing, China Abstract: VPN (Virtual Private Network) is the primary mean for users to access network information by crossing the border currently. There is little research about VPN users, though the number of users who using VPN is pretty large. Consequently, it is desiderated to find a solution to strengthen the ability to observe and discover cross-border access users. This paper proposes a novel user identification algorithm according to massive multi-site VPN log. First of all, a formal description of VPN user identification problems is given, then we analyze quantitatively for probability distribution of VPN log in two dimensions: usernames and CIP (Client Internet Protocol) addresses. Based on this, we give the solution of problems in VPN user identification, and propose a user identification algorithm based on the combination of access vector similarity, username similarity, the number of regions where users surf the internet and the connected subgraphs. Then we test the algorithm in VPN log within two months, which has proved the effectiveness and correctness of user identification algorithm.
CT394 **17:30-17:45**	Parametric Audio Equalizer Based on Short-Time Fourier Transform Peng Zhang, Ye Li, Xiaoming Wu, Xiangzhi Liu, Qiuyun Hao, Yan Liang Shandong Computer Science Center (National Supercomputer Center in Jinan), China Presenter: Peng Zhang, Shandong Computer Science Center (National Supercomputer Center in Jinan), China Abstract: Equalizers (EQs) have been widely used in audio and acoustic processing to adjust the magnitude of certain frequency bands. This paper proposes a parametric EQ based on short-time Fourier transform (STFT). The audio signal is equalized in the frequency domain by modifying its short-time spectrum with the interpolated magnitude frequency response of the EQ. Design examples show that the proposed method can realize the same function as filter-based equalization, while providing more adjustable frequency bands and wider range of gains. This brings in more flexible control and usage of the EQ for practical applications.

CT413 **17:45-18:00**	An Algorithm of Detecting Audio Copy-Move Forgery Based On DCT And SVD Feiyang Wang, Chen Li, Lihua Tian Xi'an Jiaotong University, China Presenter: Feiyang Wang, Xi'an Jiaotong University, China Abstract: In order to detect whether there is copy-move forgery in an audio file, a new algorithm is proposed in this paper. In this algorithm, some syllables are obtained by segmenting audio signal with voice activity detection (VAD) algorithm. Discrete cosine transform (DCT) is performed to process these syllables to generate DCT coefficients. Then these coefficients corresponding to every syllable are converted to a square matrix. After that, singular value decomposition (SVD) transform is performed for the square matrix to obtain singular eigenvector. Here, the contribution rate is calculated to reduce the dimension of the singular eigenvector. So the amount of data to be processed can be reduced greatly. Finally, the distances among syllables are measured by comparing the distance among the low-dimensional singular vectors to determine whether there is the copy-move relationship between corresponding syllables. Because these singular values have a great stability, the distance between two syllables would have little change after the common signal processing. The low-dimension singular eigenvector requires less computational complexity, so the algorithm costs less running time. The experiment results show that the proposed algorithm is robust against conventional attacks and has better efficiency.
CT509 **18:00-18:15**	A Beamforming Method Based on Image Tracking and Positioning in the LOS Scenario Xiuling Chen, Zaixue Wei, Xin Zhang, Lin Sang Beijing University of Posts and Telecommunications, China Presenter: Xiuling Chen, Beijing University of Posts and Telecommunications, China Abstract: With the antenna number increasing in Massive MIMO systems, overhead used for channel measurement and feedback increases rapidly. When the cellular mobile communication system apply 5GHz or higher frequency, as diffraction ability of beams gets worse, the system becomes more dependent on line of sight(LOS) propagation. However, the widespread use of cameras creates good solutions for image positioning. If the image information of the communication target is determined, combined with the image tracking algorithm, the position of the target in each frame can be calculated. In the case of LOS propagation, the angle information of the LOS path can be directly determined in order to find the best beam direction. In this paper, a beamforming method combined with binocular image tracking and positioning is proposed. Compared with the traditional method, when using this method to find the best codeword, the search steps can be omitted partly and the spectrum efficiency can be improved. By enhancing the beamforming method, it is possible to reduce the beam index error due to the estimated position inaccuracy, thereby further improve the communication quality.
CT545 **18:15-18:30**	Chemical Substance Classification using Long Short-Term Memory Recurrent Neural Network Jinlei Zhang, Junxiu Liu, Yuling Luo, Qiang Fu, Jinjie Bi, Senhui Qiu, Yi Cao, Xuemei Ding Guangxi Normal University, China Presenter: Jinlei Zhang, Guangxi Normal University, China Abstract: This paper proposed a chemical substance detection method using the Long Short-Term Memory of Recurrent Neural Networks (LSTM-RNN). The chemical substance data was collected using a mass spectrometer which is a time-series data. The classification accuracy using the LSTM-RNN classifier is 96.84%, which is higher than 75.07% of the ordinary feed forward neural networks. The experimental results show that the LSTM-RNN can learn the properties of the chemical substance dataset and achieve a high detection accuracy.
CT548 **18:30-18:45**	Service Chain Performance Optimization Based on Middlebox Deployment Can Ouyang, Yunkai Wei, Supeng Leng and Yijin Chen University of Electrical Science and Technology of China, China Presenter: Can Ouyang, University of Electrical Science and Technology of China, China Abstract: The Service Function Chain (SFC) is a mechanism which transmit packets through different services in order. With Software Defined Networking (SDN) and Network Function Virtualization (NFV), network services can be flexible deployed on the middleboxes. However, end-to-end transmission delay of the SFC will influence the time delay in a network, which is a key indicator to the performance of a network. One way to decrease transmission delay is to optimize the deployed sequence

	of service middleboxes. In this paper, we put forward a Middlebox Placement Optimization (MPO) algorithm. Different from the previous works, the MPO algorithm fully utilizes the flexibility and dynamicity provided by SDN and NFV, and can dynamically deploy the sequence of services in the SFC to adapt real-time changing service characters. Simulation results show that MPO can reduce the end-to-end delay by an average of 30 percent comparing with the traditional First Construction First Placement (FCFP) algorithm.

SESSION 15

< Electronic and Communication Engineering >

13:00–16:00

Chamber of Osmanthus (West Wing, 2F) /桂香居，西楼2楼

Session Chair: Assoc. Prof. Liang Zhou, University of Electronic Science and Technology of China, China

CT102 **13:00-13:15**	Joint Precoder and DC Bias Design for MIMO VLC Systems Yumin Zeng, Jiaheng Wang, Xintong Ling, Xiao Liang ,Chunming Zhao Southeast University, China Presenter: Yumin Zeng, Southeast University, China Abstract: Visible light communication (VLC) can provide high-speed data transmission and meet the daily illumination demand simultaneously, and thus emerges as a promising technology for future indoor wireless communication. This paper proposes effective methods to jointly design the precoder and DC bias for multiple-input multiple-output (MIMO) VLC systems. The design goal is to minimize the mean square error (MSE) between the transmitted and received VLC signals. The nonnegative constraint on the transmitted signal and two different power constraints are considered. We first consider the per-LED power constraint and propose an effective solution to the precoder design problem. Then, the proposed method is extended to address the similar joint precoder and bias design problem under the sum power constraint. Finally, the performance of the proposed precoder and DC bias designs is evaluated via simulations.
CT183 **13:15-13:30**	Polar Codes for Cooperative Unmanned Aerial Vehicle Communication Networks Chao Yuan , Chang Wu ,Yang Yang University of Electronic Science and Technology of China, China Presenter: Chao Yuan, University of Electronic Science and Technology of China, China Abstract: In order to improve the performance of cooperative unmanned aerial vehicle (UAV) networks under the condition of a UAV can only carry one single antenna in the complex wireless environment, a novel case is decode-and-forward relaying method for 4 UAVs based on the distributed space-time block code (DSTBC). It can achieve 3 times diversity gains in quasi-static Rayleigh fading channel. Moreover, to obtain a better BER performance, polar codes are used in the UAV networks. The Polar-UAV networks can be equivalent to a single transmission channel for each polar code bit. By comparing the various BER simulation results, it can be concluded that polar codes can tremendously improve the coding gain and guarantee high reliable fly control in the proposed cases.
CT224 **13:30-13:45**	Applications of Equivalent Cable Bundle Method in Frequency Domain for Emission Problems of the Computer Case Cable Harness Meng Fu, Gaosheng Li National University of Defense Technology, China Presenter: Meng Fu, National University of Defense Technology, China Abstract: Modern computer case cables are being more and more complex, and the electromagnetic environment is increasingly complex at the same time, so the case of various cables in the field generated by the radiation sources, crosstalk between the harness and the emission caused by the wiring harness is becoming one of the severe electromagnetic compatibility problems. In this paper, the equivalent cable bundle method is introduced into the computing of cable emission problems to predict the near-field

	radiation caused by the cable harness. This method can be summarized by 5 steps when it comes to a radiation problem. The principle of ECBM is analyzed first. To verify the method, a numerical experiment on 5 cables in a computer case has been carried out.
CT225 **13:45-14:00**	A High Linearity Wideband Receiver with Large Dynamic Range in 0.18um CMOS Jinyu Zhu, Yanfeng Wang, Guangnan Zou, Zijun Wang, Wenbin Wang Space Star Technology Limited Corporation, China Presenter: Zijun Wang, Space Star Technology Limited Corporation, China Abstract: A high linear, low power wideband CMOS receiver for digital set-top boxes or satellite low cost terminals is presented. It is implemented based on Zero-IF structure for a fully integrated chip and Supports different reconfigurable symbol rates. It is made up of LNA, down frequency conversion circuits, orthogonal analog baseband, fractional PLL, supply management, digital interface and necessary auxiliary circuits. Fabricated in TSMC 0.18um 1P6M MM/RF CMOS process and packaged in QFN40, the receiver performance is measured showed as: the input 1dB gain compression point is above 0dBm in 0.9-2.2GHz, noise figure is below 10dB, dynamic range is larger than 80dB, bandwidth of adjustable LPF is between 4MHz and 40MHz，and I/Q paths mismatch are smaller than 0.1dB for amplitude and 0.05 degree for phase with calibration. The area of the whole transmitter is 3.9mm x 3mm. The chips have passed relative system test verification, preparing for pilot.
CT284 **14:00-14:15**	Research on attenuation model of The Communication Leaky Coaxial Cable Jinxi Guo, Yang Liu，Duan Li, Xiucao Han China University of mining and technology (Beijing), China Presenter: Jinxi Guo, China University of mining and technology (Beijing), China Abstract: In this paper, based on the equivalent circuit diagram of the leaky cable, the impedance and admittance of the leaky cable are calculated, and the mathematical model of the leaky cable is established. In the influence of external mode coupling, weak coupling coefficient is defined, and the transmission attenuation model of the leaky cable is obtained. The relation between attenuation and frequency is obtained by simulation, show that the attenuation increases with frequency. Through the experiment of the leaky cable, the consistency between the measured value of attenuation of cable and the attenuation model is obtained.
CT321 **14:15-14:30**	Reconstruction-based Receiver of FTN Signaling at Fixed Sampling Rate Ke Wang, Aijun Liu, Xiaohu Liang, Siming Peng and Xudong Zhong PLA University of Science and Technology, China Presenter: Ke Wang, PLA University of Science and Technology, China Abstract: Faster-than-Nyquist (FTN) signaling has attracted increasing attentions for its high spectral efficiency. The FTN signaling changes the packing ratios to improve the data rate, which unavoidably induces the intersymbol interference (ISI). Moreover, the FTN signaling requires variable symbol rates which change with the packing ratios. A number of low-complexity detection methods have been employed in the FTN signaling. However, these methods based on the variable sampling rates challenge the receiver of FTN signaling. In particular, the variable sampling rates lead more complexity in the timing synchronization. We propose a receiver based on signal reconstruction to detect FTN signal at fixed rate. The receiver adopts an interpolator to recover the signal from the samples taken at fixed rate. With the simulations, the samples taken at fixed rate would not suffer information loss and the bit error rate (BER) performance of the receiver can approach the traditional way. In particular, our receiver can be used in the adaptive transmission system based on FTN signaling flexibly for the fixed-sampling scheme can simplify the process of the channel estimation.
CT348 **14:30-14:45**	Wideband Circular Polarizer Based on Twisted Double-Layer Spiral Planar Structure Farman Ali Mangi, Shaoqiu Xiao, Ghulam Fatima Kakepoto, Imran Memon Shah Abdul Latif University Khairpur, Sindh, Pakistan Presenter: Farman Ali Mangi, Shah Abdul Latif University Khairpur, Sindh, Pakistan Abstract: A wideband circular polarizer constructed by using 2x2 array metallic planar spiral structure is proposed. The top and bottom spiral structures are patterned with certain twisted angles with respect to each other along xoy directions. A new class of structure is presented that transmit the incident linearly polarized wave into a circularly polarized wave at microwave frequencies. The impinged wave is

	converted into a right-handed circularly polarized (RHCP) wave from 14.42 GHz -16.12 GHz. The accumulative axial ratio of Txx, Txy 10% is obtained for circular polarization. Results show that proposed structure possesses substantially good performances, in terms of transmission efficiency and axial ratio bandwidth. The simulated surface current distributions illustrate transformation behavior for linear and circular polarizations. The proposed structure could be useful to design optical devices and polarization control devices.
CT350 **14:45-15:00**	Reconfigurable Continuous Class-F Power Amplifier Using Tunable Output Matching Network Ke Han, Yuanwang Yang, Chang Jiang You, Xueyong Zhu and Xuekun Du University of Electronic Science and Technology of China, China Presenter: Ke Han, University of Electronic Science and Technology of China, China Abstract: The design of a reconfigurable continuous Class-F power amplifier (PA) is presented in this paper. A varactor-based output matching network is used to design the reconfigurable continuous Class-F PA. By employing the CREE 10W GaN HEMT device CGH40010F, the design is verified by simulation. The layout simulation results show that more than 50% efficiency is obtained from 0.9GHz to 1.45GHz. In each reconfigurable band with a bandwidth of 200MHz, the power gain is within 10.6±1.0dB.
CT357 **15:00-15:15**	Feedback Control with Quantized State Using Event-Triggered Communication Lun Wang, Yuan Fan, Yong Yang and Cheng Song Anhui University, China Presenter: Lun Wang, Anhui University, China Abstract: In this paper, we propose a quantized feedback control approach. An event-triggered communication scheme is introduced to select which signal should be sampled, quantized, and then transmitted. The event condition is established by considering the difference between the current output and the latest sampled output of the plant. Then, by using the linear matrix inequality technique, it is proven that the proposed algorithm can drive the system to reach asymptotic stability. Finally, the simulation example is given to illustrate the proposed method.
CT510 **15:15-15:30**	Direction Finding for Non-circular Sources Based on Weighted Unitary Nuclear Norm Minimization Weijie Tan, Xi'an Feng, Weiqiang Tan and Jun Li, Northwestern Polytechnical University, China Presenter: Weijie Tan, Northwestern Polytechnical University, China Abstract: In this paper, we propose a weighted unitary nuclear norm minimization approach for direction-of-arrival (DOA) estimation in the strictly non-circular sources case. The proposed method firstly utilizes the non-circularity characteristics of the source to extend the data model for doubling the array aperture. Then the complex-valued extend date model is turned into a realvalued data model by unitary transformation, which can suppress the noise by the real-valued structure. And then a unitary nuclear norm minimization framework is formulated via a block sparse model which has no influence of the unknown noncircularity phase. In addition, the reduced dimensional noncircular Capon (RD NC-Capon) spectrum is used to design a weight matrix for unitary nuclear norm minimization algorithm. Finally, the DOA estimation is accomplished by searching the non-zero blocks of recovered matrix. Owing to utilizing the noncircularity of source, the real-valued data model and the twofold sparsity structure, the proposed method can provide higher spatial angular resolution and better angle estimation performance. Simulation results are used to verity the effectiveness and advantages of the proposed method.
CT527 **15:30-15:45**	A Design of Frequency Doubler Based On 0.5um lnP HBT Process Wen-jie Jiang, Ming-zhu Zhou, Guo-dong Su, Jun Liu, Rui Lin, Yong-ming Liang Hangzhou Dianzi University, China Presenter: Wenjie Jiang, Hangzhou Dianzi University, China Abstract: This paper presents a type of frequency doubler with a single transistor designed with 0.5 um lnP HBT process. The frequency doubler employs LC circuit to achieve input and output impedance matching. At the emitter of the transistor, a λ/4@2f0 transmission line is connected to increase the output power. The input power of the frequency doubler is 5 dBm. In the output frequency range of 50 ~ 86 GHz, the small signal gain S21 is stabilized at -5.2 dB, the fundamental suppression is greater than 13

	dBc, and the total area of the layout is 0.265 mm2. The power supply voltage of the frequency doubler is 3 V and the DC power consumption is 6.27 mW.
CT541 **15:45-16:00**	Reduced Complexity List Polar Decoder with an Improved Path Pruning Scheme Zhiyu Chen, Jun Lin, Zhongfeng Wang Nanjing University, China Presenter: Zhiyu Chen, Nanjing University, China Abstract: While the cyclic redundancy check (CRC) aided successive cancellation list (SCL) decoding algorithm for polar codes outperforms the successive cancellation (SC) decoding algorithm in terms of error correction capability, it still has long decoding latency. To accelerate the decoding process, a high throughput list decoder architecture was proposed, which enables the list decoder to partially work in parallel. However, a large sorting space is required in this method and the sorting procedure is relatively time-consuming. In this paper, a hamming distance filter (HDF) algorithm is proposed to reduce sorting complexity during the decoding path pruning. Based on the proposed HDF algorithm, if a path has a large hamming distance (larger than a predefined threshold) between the hard decision of the received LLR and its corresponding constituent code, it is simply discarded. Supposing a HDF aided list decoder is used for an (8192,4096) polar code, simulation results demonstrate that the reduction of the sorting space varies from approximately 36% to 70% with negligible error performance loss.

SESSION 16

< Navigation System and Satellite Communication >

13:00–15:30
Chamber of Dew (West Wing, 2F) /浣花轩，西楼2楼

Session Chair: Prof. Kun Zhang, Hainan University, China

Opening Speech **CT922** **13:00-13:15**	Research on Similarity Metric Distance Algorithm for Indoor and Outdoor Firefighting Personnel Precision Wireless Location System Based on Vague Set on UWB Kun Zhang, Chong Shen, Qiao Gao, Haifeng Wang Hainan University, China Presenter: Kun Zhang, Hainan University, China Abstract: Based on the UWB indoor scale precision firefighter wireless positioning system, the similarity metric distance algorithm based on intuitionistic fuzzy Vague sets is constructed, and a new distance formula is constructed. Combined with the time difference of arrival (TDOA) algorithm, it is helpful to improve the accuracy of the tag location algorithm Degree, to achieve an effective technological breakthrough.
CT096 **13:15-13:30**	Adaptive Blind Nulling without Measurement Biases in GNSS Receivers Hailong Xu, Xiaowei Cui, and Mingquan Lu Tsinghua University, China Presenter: Hailong Xu, Tsinghua University, China Abstract: Adaptive blind nulling using an antenna array is an effective method to mitigate interferences in global navigation satellite system (GNSS) receivers. Compared with beam-forming techniques, it has the advantage that measuring the orientation of the antenna is not needed, thus saves the cost of equipping an inertial measurement unit (IMU). However, since the satellite direction information is absent, pre-existing methods of mitigating the measurement biases induced by the adaptive array algorithms are no more applicable, which makes the accuracy requirements not met in high-precision applications. To this end, a blind nulling algorithm using spatial-temporal adaptive processing (STAP) without measurement biases is proposed. This algorithm utilizes the symmetry of the array manifold, and sacrifices nearly half of both the spatial and temporal degrees of freedom (DOF) to gain the bias-free feature in all directions. Effectiveness of this method is verified by theoretical analysis and simulation

	results.
CT100 **13:30-13:45**	Study on All-Optical Cross-Band Frequency Conversion for Communication Satellite Lihua Lei, Jianjun Zhang, Ju Zhou, Guangyu Gao, Ming Xue, Xiaoying Zhang CAST, China Presenter: Lihua Lei, CAST, China Abstract: A novel all-optical cross-band frequency conversion method for communication satellite is proposed and studied in this paper. An optical frequency comb (OFC) based on a Mach-Zehnder modulator (MZM) and a DFB laser is used as optical carrier and multi-wavelength local oscillators. The frequency conversion among C-band, Ku-band, K-band and Ka-band by feeding input signals of different frequency to the proposed scheme is demonstrated in the simulation. The proposed solution makes the cross-band frequency conversion possible and flexible, showing good application potential in the communication satellite systems of future.
CT104 **13:45-14:00**	Hybrid indoor localization method based on signal subspace fingerprint database WeiGang Wang, WenRui Wang, KeXue Sun Nanjing University of Posts and Telecommunications, China Presenter: WenRui Wang, Nanjing University of Posts and Telecommunications Abstract: To solve the localization problem of multipath propagation in complex indoor circumstance, a localization method of signal subspace matching based on fingerprint database is proposed by using small antenna array in the indoor environment. Compared to the RSSI, the signal subspace fingerprint can obtain better effect by utilizing more space information. The received signal from each array is firstly processed with self-correlation and it's eigenvalue decomposed to create the signal subspace fingerprint. Location is then determined by the smallest angle between the received signal subspace and the fingerprint database. Simulation results show that the proposed algorithm has made a great improvement in localization accuracy.
CT239 **14:00-14:15**	An Improved Indoor Positioning Algorithm Based on RSSI Filtering Jin Ren, Yunan Wang, Wenle Bai, Changliu Niu, Shan Meng North China University of Technology, China Presenter: Yunan Wang, North China University of Technology, China Abstract: For the positioning range of the indoor localization algorithm is limited, location accuracy requirements are more precise. In the study of the measurement distance based on the signal receiving strength (RSSI), it is not reliable to calculate the receiving signal strength to affect the final positioning accuracy. By sampling and analyzing the signal strength of the node, filter out too big error and further reduce the measurement error to improve the positioning accuracy. The feasibility and effectiveness of the improved algorithm are verified by simulation results. The location accuracy of positioning algorithm is improved.
CT267 **14:15-14:30**	Research of impact about smoothing range using velocity on high ranging accuracy Qing Yu, Hu-jun Geng, Su-li Guo The 54th Research Institute of CETC, China Presenter: Qing Yu, The 54th Research Institute of CETC, China Abstract: With the improvement of satellite positioning and orbit determination, high accuracy ranging system in cm level is needed to study. To the question about the existing of big random error in normal measurement and control system, this paper proposes a method that using velocity value to smooth range in order to reduce the range random error. For the calculating precision of velocity, this paper gives a tracking receiving scheme based on third order phase-locked loop, what's more, we carry on analysis and simulation about loop tracking accuracy and smoothing time. The simulation results show that the receiving scheme we proposed and the method of smoothing range using velocity can ensure the effective tracking with different dynamic target signal and can effectively reduce the pseudorange measurement random error, it can provide a solution for high precision aerospace measurement and control system.

CT305 **14:30-14:45**	An underwater navigation system based on multi-orthogonal signals and its lake trial Sen Zhang, Jinbiao Guo, Zhen Tian Naval University of Engineering, China Presenter: Sen Zhang, Naval University of Engineering, China Abstract: In this paper, a new underwater navigation system based multi-orthogonal signals is proposed. The principle of the system is presented, including waveform design method and position calculation method. Then the system design is descripted, which is composed of a transmit beacon and a receiver. The performance of the proposed system is verified through the lake trial. It is shown that the proposed system can obtain high positioning accuracy up to 0.26% slant range.
CT443 **14:45-15:00**	An Information Fusion Direct Position Determination Method based on Wishart Random Matrix Asymptotic Distribution Theory YanQing Ren, Bin Ba, ZhiYu Lu, DaMing Wang National Digital Switching System Engineering and Technology Research Center, China Presenter: YanQing Ren, National Digital Switching System Engineering and Technology Research Center, China Abstract: The traditional multiple-station direct position determination method suffers location accuracy loss and source resolution degradation for the lack of position information fusion of raw data. And an information fusion direct position determination method based on Wishart random matrix asymptotic distribution theory is proposed to overcome the above-mentioned shortcomings. Firstly, the information fusion direct position determination model is established via fusing raw data of each station. Then the new cost function containing eigenspace is constructed with theory of Wishart random matrix asymptotic distribution. Finally, the target location estimation is obtained by two-dimensional geographic grid search. Furthermore, the Cramer-Rao bound of the new model is derived. Compared with the original method, the proposed method performs much better in location accuracy and source resolution by simulations. And it frequently outperforms the information fusion direct position determination method with the cost function only containing noise subspace, under scenarios of low SNR and snapshot deficiency. Its performance has been greatly improved at the expense of lower complexity.
CT503 **15:00-15:15**	The Blockage Mitigation in the Link of SATCOM-on-the-Move Based on LT Code Jingke Dai; Kailiang Lin Xi'an Research Institute of High Technology, China Presenter: Jingke Dai, Xi'an Research Institute of High Technology, China Abstract: Luby Transform (LT) code is applied in satellite communications-on-the-move (SOTM) system to combat the blockage of the link to satellite. A mixed-blockage channel model combining traditional hard and soft blockage is proposed, over which the performance of LT code is compared with that of the fixed-rate LDPC code. Simulations results demonstrate that the former code is more robust than the later code for the SOTM system, which may experience great variety of channel conditions such as signal-to-noise ratio and the probability of blockage.
CT572 **15:15-15:30**	Emitter localization using a single moving observer based on UKF ZHU YILONG, XIE SHUGUO, YANG MEILING, ZUO MING Beihang University, China Presenter: ZHU YILONG, Beihang University, China Abstract: In this paper, a method based on UKF (The Unscented Kalman Filter) for emitter localization using a single moving observer is proposed. This method considers an emitter localization problem using a number of received signal strength (RSS) data. The state equation and observation equation, which contain variables of emitter location, are firstly established. Wavelet analysis algorithm is proposed for RSS data smoothing, eliminating the noises brought by multipath effect at some extent. With these smoothed RSS data, the state vector continuously estimated and corrected with the iteration of UKF. The unknown variables of emitter location converge gradually and fluctuate at a certain value finally. The Kmeans clustering algorithm is used to cluster these convergent estimations, then the optimal estimation of the emitter location is obtained. Finally, an experiment is designed to verify the feasibility of this method. We built a test system with Universal Software Radio Peripheral (USRP) and GPS, measuring RSS data and GPS data respectively. The experimental results show that the estimated location of the emitter is closed to its actual location with a small localization error, verifying the validity of this localization method.

SESSION 17

< Mobile Communication and Intelligent Control Technology >

13:00–15:45
Chamber of Mist (West Wing, 2F) /馨雨阁，西楼2楼

Session Chair: Prof. Ruey-Shun Chen, China University of Technology, Taiwan

Opening Speech **CT368** **13:00-13:15**	Using Case-based Reasoning Method to Design a Return Merchandise Authorization System for Supply Chain Management in Internet of Thing Yeh-cheng Chen, C. N. Chu, Hung Min Sun, Ruey-Shun Chen, Mengru Tu, S.C. Lin China University of Technology, Taiwan Presenter: Ruey-Shun Chen, China University of Technology, Taiwan Abstract: This paper drives into the deficiencies of the traditional RMA service system of a notebook computer manufacturer and analyzes the customer service behavior of its customer relationship management. It uses a global web-based framework and Java for development tool for the establishment of system. Data compilation procedure, with the help of the pro system case-based deduction technique, provided the system with an automatic analytical capacity, thereby further enhancing the capacity of the web-based intelligent RMA repair and maintenance system. The system allowed an interaction with the customers. The intelligent RMA system allowed us to improve repair and maintenance efficiency by 26%, strongly boosting degree of customer satisfaction. Moreover, the global inventory management can reduce 12%; a boon that not only reduced the interest payments for inventory, but also eased up the company revolving fund cycle. The system can institute a more flexible part supply system, as well as enabled the Quality Assurance (QA) and R&D departments to understand the trouble-causing factors of the products that the company has sold. As a result, product AFR (Annual Failure Rate) dropped by around 85%. Finally, we also used the repair and maintenance information to train new engineers. It saved us training time. Hence, the research has designed an innovative and practical IT (CRM) system.
CT192 **13:15-13:30**	An Integrated Smart Surveillance System for Diseases Monitoring in Tropical Plantation Forests Yeni Herdiyeni, Muhammad Ilham Jamaluddin, Tri Setio, Vektor Dewanto, Budi Tjahjono, Bayo Alhusaeri Siregar Bogor Agricultural University, West Java, Indonesia Presenter: Yeni Herdiyeni, Bogor Agricultural University, West Java, Indonesia Abstract: The plantation forests are more susceptible to damage by pest and diseases than are natural forest. Monitoring of plantation forest is critical input to the Integrated Pest Management (IPM) process. This study proposes an integrated smart surveillance system for pest and diseases monitoring in tropical plantation forests. The system, called Dismon, is an online and mobile application for monitoring and diseases identification in plantation forests. The application contains three components: digital library, monitoring system and disease identification system. In this work we build the intelligent system for disease monitoring by developing computer vision technology for disease identification through digital image processing. We have examined 1766 leaf samples containing five diseases: leaf spot, leaf blight, leaf curl, phyllode rust and anthracnose leaf spot. In this work, we train Support Vector Machine (SVM) for leaf diseases identification. The experimental results show that the proposed system obtained accuracy of 91% in differentiating healthy leaves and acacia leaf diseases. The ROC curve of acacia leaf identification indicates that the system is reliable to distinguish the leaf diseases. The resulting surveillance system is extremely suitablpromisinge for plantation forests. This application can help surveyors, forest rangers or public users for gathering information, record observation and diseases identification in forest plantation.

CT299 **13:30-13:45**	The software architecture design of the telecom number service platform Shuo Li, Meng Ran China Academy of Information and Communications Technology, China Presenter: Shuo Li, China Academy of Information and Communications Technology, China Abstract: The telecom number service platform is based on the telecom number resource database, the number portability database and telecom operator databases, which is to provide the telecom number of the entire life cycle information for the whole society. In this paper, the platform architecture based on distributed SOA is designed to solve the problems of integration, publishing and sharing of heterogeneous data.
CT319 **13:45-14:00**	Real-time Monitoring System for Containers in Highway Freight Based on Cloud Computing and Compressed Sensing Ke Fang, Qi-Fan Yang, Zhi-Wei Wang Jinan University, China Presenter: Ke Fang, Jinan University, China Abstract: With the rapid development of world economic integration, the importance of container in modern logistics system is becoming more and more prominent. However, the status of products in containers is opaque in highway freight. So this paper designs a real-time monitoring system for status of products in logistical containers based on cloud computing and compressed sensing. This monitoring system consists of the perception layer, the network layer, the cloud service layer and the application layer. In this system, temperature, humidity, vibration intensity, ethylene concentration and oxygen concentration of the container which are measured in perception layer are transmitted to the sink node. Compressed Sensing (CS) is designed in the sink node in order to compress the acceleration data, since the amount of the data is too large. These measurements of the acceleration data together with other sensor data are sent to cloud service layer through the network layer. The cloud servers integrate, store the data, and decide the current logistical environment whether meet the transportation requirement of products. The application layer fetches the data from network layer, displays them by graphics and tables, and alerts the drivers if necessary.
CT326 **14:00-14:15**	Microservices Architecture: Case on the Migration of Reservation-based Parking System Pujianto Yugopuspito, Frans Panduwinata, Sutrisno Universitas Pelita Harapan, Indonesia Presenter: Pujianto Yugopuspito, Universitas Pelita Harapan, Indonesia Abstract: This paper explores the migration of a reservation-based parking system into microservice architecture. In the beginning the parking system is a monolith architecture, web-based technology. This is a journey report of finding microservice architecture based on monolith architecture. Several steps are taken, according to service-oriented architecture, then we migrated the design to be a microservice. This paper emphasized the existence of microservices as a refinement of services-oriented architecture, also provides the impact of business process changes due to user experiences.
CT418 **14:15-14:30**	Vehicle Travel distance and time prediction using Virtual Detection Zone and CCTV Data Benny Hardjono, Hendra Tjahyadi, Andree E. Widjaja and Mario Gracio Anduinta Rhizma Universitas Pelita Harapan, Indonesia Presenter: Benny Hardjono, Universitas Pelita Harapan, Indonesia Abstract: This paper proposes a solution to traffic monitoring and planning by using nonintrusive traffic sensors only, namely Virtual Detection Zone (VDZ) and Closed Circuit Television (CCTV). We propose that our novel method, VDZ with CCTV snap shots, when combined as a system, can replace the traditional system using inductive loop detector sensor. The latter is in disadvantage because inductive loop detectors need to be physically embedded in to a highway-surface. Our previous works have shown that our system can provide the empirical data to construct Fundamental Diagrams and to calibrate a chosen model of the target highway, by using only seven VDZ agents which have carried GPS enabled smartphones, together with snapshots from fifteen existing CCTV, on Tangerang to Jakarta highway (21 km distance) over a period of three months. Our system is better than the traditional system, because it: can show zero speeds at totally jammed density, uses only one GPS coordinate to form a speed aware zone, costs less to build and is more practical to implement, especially for developing countries like Indonesia. By adopting and modifying Cell Transmission Model or CTM, a variant Macro model, our

	system can give short term predictions for travel time, and travel distance. Graphical and tabular comparisons are presented to highlight the worsening or improvement effects on traffic conditions when certain highway topology parameters have been changed for our target road. For example, simulated on our already calibrated model on our target highway, an addition of 3 off ramps at km 13, 15 and 17, would cause a reduction of vehicle travel time by up to 17.6% between minutes 75 to 230, which also mean a reduction of traffic jam. These results show that this system is potentially beneficial not only for commuters, but also for highway designers and government road authority.
CT427 **14:30-14:45**	A Remote Test Method for Parking Detection System Based on Magnetic Wireless Sensor Network Songde Qiu, Hongmei Zhu, and Fengqi Yu Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China / University of Chinese Academy of Sciences, China. Presenter: Sonngde Qiu, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China and University of Chinese Academy of Sciences, China. Abstract: With the number of vehicles increasing, the parking problem becomes more and more serious. In recent years, many parking detection systems have been installed to solve parking problems. During system installation, system test is important, but onerous. However, very few publications have discussed this issue so far. This paper proposes a remote test method for parking detection system based on wireless sensor network. The idea of the proposed method is as follow. After sensor nodes are deployed, they start to work and enter test mode. In test mode, they send test packets wirelessly to a remote server via some wireless routers for testing. The test packets can then be analyzed in the system control center to find out possible problems remotely. The proposed method includes two stages: vehicle detection algorithm test and network reliability test. It has been conducted in a parking lot. The experimental results show that the proposed system test method is valid and very useful in the setup of a parking detection system.
CT471 **14:45-15:00**	The framework of vehicle emotion system Ruijie Chen, Zhaoxin Liu and Xiangdong Chen Nanjing University of Posts and Telecommunications, China Presenter: Xiangdong Chen, Nanjing University of Posts and Telecommunications, China Abstract: In this work, we designed a framework of vehicle emotion system (VES) to estimate the vehicle health condition by considering all the possible factors including the driving habit, the maintenance of the vehicle, road condition and the frequency and distance the car used, etc. These factors may have positive or negative effects of the life-span, appearance, security and comfort of the vehicle. By quantitative analysis of all these factors, we can estimate the vehicle health condition roughly. With our research, it can be analyzed the main factor that affect vehicle health condition intuitively, which help our drivers to pay more attention of their behavior while using the car. Also, the automotive maintenance company and insurance company can make a customized service plan for consumers when they need professional suggestion.
CT526 **15:00-15:15**	Flow Watermarking and Random Sampling Based Flow Trajectory Tracking Technology in Software Defined Network Liancheng Zhang, Huiqiang Yuwen, Yi Guo, Zhenxing Wang National Digital Switching System Engineering and Technological Research Center, China Presenter: Liancheng Zhang, National Digital Switching System Engineering and Technological Research Center, China Abstract: Current technologies for extracting forwarding information from data plane focus on the forwarding behaviors of the flow on its flow path, so it is difficult for them to monitor the forwarding behaviors deviation from the original path. In order to effectively detect malicious forwarding behaviors such as traffic replication, traffic misrouting and traffic fabrication, flow watermarking and random sampling based flow trajectory tracking technology is proposed, which embeds covert watermark into target flow, and detects traffic replication, traffic misrouting and traffic fabrication by random sampling packets at each port of all switches. Experimental results show that this proposed technology can effectively detect malicious behaviors such as traffic replication, traffic misrouting and traffic fabrication at a low false negative rate when a certain sampling rate is guaranteed.

CT534 **15:15-15:30**	A Study of Vehicular Desynchronization for Platooning Application Visatouch Deeying, Kiattikun Kawila, Kulit Na Nakorn, Kultida Rojviboonchai Chulalongkorn University, Thailand Presenter: Visatouch Deeying, Chulalongkorn University, Thailand Abstract: Platooning is a challenging application because it requires a frequent rate of beaconing. Performance of traditional Carrier Sense Multiple Access with Collision Avoidance method (CSMA/CA) on IEEE 802.11p is unable to satisfy for platooning needs due to unbounded delay especially under high channel load. Several researches about platooning are involved with medium access control (MAC) layer modification in a protocol stack and/or does not support variable number of vehicles and/or have a single point of failure. In this paper, we propose to use a vehicular desynchronization TDMA-based protocol over off-the-shelf IEEE 802.11p, while supporting vehicles joining and leaving a platoon and having no single point of failure. We recommend a range of parameters that are suitable for the platooning application. Our evaluation shows that using our suggested parameters, the vehicular desynchronization protocol could support a high-frequency beaconing with up to 16 vehicles at 100 Hz beaconing.
CT920 **15:30-15:45**	Design and implementation of constant pressure water supply monitoring system based on STM32 Xin Fang and Kun'ao Zhang Xi'an University of Science and Technology, China Presenter: Xin Fang, Xi'an University of Science and Technology, China Abstract: In order to reduce the design difficulty and cost of constant pressure water supply control system controlled by PLC, STM32 was chosen in this system as processor and intelligent constant pressure water supply monitoring system was designed based on Modbus-RTU communication protocol to realize the real-time data acquisition, display, fault alarm and water pressure alarm function. In addition, accuracy will be improved and energy consumption will be reduced when the pump outlet pressure of the system is operating. The software design of computer system using fuzzy PID algorithm. The system can control the speed of water pump according to dynamic output frequency signal of the data acquisition to achieve a good control about constant pressure of water supply and pump frequency meeting the design requirements of the system. Finally, getting the system simulation results and test results and the interpretation and analysis about them were given. Experimental results show that the system is economical and practical. It has strong anti-disturbance ability and can be widely used in industrial control field.

SESSION 18

< Filter Design and Microwave Engineering >

13:00–16:00

Chamber of Dialogue (West Wing, 2F) / 相语堂，西楼2楼

Session Chair: Assoc. Prof. Yongjun Huang, University of Electronic Science and Technology of China, China

CT090 **13:00-13:15**	Likelihood-gating SMC-PHD Filter Yiyue Gao, Defu Jiang, Ming Liu, Wei Fu Hohai University, China Presenter: Yiyue Gao, Hohai University, China Abstract: To resolve the low computational efficiency of the sequential Monte Carlo (SMC) implementation of the probability hypothesis density (PHD) filter, which requires a large number of particles, we propose an improved SMC-PHD filter called the likelihood-gating SMC-PHD filter. By selecting real observations based on all the predicted particles and using their likelihood values in the SMC-PHD filter updater to substitute for the distances used in the existing gating methods, the proposed filter not only saves time but is also easily implemented in various applications. Experiments show that this filter has excellent real-time performance and better filtering accuracy compared with the basic

	SMC-PHD filter.
CT098 **13:15-13:30**	A Microstrip Dualband Bandstop Filter with Dualband Bandstop Resonators Peng Chen, Kai Yang, Kezhao Hua and Xianhu Luo University of Electronic Science and Technology of China, China Presenter: Peng Chen, University of Electronic Science and Technology of China, P. R. China Abstract: A novel compact microstrip dualband bandstop filter with dualband bandstop resonator is proposed in this paper. The dualband bandstop resonator consists of a main line and five-order dualband bandstop resonators. The equivalent circuit model of the dualband bandstop resonator is extracted and the effects of the different design parameters on the performance of the dualband Bandstop resonator are investigated. A dualband Bandstop filter with frequencies at 5.6 GHz and 6.2 GHz is designed, simulated and fabricated to verify the proposed design method. Simulation and measurement show this filter generates two stopbands around 5.54 GHz and 6.26 GHz.
CT113 **13:30-13:45**	A Miniaturized, Self-Actuated, Energy Selective Spatial Filter Ke Wang, Peiguo Liu, Jieru Meng, Hanqing Liu National University of Defense Technology, China Presenter: Ke Wang, National University of Defense Technology, China Abstract: In this paper, a miniaturized, self-actuated, energy selective spatial filter is designed for achieving field intensity dependent electromagnetic (EM) protection in a working frequency band. The spatial filter is periodic with each unit loaded with four microwave nonlinear devices. The dimension of the unit is in size of $\lambda/16$ and is ultrathin. Structural design, mechanism of operation are presented and discussed. A full-wave simulation is carried out for obtaining the transmission characteristic of the spatial filter. Results show that the received field intensity by using the spatial filter can be well controlled with a variable power loss from 0.1 dB up to 24 dB, and the spatial filter has a stable transmission characteristic to different incident angles. Therefore, the spatial filter is able to distinguish small signals from strong incident waves and can be utilized in EM protection against high power microwaves.
CT218 **13:45-14:00**	IIR Digital Filter Design based on Cultural Quantum-inspired Flower Pollination Algorithm Hongyuan Gao, Yansong Liang, Dandan Liu, Ming Diao Harbin Engineering University, China Presenter: Yansong Liang, Harbin Engineering University, China Abstract: In order to resolve the multi-parameter optimization problem of infinite impulse response (IIR) digital filter design, a cultural quantum-inspired flower pollination algorithm (CQFPA) is proposed. The proposed CQFPA is a multi-dimensional search algorithm for optimization of real numbers, and uses mechanisms of the quantum and cultural evolution to update the quantum pollens, which may improve the capability of algorithm to find the optimal solution. Computer simulations have showed that IIR digital filters based on the CQFPA are superior to previous filters based on quantum-behaved particle swarm optimization (QPSO) and adaptive quantum-behaved particle swarm optimization (AQPSO) in the convergence speed and optimization results. The effectiveness and superiority of the CQFPA are also demonstrated by simulation experiments.
CT222 **14:00-14:15**	Design and simulation of an adaptive filter in MIMO-PLC system Songnong Li, Guoqing Xu, Xiao Liu, Xingzhe Hou Chongqing University, China Presenter: Guoqing Xu, Chongqing University, China Abstract: In recent years, much attention has been paid to multiple-input–multiple-output (MIMO) signal processing in power line communication (PLC), to increase channel capacity and anti-interference ability. In this study, an adaptive filter was designed to reduce the influence of interference and bit error rate in MIMO-PLC random channel. This filter was set in the receiving port of a 3×4 MIMO-PLC system. The bit error rate before and after adding filter was analyzed and compared. Results show that the filter provides a remarkable performance gain on bit error rate in this 3×4 MIMO-PLC system.

CT228 **14:15-14:30**	An Explicit Track continuity algorithm for the SMC-PHD Filter Yiyue Gao, Defu Jiang, Ming Liu, Wei Fu Hohai University, China Presenter: Yiyue Gao, Hohai University, China Abstract: In multi-target tracking, the real-time performance, state-estimates accuracy, and track continuity are affected by clutter, missed detection, and closely spaced targets. To solve these problems, an improved sequential Monte Carlo implementation (SMC) of the probability hypothesis density (PHD) filter is proposed in this paper. First, based on double one-to-one principles, particle labeling approach and weight redistribution scheme for particle cloud are proposed to shield against the negative effects of clutter in high prior density region on the estimation. Second, the multi-estimate extraction are converted into multiple single-estimate extractions, which can provide the identities of the individual targets; thus, explicit track maintenance can be obtained. The results of numerical experiments demonstrate that the proposed approach can achieve explicit track continuity and better performance compared to the basic SMC-PHD filter, in terms of faster processing speed and superior estimation accuracy.
CT277 **14:30-14:45**	Design of A Compact Dumbbell-Shape Twist Waveguide with Performance of Band-Pass Filtering Haoming Hu, Xue Lei, Junmo Wu National Digital Switching System Engineering and Technological R&D Center, China Presenter: Haoming Hu, National Digital Switching System Engineering and Technological R&D Center, China Abstract: A dumbbell-shape 90 ° step twist waveguide with the performance of band-pass filtering is proposed. Not only could the smooth dumbbell-shape structure be easily manufactured but also avoid high-strength electric field that excited by corner point. Traditional metal waveguide section is replaced by medium substrate. This waveguide can achieve the 90 °polarization rotation of electromagnetic wave, also can be regarded as a filter with 190MHz bandwidth. The twist waveguide has the features of high Q factor, small size and low manufacturing costs. The measured insertion loss is 0.9dB and the relative bandwidth compared with the bandwidth of the structure with similar function is broadened by 58%. The total length of the twist section is only 1.6mm and it achieves the miniaturization of device dramatically.
CT332 **14:45-15:00**	Research and design of an intelligent monitoring system for HF receiving based on completeness Yong Luo, Yixue Xiang and Jun Gao Naval University of Engineering, China Presenter: Yong Luo, Naval University of Engineering, China Abstract: In order to realize the real-time and effective monitoring on the function completeness of complex short wave receiving equipment and accurately master the real working state of receiving system, a new intelligent monitoring system was designed. The receiving sensitivity and frequency accuracy index for the receiver, standing wave ratio (SWR) of the antenna-feeder system and the attenuation loss of the feeder are monitored. This paper made the analysis and improvement on traditional detection method, proposed the hierarchical architecture and system structure model of the monitoring system, designed a receiving monitoring terminal and audio monitoring terminal device based on remote network control, and gave a detailed description on the system's monitoring operation mechanism. Through coding and classification the monitoring state of receiving system, the improved multi-classification BP-AdaBoost algorithm is used to train and simulate the monitoring data, to realize the intelligent analysis of the monitoring state and the intelligent discrimination of the possible fault information, effectively improve the effectiveness and practicability of the monitoring system, and provide reference for the development and research of the related monitoring technology and methods.
CT345 **15:00-15:15**	A Novel Hybrid Digital-Analog Beamforming Algorithm with Uplink Training for TDD Systems Yong Wang, Shu Fang, Binyan Lu, Chengyu Lu, Yiqian Xu National Key Laboratory of Science and Technology on Communications, UESTC, China Presenter: Yong Wang, National Key Laboratory of Science and Technology on Communications, UESTC, China Abstract: In contrast to conventional multiple-input-multiple-output (MIMO) systems, precoding in millimeter wave (mmWave) massive MIMO is envisioned to achieve considerable capacity improvement, but at the cost of highly hardware complexity. As a cost-effective alternative, hybrid digital-analog beamforming has drawn considerable attention. In most conventional theoretical

	researches, ignoring practical implementation, perfect channel state information (CSI) is always assumed. However, whether FDD or TDD, in hybrid beamforming architecture, it is extremely challenging for base station (BS) to obtain perfect CSI. In this paper, based on the channel reciprocity in TDD systems, we propose a novel hybrid digital-analog beamforming algorithm with uplink training to maximize the capacity performance. Owing to uplink training, the requirement of CSI at eNodeB to conduct hybrid beamforming is graciously avoided. With practical RF hardware and unit modulus constraints, the proposed scheme provides useful low-complexity solutions in practical hybrid beam-forming system designs. Simulation results validate the efficiency of the proposed scheme compared with some existing hybrid beamforming schemes.)
CT384 **15:15-15:30**	A Novel Waveform Design Method Based on Improved Ambiguity Function Bin WANG, Xin SONG Northeastern University at Qinhuangdao, China Presenter: Bin WANG, Northeastern University at Qinhuangdao, China Abstract: With the development of technology and the increase of people's demand, there are more and more intelligent requirements for radar. Intelligent radar should be more flexible, and transmits different waveforms according to different working conditions. In this paper, after analysis of point target echo, we propose an improved ambiguity function for uniform coherent pulse train signal (UCPTS), which can obtain more flexible waveform. In simulations, time frequency characteristics and ambiguity characteristics of the proposed waveform design method are provided. Simulations results demonstrate that the novel waveform design method for uniform coherent pulse train signal has good range and velocity resolution. Finally, a summary of the paper is presented.
CT570 **15:30-15:45**	OFDM MIMO Radar Waveform Design with High Range Resolution and Low Sidelobe Level Ting Bai, Xiyu Song, Hanying Hu National Digital Switching System Engineering and Technological Research Center, China Presenter: Ting Bai, National Digital Switching System Engineering and Technological Research Center, China Abstract: In this paper, we presented a novel waveform design method for orthogonal frequency division multiplexing (OFDM) multiple input multiple output (MIMO) radar with low sidelobe level and high range resolution. The signal model that all OFDM subcarriers are transmitted on each antenna is established to ensure high range resolution. And code domain orthogonality is achieved through complex orthogonal design (COD). Moreover, we transform range sidelobe suppression into an unconstrained optimization problem based on the relationship between the transmitted waveform and the phase. The Integrated Sidelobe Level (ISL) is utilized as the objective function, and then solved by Broyden–Fletcher–Goldfarb–Shanno (BFGS) algorithm. Simulation results show that the proposed method has remarkable performance in suppressing sidelobe and high range resolution.
CT930 **15:45-16:00**	A D-band Monolithic Doubler in 70nm GaAs mHEMT process Lingling Sun, Long Wang, Ting Wu, Jun Liu Hangzhou Dianzi University, China Presenter: Long Wang, Hangzhou Dianzi University, China Abstract: A D-band monolithic doubler is presented in a 70 nm GaAs mHEMT process. The circuit consists of a frequency doubling stage for second harmonic signal and an output amplifier stage. Coplanar waveguide (CPW) transmission lines and MIM capacitors are used to achieve impedance matching of the fundamental input and second harmonic output, and fundamental suppression with reduced area. The test results show that the doubler can achieve maximum conversion gain of 0 dB from 122 GHz to 140 GHz band, and the compact chip area with pads is 0.54 mm2.

SESSION 19

< Channel Estimation >

13:00–15:30
Chamber of Willow (West Wing, 2F) / 舒柳园，西楼2楼

Session Chair: Assoc. Prof. Haifen Yang, University of Electronic Science and Technology of China, China

CT042 **13:00-13:15**	Maximum Diversity Order Of SIMO High Mobility Systems with Imperfect Channel State Information Mahamuda Alhaji Mahamadu, Jingxian Wu, Zheng Ma, Weixi Zhou, Pingzhi Fan Southwest Jiaotong University, Chengdu, China Presenter: Mahamuda Alhaji Mahamadu, Southwest Jiaotong University, China Abstract: This paper studies the maximum diversity order of single-input multiple-output (SIMO) high mobility communication systems. In high mobility systems, channel estimation errors are usually inevitable due to severe Doppler effects caused by fast time-varying fading, and this might have significant adverse impacts on system performance. On the other hand, Doppler effect provides potential Doppler diversity which can be exploited to improve system performance. Based on the statistical properties of minimum mean square error (MMSE) channel estimation, a new optimum diversity receiver for a SIMO system with imperfect channel state information (CSI) is proposed. The error probability of the new receiver is analytically identified. The result is expressed as an explicit function of the channel temporal correlation, pilot and data signal-to-noise ratios (SNRs). The maximum achievable diversity order of the SIMO system with imperfect CSI is obtained through asymptotic analysis. Analytical results show that, if the energy of pilot symbols scales linearly with that of data symbols, then a SIMO system with imperfect CSI can achieve the same diversity order as those with perfect CSI in a high mobility environment. However a non-linear scaling between the energies of pilot and data symbols always results in loss in Doppler diversity.
CT099 **13:15-13:30**	Beamspace Channel Estimation for 3D Massive MIMO Cellular System Ximing Wang, Zhi Chen, Kui Xu, Dongmei Zhang, Yijun Yang PLA University of Science and Technology, China Presenter: Ximing Wang, PLA University of Science and Technology, China Abstract: In this paper, we consider 3D multi-user massive multiple-input multiple-output (MIMO) cellular system with a base station (BS) and a number of uplink (UL) and downlink (DL) single-antenna users. The BS is equipped with large-scale uniform planar antenna array (UPA). Exploit the beam characteristic of 3D massive MIMO channels, we obtain the low-dimension beamspace of each user based on the direction of arrival (DOA) and direction of departure (DOD) of the signal. Then, we transfer the signal processing procedure to the beam domain. According to the particular beamspace of each user, we partition users whose beamspaces are the same into the same group while the beamspaces between groups are disjoint. With the orthogonal beamspaces, the inter-group interference can be eliminated as the BS antennas tend to infinity, and users within the same group are separated by orthogonal pilots. Finally, the simulation part shows that either the estimation performance or the overhead for estimation, the proposed beamspace channel minimum mean square error (MMSE) estimation scheme outperforms the conventional full-dimension MMSE channel estimation.
CT120 **13:30-13:45**	Performance Comparison of LS,LMMSE Channel Estimation Method in Frequency and Time Domain for OQAM/OFDM systems Kai Zhang, Lunsheng Xue, Xiaopeng Liu, Xihong Chen Air Force Engineering University, China Presenter: Kai Zhang, Air Force Engineering University, China Abstract: In this paper, we first compare least square (LS) and linear minimum mean square error (LMMSE) channel estimation method with frequency and time domain in offset quadrature amplitude modulation/orthogonal frequency division multiplexing(OQAM/OFDM) systems. We proposed an iterative LMMSE channel estimation in time domain which needn't a priori knowledge for the channel. Simulation results demonstrate that the time domain methods improve the channel estimation

	performance compare to the frequency domain methods. Moreover, simulation results show that the proposed method has an approximate performance with the conventional LMMSE method.
CT559 **13:45-14:00**	Channel Estimation for Power Line Communication Tao Liu China University of Petroleum (Beijing), China Presenter: Tao Liu, China University of Petroleum (Beijing), China Abstract: Broadband low-voltage power line communications (PLC) has many advantages including less investment cost, construction speed, convenient access. The orthogonal frequency division multiplexing (OFDM) technology for its strong anti-jamming and anti-frequency selective fading characteristics naturally becomes the best low voltage power line communication solution. This paper proposed an OFDM channel estimation method based on compressed sensing (CS) technique according to the channel characteristics of low-voltage power lines. The compressed sensing algorithm in OFDM system was discussed and the orthogonal matching pursuit (OMP) algorithm was employed to reconstruct the PLC channel information. The simulation results showed that the communication channel estimation method based on CS technique was feasible in power line carrier communication system. In CS channel estimation method, the original pilot for the sub-carrier transmission symbols was saved down for the transmission of user data information, thus the effectiveness of information transmission in OFDM systems can be enhanced.
CT176 **14:00-14:15**	Direction-of-Arival Estimation Based on Differenceof L1 and L2 Minimization Rui Lu, Binke Huang, Shitao Zhu, Ming Zhang, Xiaobo Liu, Anxue Zhang Xi'an Jiaotong University, China Presenter: Rui Lu, Xi'an Jiaotong University, China Abstract: In this paper, we proposed an direction-of-arrival (DOA) estimation method based on difference L1 and L2 minimization. The dictionary is highly coherent in the application of DOA estimation, which brings about challenges to sparse signal reconstruction algorithms. Difference of L1 and L2 behaves closer to L0 than Lp ($0 < p < 2$), and is able to produce better result in the case of highly coherent dictionary. Therefore, the better results are achievable when difference L1 and L2 minimization is employed to DOA estimation. In addition, the nested array is adopted in our method to improve the degrees of freedom (DOF). Simulation results illustrate that our method performs better than Lp minimization and spatial smoothing (SS)-MUSIC when snapshots are shortage.
CT402 **14:15-14:30**	Wideband FDD Massive MIMO Downlink Channel Estimation with New Pilot Design and Hybrid GAMP Algorithm Wenyuan Wang, Yue Xiu, Wanwan Li University of Electronic Science and Technology of China, China Presenter: Wenyuan Wang, University of Electronic Science and Technology of China, China Abstract: This paper proposes a new pilot design for the wideband frequency division duplexing (FDD) massive MIMO channel estimation (CE) associated with the hybrid generalized approximate message passing (GAMP) sparse reconstruction algorithm. During each estimation, one subcarrier is used to carry a long pilot sequence that the channel response as well as the non-zero probability are estimated with GAMP algorithm. Then the property of spatially common sparsity across different subcarriers is used so that the non-zero probability information can be shared by different subcarriers before the CE process with hybrid GAMP algorithm. With the help of the extra non-zero information, a similar CE accuracy performance is achieved with much shorter pilot sequences. Thus, the new pilot pattern consists of one long pilot sequence and lots of short pilot sequences, which have a much better spectrum efficiency.
CT409 **14:30-14:45**	A Novel Low Rank LMMSE Channel Estimation Method in OFDM Systems Ruiguang Tang, Xiao Zhou, Chengyou Wang Shandong University (Weihai), China Presenter: Ruiguang Tang, Shandong University (Weihai), China Abstract: Orthogonal frequency division multiplexing (OFDM) has been widely used in modern wireless communication systems. In OFDM scheme, channel estimation method is a key technology in improving the accuracy of the channel estimation and the system performance. There are many channel estimation methods in OFDM system. The least square (LS) channel estimation method is relatively simple but it is

	susceptible to the noise of the wireless channel. The linear minimum mean square error (LMMSE) and approximate LMMSE (ALMMSE) channel estimation methods provide good performance but are much more complex than conventional LS method. This paper proposes a novel low rank LMMSE method to simplify the filtering matrix in LMMSE method and diagonal matrix in ALMMSE method. Performance comparison is shown to verify the effectiveness of the proposed low rank channel estimation method. LMMSE and ALMMSE channel estimation methods are better than LS method, and LS method is the worst. Except the ideal channel estimation method, the low rank LMMSE channel estimation method provides the best bit error rate (BER) performance in cyclic prefix - OFDM (CP-OFDM) system. It simplifies the calculation of channel auto-correlation matrix and provides superior system performance over multipath channel conditions.
CT449 **14:45-15:00**	Wideband Massive MIMO OFDM Uplink Channel Estimation with Specific Partial-DFT Transform Wenyuan Wang, Yue Xiu, Wanwan Li University of Electronic Science and Technology of China, China Presenter: Wenyuan Wang, University of Electronic Science and Technology of China, China Abstract: We propose a new approach to apply the specific partial discrete Fourier transform (SPDFT) technique for channel estimation in wideband massive multiple-input multiple-output (MIMO) systems employing orthogonal frequency division multiplexing (OFDM) to reduce the pilot overhead and to enhance the estimation accuracy. Based on a physically motivated channel model, our approach verify that some parts of the frequency domain information on subcarriers are enough to obtain the nonzero part of channel state information on delay domain during a coherence time period. Then the channel state information on delay-domain are constructed and the whole channel state information on frequency domain are recovered. The simulation results demonstrate the proposed SPDFT scheme can provide a better spectral efficiency or a better estimation accuracy with different strategies of pilot scheduling than the conventional DFT scheme.
CT485 **15:00-15:15**	Pilot Design for Channel Estimation in a Long-Tap Faster-than-Nyquist Signaling Transmission Shan Gao, Li Lin, Yueyu Lin, Han Zhang, and Daru Pan South China Normal University, China Presenter: Han Zhang, South China Normal University, China Abstract: Faster-than-Nyquist (FTN) techniques offer a transmission rate beyond that of Nyquist criterion without imposing bandwidth expansion. On the other hand, orthogonality among modulated pulse shapes can be destroyed because of the FTN signaling, whereupon inter-symbol interference (ISI) appears, and hence an irreducible error floor occurs. This paper presents the optimal pilot design for channel estimation in FTN signaling transmissions. By taking advantage of an additional cyclic prefix, the resultant ISI imposed by FTN signaling can be approximated by a finite-tap circulant matrix structure, which allows us to employ an efficient fast Fourier transform operation and a low pilot-ratio based frequency-domain channel estimation algorithm. Both analytical and simulation results show that the proposed design is especially beneficial for practical long-dispersion channel scenarios.
CT508 **15:15-15:30**	A Low Complexity Millimeter Wave Multi-path Channel Estimation Algorithm Exploiting Directional Energy Elimination Haoqiang Sun, Zaixue Wei, Nanxi Li, Jianyi Yang and Dacheng Yang Beijing University of Posts and Telecommunications, China Presenter: Haoqiang Sun, Beijing University of Posts and Telecommunications, China Abstract: Millimeter wave (mmWave) communication is a promising scheme for 5G networks because it can provide wide bandwidth. To compensate for the high attenuation and signal absorption of mmWave channel, the massive MIMO systems have been employed. However, in such systems, channel estimation is a challenge due to the high channel complexity and limited coherence time. This paper develops a low complexity mmWave multipath channel estimation algorithm exploiting directional energy elimination. The algorithm alleviates the cumulative angle estimation error in the path by path estimation scheme. We also design a codebook which is suitable to the proposed algorithm. Simulation results show that with the same training overhead of the previous adaptive compressed sensing based algorithm, the proposed algorithm achieves better angle estimation and spectrum efficiency performance.

SESSION 20

< Network Security >

16:15–19:00

Chamber of Osmanthus (West Wing, 2F) /桂香居，西楼2楼

Session Chair: Prof. Caifu Yu, University of Electronic Science and Technology of China, China

CT056 **16:15-16:30**	The Analysis of Measurement Method in the Knowledge System of Network Security Based on Information Entropy QI Bin, WANG Yu, Zou Hongxia, LIU Sheng'en, and LI Jixing Astronautics Engineering University, China Presenter: Bin QI, Astronautics Engineering University, China Abstract: The knowledge system of network security is the core of the Education of Network Security Literacy, which is the theoretical basis of quantitative evaluation and education. In order to build a scientific, systematic and pertinent knowledge system, the paper develops the measurement method based on information entropy, presents the library of network security knowledge, put forwards the definition of the knowledge function, discusses the authentication of its nature and the method selection of knowledge system based on position demand. The paper also takes an real example to verify the algorithm, finally the quantitative method of the knowledge system is also put forward to provide a reference for the engineering practice of network security education.
CT070 **16:30-16:45**	NODE CACHING FOR CONTENT DISTRIBUTION IN MOBILE DELAY TOLERANT NETWORK Junli She, Xiangyu Bai, Qi Liu Inner Mongolia University, China Presenter: Junli She, Inner Mongolia University, China Abstract: Different countries in the world all have different degrees of communication underdeveloped areas, how to reduce "digital gap" between urban and rural effectively is one of the problems need to be solved. This phenomenon provides ample space for the development of mobile delay tolerant network because the "storage-carry-forward" communication mode in MDTN does not need the support of the network infrastructure, and MDTN can effectively compensate for the shortage of operator's network coverage. At the same time, the requirement of storage capacity of nodes in MDTN is increasing quickly. How to manage the limited cache space efficiently is the focus of the study. At present, many cache strategies have achieved some results, but the "user interest" is often easily overlooked by the researchers. Based on this phenomenon, we believe that the user interest is one of the factors that cannot be ignored in the design of caching strategies. Considering the lack of communication in remote areas, this paper combined MDTN and content center network and proposed a new node cache technology named IBCS for this hybrid network. In IBCS, we consider the user interest as the main metric to decide whether or not to cache a content. Finally, the cache technology is implemented on the ONE simulation platform. Through the experiment analysis and comparison under the real data set and the whole simulation data set, we found that the IBCS (Interest Based Cache Strategy) proposed in this paper is the best in all aspects of network performance under the same network environment.
CT086 **16:45-17:00**	Physical Layer Security Transmission in Cognitive Radio Network Composed of Multi-Downlinks SU Network XU Zhaoye, LU Ruimin Institute of Communications Engineering PLA University of Science & Technology, China Presenter: XU Zhaoye, PLA University of Science & Technology, China Abstract: In cognitive radio network, the primary user (PU) network and the secondary user (SU) network interfered with each other because of sharing the spectral resource. Also interference among multi-downlinks in SU network decreased the sum rate in SU network and the eavesdropper in PU network decreased the secrecy rate in PU network. Focusing on above problem, this paper raised two channel selection and beamforming methods based on singular value decomposition (SVD) and uplink-downlink duality respectively, and then analyzed the performance of them in physical layer security.

CT333 **17:00-17:15**	Modeling Software Defined Security using Multi-level Security Mechanism for SDN Environment Ihsan H Abdulqadder, Deqing Zou, Israa T. Aziz, Bin Yuan Huazhong University of Science and Technology, China Presenter: Ihsan H Abdulqadder, Huazhong University of Science and Technology, China Abstract: Software Defined Networking (SDN) support several administrators for quicker access of resources due to its manageability, cost-effectiveness and adaptability. Even though SDN is beneficial it also exists with security based challenges due to many vulnerable threats. Participation of such threats increases their impact and risk level. In this paper a multi-level security mechanism is proposed over SDN architecture design. In each level the flow packet is analyzed using different metric and finally it reaches a secure controller for processing. Benign flow packets are differentiated from non-benign flow by means of the packet features. Initially routers verify user, secondly policies are verified by using dual-fuzzy logic design and thirdly controllers are authenticated using signature based authentication before assigning flow packets. This work aims to enhance entire security of developed SDN environment. SDN architecture is implemented in OMNeT++ simulation tool that supports OpenFlow switches and controllers. Finally experimental results show better performances in following performance metrics as throughput, time consumption and jitter.
CT355 **17:15-17:30**	Rumor Spreading and Monitoring Deployment in Online Social Networks Qiyi Han, Fang Miao, Wenjie Fan Chengdu University, China Presenter: Qiyi Han, Chengdu University, China Abstract: The rumor takes advantage of online social networks to spread and cause damage by abducting public's psychology and behaviors. Therefore, a novel SIDR rumor spreading model, which consider a "doubt" psychologic factor, is proposed to study the dynamic rules of rumor. To defense against rumors efficiently, a full coverage monitoring scheme based on theory of set cover problem is deployed through a greedy algorithm. The experiments show the way to control the rumor spreading. And the result shows the monitoring deployment achieves a full coverage efficiently.
CT447 **17:30-17:45**	Anomaly Detection of Malicious Users' Behaviors for Web Applications Based on Web Logs Yang Gao, Yan Ma, Dandan Li Beijing University of Posts and Telecommunications, China Presenter: Yang Gao, Beijing University of Posts and Telecommunications, China Abstract: With more and more online services developed into web applications, security problems based on web applications become more serious now. Most intrusion detection systems are based on every single request to find the cyber-attack instead of users' behaviors, and these systems can only protect web application from known vulnerability rather than some zero-day attacks. In order to detect newly developed attacks, we analyze web logs from web servers and define users' behaviors to divide them into normal and malicious ones. The result shows that by using the feature of web resources to define users' behaviors, a higher accuracy rate and lower false alarm rate of intrusion detection can be obtained.
CT475 **17:45-18:00**	Intrusion Detection Study Based on the Distributed Collaboration Structure Tao Qin Hunan Provincial Party School, China Presenter: Tao Qin, Hunan Provincial Party School, China Abstract: In this paper, characteristics and collaborative method of the intrusion detection system related to Internet information security were analyzed. Furthermore, a set of intrusion detection system based on distributed collaborative control technology was presented with an aim to solve defects in collaboration among intrusion detection systems at present, including low efficiency, complex configuration and slow detection response, etc.
CT486 **18:00-18:15**	Security Requirements for Virtual Network Function Isolation and Encryption Håkon Gunleifsen and Thomas Kemmerich Norwegian University of Science and Technology, Norway Presenter: Håkon Gunleifsen, Norwegian University of Science and Technology, Norway Abstract: This paper presents a study of Service Function Chaining (SFC) isolation and encryption in

	interconnected Network Function Virtualisation (NFV) domains. The adoption of NFV deployments is currently designed to be implemented within trusted domains where overlay networks with statically trusted links are considered to enable network security. We challenge this statement and introduce a security problem related to Virtual Network Functions (VNF) confidentiality and isolation. A dataflow that traverses through a chain of Virtual Network Functions (VNF) cannot be end-to-end encrypted when each VNF must have access to the data-flow. This restricts both end-users and Service Providers from enabling end-to-end security and VNF isolation to their NFV flow. Therefore, there is a need to encrypt the dataflows on a per flow basis. In this paper we present the discovered security problem, set the requirements for the problem solution and study the constraints for securing and isolating VNFs in a Service Function Chain.
CT493 **18:15-18:30**	A Physical Layer Security Algorithm Based on Constellation Mao Xiang-ning, Lin Kai-jia, Liu Hao University of Electronic Science and Technology of China, China Presenter: Mao Xiang-ning, University of Electronic Science and Technology of China, China Abstract: The cyclostationary characteristics of signals has some important applications in such as blind channel equalization, blind adaptive beamforming, and system identification. However, the cyclostationary characteristics also can be a weak link in physical layer security. With high-order cyclostationary theory, some system information can be obtained easily. In this paper, we proposed a new algorithm based on constellation phase rotation and amplitude randomization, during which the cyclostationary feature of signals can be suppressed.
CT498 **18:30-18:45**	A Novel Physical Layer Error Correction and Encryption Method Based on Chaotic Sequence Xiaoqian Li, Wei Li, Jing Lei, Zhipeng Pan and Sixin Wang National University of Defense Technology, China Presenter: Xiaoqian Li, National University of Defense Technology, China Abstract: The security of conventional wireless communication mainly depends on the encryption at the upper layers, while the information at the physical layer is not well protected. In this paper, a physical layer error correction and encryption method is proposed. The legitimate transceivers extract the binary secret key from the properties of the wireless channel. And the chaotic sequence and the unit delay function is used to encrypt the channel coding information. The method takes full advantage of the randomness, reciprocity and location sensitivity of the wireless channel and uses those properties to enhance the security of the physical layer information. The results of mathematical analysis and computer simulation show that the cipher text satisfies the national institute of standards and technology (NIST) randomness test and has strong key space and key sensitivity. Compared with the error correction based cipher (ECBC), when the bit error rate (BER) is 10-4, the reliability of the proposed method increases 1dB.
CT568 **18:45-19:00**	Malware Propagation Analysis in Message-recallable Online Social Networks Yijin Chen, Yuming Mao, Supeng Leng, Yunkai Wei and Yuchen Chiang University of Electronic Science and Technology of China, China Presenter: Yijin Chen, University of Electronic Science and Technology of China, China Abstract: The powerful information diffusion ability of online social networks (OSNs) attracts many attackers to spread malware, because malware can fiercely spread among massive active users with close social relationship in OSNs. A messagerecallable function in user profile of modern OSNs can delete messages containing malicious link, and stop malware spreading. However, existing works on malware propagation models have not concerned the new message-recallable mechanism (MRM). This paper proposes a novel malware spread model to analyze the performance of malware propagation in OSNs with MRM. For analyzing the malware spread model, we carry out theoretical derivation to obtain key metrics, including infection rate, recalling rate, and epidemic threshold. Numerical analysis and simulation are conducted to validate the accuracy of the proposed model. The proposed malware spread model with theoretical metrics can provide a guidance to design highly efficient network defense schemes for emerging messagerecallable OSNs.

SESSION 21

< Future Communications Technology and Development >

16:15–19:00

Chamber of Dew (West Wing, 2F) /浣花轩，西楼2楼

Session Chair: Assoc. Prof. Yongjun Yang, University of Electronic Science and Technology of China, China

CT022 **16:15-16:30**	Optimal power splitting in wireless powered communication network with two-way relay Yingting Liu, Chunman Yan, Hongwu Yang, Xiaojuan Bai, Li Cong Northwest Normal University, China Presenter: Yingting Liu, Northwest Normal University, China Abstract: Wireless energy harvesting is an efficient way to prolong the lifetime of energy constrained networks. In this paper, we consider a wireless powered communication network (WPCN), where two source nodes exchange information via a relay node adopting a three time slots analog network coding (ANC). In this model, two source nodes both only harvest energy from relay node. Transmitting process is split into three time slots which have the same duration time. In the first time slot, relay node send energy signal to two source nodes using two directional antennas. In the second time slot, source nodes using all harvested energy send itself information signal to relay node, and relay node amplifies and forwards received signals to two source nodes in the third time slot. We study relay node how to split its energy to maximize information throughput of the system. Numerical results demonstrate maximum information throughputs and power splitting ratios of proposed model for different power attenuations.
CT097 **16:30-16:45**	On Minimizing Average Packets Decoding Delay based on B-DLNC for Wireless Broadcasting Teng Niu, Zhi Chen, Dongmei Zhang, Kui Xu PLA University of Science and Technology, China Presenter: Teng Niu, PLA University of Science and Technology, China Abstract: We are concerned with designing an optimal binary determine linear network coding (B-DLNC) strategy with the aim of reducing the number of transmissions and the average packets decoding delay for wireless broadcasting scenarios. In this paper, we first propose the concept of the B-DLNC that no longer limits the encoding packets to be immediately decoded by the receivers and allows the receivers to cache the correctly received undecodable retransmission packets waiting for future decoding opportunities. Next, we use channel coding theory (generation matrix and decoding matrix) to analyze the performance of B-DLNC strategy. In addition, we formulate the average packets decoding delay minimization problem as a max-weight search problem and propose a heuristic algorithm (IMWSA) to improve search efficiency. The simulation results show that compared with the traditional strategies, the proposed strategy can obviously reduce the number of transmissions and average packets decoding delay.
CT107 **16:45-17:00**	A Printed Quadrifilar-Helical Antenna for Ku-Band Mobile Satellite Communication Terminal CUI Mengmeng, HAO Weina Academy of Opto-Electronics, Chinese Academy of Sciences, China Presenter: Mengmeng CUI, Academy of Opto-Electronics, Chinese Academy of Sciences, China Abstract: A printed quadrifilar-helical antenna for potential use in the mobile terminal of the satellite communication system is designed in this paper, the antenna combines the qualities of miniaturization, high gain, wide beam and wide angle circular polarization. The relative band-width is 8%, which enables the antenna to meet the requirements of multiple Ku-band satellite communication systems. The polarization purity is high, which restrains the ground clutter effectively. The radiation patterns show a regular hemisphere shape, making the antenna suitable for receiving satellite communication signals in a plurality of mobile platforms, such as the ship, the vehicle, the aircraft and the handset receivers. A compact designed Wilkinson power divider is employed as the feeding network of the antenna. The relations between the winding direction and the current phase stepping direction are given. Furthermore, the impacts of current amplitude error and phase error are comparatively analyzed. A good agreement is observed between simulated and measured results within the operating band. Through the integrated

	optimal design of the structure and material, the "three-proof" quality is achieved without any degradation to the radiation properties of the antenna.
CT108 **17:00-17:15**	Game Theoretical Approach of Downlink Resource Allocation in 5G Wireless Fusion Networks Yuan Gao, Hong Ao, Zenghui Feng, Weigui Zhou , Su Hu, Xiangyang Li Tsinghua University, China Presenter: Yuan Gao, Tsinghua University, China Abstract: The wireless networks are requiring higher transmission speed and more reliable QoS, especially the 5G systems. Different network providers will run different quality of transmission services and the user could choose the suitable set. In this work, considering the varieties of transmission types and price, we propose a novel game theoretical solution of downlink resource allocation, the fusion of different types of transmission could significantly reduce the transmission price under the constraint of system Quality of Service (QoS). Simulation results prove the fact that by using our proposed game theoretical method, the price of the downlink transmission could be reduced up to 37% under the constraint of QoS, the expense is the time consumption and the signal processing delay.
CT154 **17:15-17:30**	A coherent parameter calibration method for distributed array radar Bi Haixia, Wei Zhiqiang Xi'an Electronic Engineering Research Institute, Xi'an,China Presenter: Bi Haixia, Xi'an Jiaotong University, China Abstract: To generate high gain synthesized transmitting beam, a coherent parameter calibration method for distributed array radar is proposed in this paper. The method first executes coarse calibration on each radar unit the coarse adjusting unit radar array and position array reference point, then calculates position precision range according to antenna gain requirement and estimates radar position error using optimization algorithm. Finally, transmitting beam is formed based on the weighted calibration estimate value. The simulation result of the distributed array radar model demonstrates the effectiveness of the method.
CT217 **17:30-17:45**	Efficiency Improvement using Adaptive MCFS Scheme for future 5G Wireless Network Ahmed F. Ashour, Hussein ElAttar and Mohamed A.Aboul Dahab Arab Academy for Science, Technology and Maritime Transport, Egypt Presenter: Abstract: This paper presents an approach of a Matlab/Simulink-based model for Hybrid M-QAM/L-FSK (4/16 HQFM) modulation scheme with a non-coherent detection of 4-ary FSK demodulator in the presence of Additive White Gaussian Noise (AWGN) channel which maintains the same theoretical results of Bit Error Rate (BER), Power Spectral Density (PSD) and bandwidth efficiency in previous literature using Monte Carlo simulation without using the Phase Acquisition Algorithm (PAA). A new Adaptive modulation with coding and carrier frequency selection scheme (Adaptive Hybrid MCFS) will be proposed and applied for different types of cells to be adapted to channel conditions for improving the achievable data rates and spectral efficiency of the overall system which is recommended for 5G cellular network and can be easily implemented using the Software Defined Radio (SDR) systems.
CT244 **17:45-18:00**	The Technology of Deviation Compensation for Radar Phantom Tracks Xiang Liu and Dongsheng Li Electronic Engineering Institute, China Presenter: Xiang Liu, Electronic Engineering Institute, China Abstract: One important issue when multiple cooperating electronic combat air vehicles (ECAVs) are used to generate phantom radar tracks in a radar network is the position inaccuracy. Under the background of radar network with the centralized fusion architecture, the same-source-testing recognition for phantom track jamming has been proposed in the presence of the difference of spatial distribution property between phantom track and target track. In order to solve this problem, a deviation compensation for phantom radar tracks is presented. Firstly, the effect of the inaccuracies of radar

	position and ECAVs position to the phantom track is considered. Then, a deviation compensation for the same-source-testing recognition is proposed. Finally, the simulation results show that the method can reduce the recognition rate of phantom track effectively.
CT258 **18:00-18:15**	Low-Complexity RMS Delay Spread Estimation for Wireless OFDM Systems Qiran Shi, Yuan Luo Shanghai Jiao Tong University, China Presenter: Qiran Shi, Shanghai Jiao Tong University, China Abstract: In OFDM systems, some communication channels can be characterized by RMS delay spread. To estimate RMS delay spread, Manhattan distance is used as the symbol-by-symbol correlator in this paper. Compared with old classical methods like cosine correlator, Manhattan distance has lower compatation complexity. At the same time, the accuracy of estimation is kept, which is verified by our simulations.
CT281 **18:15-18:30**	Digital Automatic Gain Control Design with Large Dynamic Range in Wireless Communication Receivers Naikang Zhang, Zhiping Wen, Xunping Hou, Wu Wen Beijing Microelectronics Technology Institute, China Presenter: Naikang Zhang, Beijing Microelectronics Technology Institute, China Abstract: Automatic gain control technology is usually adopted to solve the problem of large dynamic range of input signals. Aiming at the challenges existing in digital automatic gain control (DAGC) algorithm, this paper proposes an approximate method based on logarithmic space, and solves the problem of circuit complexity and low dynamic range in traditional DAGC algorithm with the employment of a lookup table. The novel algorithm can change gains of multiple modules on the receiving path at one time, and realize a large dynamic gain control range of 76dB without sacrificing the convergence speed and accuracy. The simulation results show that this new type of DAGC can adjust the overall gain of the receiver rapidly and efficiently according to different input signal amplitudes, and has good engineering practicability with the advantage of simplified circuit.
CT416 **18:30-18:45**	A D-S Evidence Theory Fault Diagnosis Method based on Mapreduce for SF6 High Voltage Switchgear Hongxia Miao, Rui Ni, Kangkang Liu, Long He Hohai University Changzhou Campus College of Internet of Things Engineering, China Presenter: Rui Ni, Hohai University Changzhou Campus College of Internet of Things Engineering,China Abstract: As one of the AC and DC switching devices in power system, high voltage switchgear is mainly used for the control and protection of power systems. In order to meet the demand of large amount of data, many types, fast processing speed and high quality of fault diagnosis in large data environment, a parallel processing framework based on a data fusion fault diagnosis algorithm designed by D-S Evidence Theory is introduced taking SF6 high voltage circuit breaker as an example in this paper. SF6 high voltage circuit breaker trip(closing) coil current, voltage and current time are selected as input of the diagnosis system, and six main fault types are selected as output of the diagnosis system in this paper. Considering the multi-level, multi-layer and multi-faceted advantages of multi-sensor data fusion, D-S evidence theory based on MapReduce framework is designed. The simulation shows that the requirements of mass rapid diagnosis of high voltage switch equipment can be satisfied. Compared with the traditional serial processing method, processing time can be reduced by 95 percent under situation of hundreds of megabytes data.
CT554 **18:45-19:00**	A Synchronization Acquisition Algorithm for Wireless Communication System in High Dynamic Environment Manshu Li, Yufan Cheng, Xuezhe Wang,Fucheng Yan National Key Laboratory of Science and Technology on Communications, UESTC, Chengdu, China Presenter: Manshu Li, National Key Laboratory of Science and Technology on Communications, UESTC, Chengdu, China Abstract: This paper presents a novel code acquisition algorithm that can overcome the reduction of correlation peak caused by the Doppler offset in high dynamic environment and thereby increasing the acquisition probability. Compared with the existing code acquisition algorithms, this algorithm can

	improve the acquisition probability under the same false alarm probability without increasing the algorithm complexity. This algorithm can deal with high dynamic environments with greater frequency offset, such as high-speed open space communications and airborne communications. With a number of simulation experience, the efficacy of the proposed acquisition algorithm is validated by the numerical results.

SESSION 22

< Modern Electronic Systems and Measurement Techniques >

16:15–18:30

Chamber of Mist (West Wing, 2F) /馨雨阁，西楼2楼

Session Chair: Assoc. Prof. Gong Chen, Chengdu University of Information Technology, China

Opening Speech **CT425** **16:15-16:30**	A 9-bit 10MSps SAR ADC with Double InputRange for Supply Voltage Gong Chen, Weiwei Ling, Li Li, Hua Wei, Juan Zhou, Yao Yao, Yao Huang and Jiang Du Chengdu University of Information Technology, China Presenter: Gong Chen, Chengdu University of Information Technology, China Abstract: This paper presents a pre-charge VCM-based method for 1.2V 9-bit 10MSps Successive Approximation register (SAR) ADC. This conversion mechanism achieves the twice range of the input signal range beyond the supply voltage. We introduces a dynamic comparator with a special design and an additional comparison stage before each redistribution stage in the pre-conversion. The prototype was designed on 65nm CMOS technology. The simulation results shows INL and DNL 0.05 and 0.035 LSB respectively. The ADC consumes a total energy of 0.504 mW at a 1.2V supply and 10MSps.
CT025 **16:30-16:45**	Zone Coordinates: A New Coordinate System Zehua Gao, Mingjing Zhu, Yuxi Tan Beijing University of Posts and Telecommunications, China Presenter: Yuxi Tan, Beijing University of Posts and Telecommunications, China Abstract: Coordinates systems include rectangular coordinate systems, cylindrical coordinate systems, and spherical coordinate systems, among others. In three-dimensional rectangular coordinate systems, "x = 2" defines a plane, "x = 2, y = 3" defines a line, and "x = 2, y = 3, z = 1" defines a point. Therefore, traditional coordinates systems are represented by the combination of point, line, and plane. In the real world, every object or field occupies a certain volume, even atoms or protons. We present a new coordinate system, called the zone coordinate system, that gives the position of an entire object or field. The zone coordinate system is more in line with reality. It can be applied in every field that requires a location-based application.
CT119 **16:45-17:00**	Local Voltage Control in Distribution Networks: Game and Variational Inequalities Jie Tian, Dong Hou, Nan Xie, Yongsheng Cheng Institute of Electronic Engineering, China Academy of Engineering Physics, China Presenter: Jie Tian, Institute of Electronic Engineering, China Academy of Engineering Physics, China Abstract: Inverter-based voltage regulation for distribution systems is gaining importance as the penetration of distributed renewable energy resources increases, bringing about frequent and rapid supply and voltage fluctuations which traditional voltage regulation methods cannot handle. While previous works proposed and analyzed several inverter-based local volt/var control algorithms in linearized power flow model with line loss ignored, we are still interested in analytical characterization of these algorithms in frameworks without linear approximation. In this work, we considered a nonlinear dynamical system with nonincremental local Volt/VAr control, reverse engineer the nonlinear Volt/VAr dynamics as a voltage control game, and leveraged the fixed-point theorem and defined the equivalent variational inequalities (VI) problem. We made convex relaxation of the VI problems and characterize the equilibrium of dynamics through the solution set of VI problems. We give sufficient convergence conditions through showing contraction mapping. Numerical examples are provided to complement the analytical results.

CT214 **17:00-17:15**	A position sensing device's application on TianMa Radio Telescope Yongchen JIANG, Jinqing WANG, Wei GOU，Linfeng YU，Fengjie PAN Shanghai Astronomical Observatory, Chinese Academy of Sciences, China Presenter: Yongchen JIANG, Shanghai Astronomical Observatory, Chinese Academy of Sciences, China Abstract: Based on the platform of Shanghai TianMa 65m radio telescope, a PSD (Position Sensing Device) has been installed. As we know, for large telescopes, many factors including temperature, gravity deformation and wind load can result in sub reflector's (SR) position moving, which can make telescopes' focus's change and pointing error's increasing. For existing methods, we always choose night with good weather to measure antenna's pointing error and then establish the pointing model. Contrast to the models, the system provided in this paper can identify the SR's two dimensional position offset real-timely. It can measure SR's position intuitively. Also an anemorumbometer has been installed on the SR of TMRT to measure the wind speed and direction at the height of SR.
CT261 **17:15-17:30**	Software Design of Bridge Health Monitoring System Based on Java-EE and Android Kangxu Liu, Guangming Li Shandong University, China Presenter: Kangxu Liu, Shandong University, Weihai, China Abstract: In recent years, with the widespread construction of bridge, there are more and more bridge accidents happened in china, even all over the world, which cause causalities and property loss. The reason why most of bridge accidents occurred is lack of effective monitoring. The necessity of bridge health monitoring has been drawn more and more attention. In this paper, a bridge health monitoring system is proposed, which consists of hardware and software. The hardware design of the system adopts the way of wireless sensor networks. The software design of the system adopts Java-EE and Android technology to achieve related functions, for instance, registering, showing and changing user data, and showing collected pressure data, which ensures that the browser and phone client receive the same monitoring information. The system can monitor the health of the bridge and what's more important is that it is helpful for bridge maintenance to prevent accidents.
CT389 **17:30-17:45**	Research of Home Environment Surveillance System based on Wireless Sensor Network Peijun Hong, Hao Liu, Zhiguang Yan, Zhiqin Qian, Kai Wu, Zhuming Bi Shanghai iComhome Co.,Ltd, China Presenter: Hao Liu, Shanghai iComhome Co.,Ltd, China Abstract: This Nowadays, people are paying more and more attention to the quality of home environment with the rapid popularity of smart home system and Internet of things technology. In this paper, a new method based on the technology of WSN is adopted to monitor some indicators of the environment indoors, so that the damaging caused by these imperceptible and even dangerous indications, such as PM 2.5, temperature, humidity and the concentration of carbon monoxide, can be reduced or eliminated. The proposed system of WSN and a PM 2.5 detector is used in acquiring real-time data for surveillance and control of smart homes. The final results show that this cost-effective home monitoring system based on Wireless Sensor Network can reflect the indoor air quality to a great extent, thus it is of great progress in making people changing their living mode and sustaining a better life.
CT404 **17:45-18:00**	A 24 to 52 GHz Broadband Power Amplifier in 65 nm CMOS Technology Qing-ping Zhang, Jin-cai Wen, Long Wang, Guo-dong Su, Ling-ling Sun Hangzhou Dianzi University, China Presenter: Qing-ping Zhang, Hangzhou Dianzi University, China Abstract: A 28 GHz 3-dB bandwidth power amplifier (PA) in 65 nm CMOS technology is presented in this paper. This PA is a 2-stage common source (CS) structure with multi-section matching method and the filter effect of bias circuit for broadband matching network. Patterned ground shield under signal line is used to reduce the loss and area in the layout. The results of the measurement show that the PA obtains a maximum small signal gain of 7 dB from 24 to 52 GHz. The measured saturation output power (Psat) is 14.1 dBm and the power added efficiency (PAE) is 9.6% at 40 GHz with 12 dBm of output 1 dB compression point (P1dB), under 1.2 V supply voltage. The chip size without pad is 434 ×184 um2.

CT478 **18:00-18:15**	Electromagnetic Scattering Modeling from Gaussian Rough Surface Based on SPM Ting Fang, Zhen Cao Nanjing University of Posts and Telecommunications, China Presenter: Ting Fang, Nanjing University of Posts and Telecommunications, China Abstract: Based on the small perturbation method (SPM), a basic model is established to study the electromagnetic scattering of Gaussian rough surface. By using the small perturbation method, the relationship between scattering coefficient and scattering angle is given when scattering azimuth, incident angle, relative permittivity and relative permeability are changed respectively. Then we find the common points between them so that we can establish the relation model between scattering angle and scattering coefficient. In order to validate the accuracy, the specific parameter values are brought into the established model. The results show that the numerical results are basically the same as the modeling results, and the error is very small. Therefore, when the statistical parameters of the rough surface are determined, a model between scattering coefficients and scattering angles can be established to simplify the calculation of scattering coefficients.
CT519 **18:15-18:30**	Noise-reduced and Gain-Boosted 160GHz LNA in 65nm CMOS Yongming-liang; Mingzhu-Zhou Hangzhou Dianzi University, China Presenter: Yongming Liang, Hangzhou Dianzi University, China Abstract: A three-stage transformer-coupled 160 GHz CMOS low noise amplifier (LNA) with noise-reduced and gain-boosted techniques is presented in this paper. The noise-reduced technique is realized by employing an inductor between common gate and common source in one cascode stage, while gain-boosted technique is achieved by using an inductor in the gate of common gate stage. Both techniques aim to obtain high gain and low noise concurrently. The proposed LNA is fabricated by GF 65 nm CMOS process. From simulation results, this LNA realizes a 13.8 dB gain and a 7 dB noise figure at 160 GHz, and draws 28.4 mA current from a 2 V supply.

SESSION 23

< Communication Protocols and Algorithms >

16:15–18:30

Chamber of Dialogue (West Wing, 2F) / 相语堂，西楼2楼

Session Chair: Assoc. Prof. Ke Zhang, University of Electronic Science and Technology of China, China

CT040 **16:15-16:30**	A routing recovery method based on structure properties and centralized control for inter domain routing system Yi GUO, Juwei YAN, Liancheng ZHANG and Han QIU National Digital Switching System Engineering & Technological Research Center, China Presenter: Yi GUO, National Digital Switching System Engineering & Technological Research Center, China Abstract: The network attack against inter domain routing system becomes more and more complex, especially in recent years there has appeared a new kind of attacks, that is a LDoS-based cross plane attack. Due to such attacks have strong proliferation and not obvious abnormal characteristics, it is hard to detect and avoid their occurrence in time. Borrowing an ideal from survivability theory, this paper propose a routing recovery method based on structure properties and centralized control for inter domain routing system, called SPCC. In the SPCC, each BGP nodes make determination by itself to join the routing recovery network. All participating nodes have obligations to upload their routing information to the central server, which is respond to construct backup routing subgraphs. When the inter domain routing system suffering from routing failure, backup sub-graphs will be sent from the central server to SPCC nodes for routing recovery. The experimental result shows that the routing recovery ability of inter domain routing system can be greatly improved after deploying SPCC mechanism, especially when

	only a small number of key AS joining in the SPCC network, it can better achieve the goal of global routing recovery when inter domain routing system suffering large scale cascading failure.
CT093 **16:30-16:45**	A Method for Calibrating Standard Propagation Model in LTE system Guangyuan Li, Yuanbo Chai, Wei Li, Chunlai Yu, hunqing Xu, Xi Meng Huanghe Science and Technology, China Presenter: Guangyuan Li, Huanghe Science and Technology College, China Abstract: In the LTE network planning, the propagation loss prediction is essential to predict the strength of the signal and interference. Conventionally, Standard Propagation Model (SPM) calibrating algorithms based on least squares (LS) are widely adopted. In this paper, a method using matrix operations is proposed to calibrate the SPM. The simulation results show that the proposed method is able to reduce the mean error and decrease the standard deviation, compared with conventional methods. In addition, it meets the calibration standard.
CT106 **16:45-17:00**	Energy, Delay and Hop Count Multi-Constraints QoS Routing Algorithm for Wireless Ad-Hoc Networks Mohamed Ibrahim El-Emary , Hussein M. ELAttar. Arab Academy For Science and Technology and Maritime Transport, Egypt Presenter: Mohamed Ibrahim Mahmoud El Emary, Arab Academy For Science and Technology and Maritime Transport, Egypt Abstract: QoS configuration is needed to sustain the global network needs as Maintaining Max Network Throughput, Minimum Network energy consumption, Assigning Specific Profiles upon Organization's Request and Targeting Prioritizing Service Delivery Based On the constraints Faced. This paper will introduce an optimization solution for multi-constrained routing problem to assess the potential benefit of QoS routing. Multi Constrained Routing Algorithm (OMCR) will be analyzed throughout the paper, including simulation results done by Network Simulation program (NS2). The paper also compares its advantages over other routing algorithms. The OMCR main disadvantage is that it deals with constraints separately while fetching best path to the destination; this barrier prevents the network from dealing effectively with multi constraint behavior. In this paper, Advanced OMCR (A-OMCR) protocol is proposed to optimize the quality of service parameters such as energy, delay and hop count. The main aim of A-OMCR is fetching a feasible path from source to destination while optimizing multiple QoS constraints simultaneously to overcome the primary disadvantage of OMCR Algorithm.
CT158 **17:00-17:15**	Performance Criteria of Optimal Sensing Algorithm for Time-varying Spectrum Zhu Yonggang, Mei Xueyan, Li Yonggui, Zhu Yiyong Nanjing Telecommunication Technology Institute, China Presenter: Zhu Yonggang, Nanjing Telecommunication Technology Institute, China Abstract: The requirement of real-time processing indeed poses challenges on implementing spectrum sensing algorithms, especially for time-varying spectrum environments. The time-varying feature of the spectrum for wireless communication countermeasure system is analyzed. And the mathematical model of the time-varying spectrum is proposed. With the help of adaptive filtering theory, the performance criteria of optimal spectrum sensing algorithm is proposed, in which the total error was composed by sensing error and lag error. The objective of the real-time spectrum sensing algorithm is to minimize the summation of sensing error and lag error. Finally, the proposed performance criterion was used to guide the channel estimation of intelligent frequency hopping communication system.
CT304 **17:15-17:30**	An Asynchronous, Distributed Protocol for DC Power Management in a Smart Building Benjamin Millar and Danchi Jiang University of Tasmania, Australia Presenter: Danchi Jiang, University of Tasmania, Australia Abstract: With the increase in home automation and control solutions through interconnected devices there is a greater interest for the development of more advanced home energy management systems (HEMS). In this paper we propose a Home Energy Management Multi-Agent (HEMMA) protocol to facilitate the distributed optimisation of a HEMS. A distributed optimal power flow algorithm based on the method of multipliers is applied to the HEMMA protocol in order to optimise the problem of DC power supply to a smart building. Together, the distributed optimisation strategy and HEMMA protocol

	implemented by agents in an Internet of Things are able to achieve a local optimum to the global problem while observing the voltage and power supply constraints of the DC power sources and servicing constant current and constant power loads.
CT352 **17:30-17:45**	Security Improvement on a Biometrics-based Authentication Protocol for Multi-server Environment Yi Gu, Shengqiang Li University of Electronic Science and Technology of China, China Presenter: Yi Gu, University of Electronic Science and Technology of China Abstract: Recently, an biometrics-based multi-server authentication protocol was proposed by Odelu et al. It was proved that the scheme is secure against different possible known attacks and satisfies attractive security properties. In this paper, however, we prove that Odelu et al.'s scheme suffers from offline password guessing attack and fails to provide three-factor security. Further, we propose an improved scheme by applying fuzzy verifier to local password verification and employing Chebyshev chaotic map-based cryptography. Security analysis shows that our scheme not only maintains the advantages of the Odelu et al.'s scheme but also withstand the offline password guessing attack. As a result, our improved scheme can provide three-factor security and has better performance compared with Odelu et al.'s scheme.
CT361 **17:45-18:00**	SRR: A Lightweight Routing Protocol for Opportunistic Networks Xia Wang, Xiaofei Sun, Wenwen Pan, Tao Xu , Xuhong Li Zaozhuang University, Shandong, China Presenter: Xia Wang, Zaozhuang University, Shandong, China Abstract: Opportunistic networks can dispatch the messages among mobile devices through dynamic routes. Therefore time efficiency of routing protocol is an important performance metric for opportunistic networks. This paper propose a new routing protocol called Success Ratio-based Routing (SRR) protocol, which can dispatch each message in an efficient and accurate way, balancing the delivery ratio and communication overhead. SRR undertakes the experience statistics for the nodes' motion in opportunistic networks, and finds that part of mobile nodes have fixed social attribute, having regular daily routine. SRR introduces a new parameter Success Ratio (SR) to measure quality of paths, picking the optimal path to dispatch message. SRR also adopts a lightweight algorithm to construct the forwarding table, which utilizes the local parameters to calculate SR, saving the network resources. The extensive simulation experiments demonstrate that SRR protocol is able to cost less communication overhead and network resources to dispatch the message in an efficient and accuracy way.
CT445 **18:00-18:15**	A Collision-Predicted TDMA MAC Protocol in Centralized Vehicular Network Lizhao Lin, Bin-Jie Hu, Zongheng Wei, Chaodong Wu South China University of Technology, China Presenter: Lizhao Lin, South China University of Technology, China Abstract: Collision is the main problem in Vehicular network, which badly affect network throughput and time delay. To tackle this, this paper proposes a Collision-Predicted TDMA MAC (CPTM) protocol in the centralized vehicular network which includes a Road Side Unit (RSU). The main idea is that the RSU first predicts the merging collisions in the upcoming slots, and then adjusts appropriately the time slots allocation for vehicles to prevent the collisions. In order to decrease the possibility of access collision, empty time slots list is provided by RSU for new vehicles in RSU region. What's more, RSU reassigns time slots for different-direction vehicles according to vehicle density ratio on roads, which can improve the utilization of channels. We evaluate the proposed protocol with extensive simulations. Simulation results show that comparing with the existing MAC protocols, CPTM can achieve higher throughput and lower time delay.
CT924 **18:15-18:30**	Design and Implementation of Multi - hops Wireless Sensor Network Routing Protocol Based on HEED Jiwei Huang, Yuan Li, Huang Yu Fuzhou University, China Presenter: Yuan Li, Fuzhou University, China Abstract: A new energy equalization algorithm based on HEED algorithm is proposed to solve the problem of energy consumption imbalance and extend the lifetime of wireless sensor networks. The algorithm chooses the cluster head according to the HEED algorithm of the cluster head election, and

	then graded the cluster head according to the distance to the basestation. The Dijkstra algorithm using energy and distance as composite weights is introduced in the data transmission between clusters. Finally, through theoretical analysis and simulation, it is proved that the algorithm has a good effect on controlling the energy consumption of wireless sensor networks and prolonging their lifetime

SESSION 24

< Image Processing Techniques and Methods >

16:15–18:45

Chamber of Willow (West Wing, 2F) / 舒柳园，西楼2楼

Session Chair: Prof. Chong Fu, Northeastern University, China

Opening Speech **CT569** **16:15-16:30**	A Color Image Encryption Algorithm Using a New 1-D Chaotic Map Chong Fu, Yu Zheng, Min Chen, Zhan-kao Wen Northeastern University, China Presenter: Chong Fu, Northeastern University, China Abstract: This paper presents a color image encryption algorithm using a new 1-D chaotic map, tent-logistic map, which is produced by a cascade chaotic system (CCS). Compared with corresponding seed maps, the employed chaotic map has more parameters and complex chaotic properties while remaining simplicity, making it a good candidate for constructing image ciphers with a sufficiently large key space and high computational efficiency. In the permutation stage, the positions of colored subpixels in the input image are scrambled using a pixel-swapping mechanism, which effectively avoids the periodicity problem encountered by discretized version of area-preserving chaotic maps. To strengthen the robustness of the proposed algorithm against chosen-plaintext attack and increase the diffusion intensity, a mechanism for associating keystream sequence with plain-image is introduced during the substitution process. The results of NPCR and UACI tests indicate that the proposed algorithm takes only two cipher rounds to achieve a satisfactory diffusion effect. The security of the proposed algorithm is analyzed in detail, and the results demonstrate its satisfactory level of security.
CT138 **16:30-16:45**	Influence of the Stop-and-hop Assumption on Synthetic Aperture Sonar Imagery Xuebo Zhang, Xiaohui Chen, Wu Qu Science and Technology on Underwater Acoustic Antagonizing Laboratory, China Presenter: Xuebo Zhang, Science and Technology on Underwater Acoustic Antagonizing Laboratory, China Abstract: Stop-and-hop (S&H) assumption is usually exploited by most multiple receiver synthetic aperture sonar (SAS) imaging geometries, which are the basis of the SAS image formation algorithms. It is a reasonable approximation for the target focusing with a slow sonar platform speed. However, it is not suitable for the systems with a fast speed at far range as this assumption would deteriorate the target focusing performances. This paper firstly analyzes the error of S&H approximation in the 2-D space domain, which shows the necessity of the compensation for this approximation error. Based on back projection (BP) algorithm, simulated data is processed with and without the S&H approximation, respectively. The experiments are carried out with two sonar platform velocities, i. e. slow and fast sonar platform velocities. The processing results further indicate that the S&H error should be compensated when the system is operated with a fast speed.
CT182 **16:45-17:00**	An Efficient Feature Selection Method for Network Video Traffic Classification Yuning Dong, Quantao Yue, Mao Feng Nanjing University of Posts and Telecommunications, China Presenter: Yuning Dong, Nanjing University of Posts and Telecommunications, China Abstract: A feature selection method RFPSO based on ReliefF and Particle Swarm Optimization (PSO) is proposed to mitigate the problem that the feature dimension of network traffic classification is too high. In this method, the ReliefF algorithm is used to filter out some irrelevant features and achieve the

	goal of rapid dimension reduction. Then, PSO is used as the search algorithm, and some better features are used as the partial initial population of particle swarm. The inconsistency rate is used as the evaluation function to select the optimal subset in the remaining feature subsets. The experimental results show that the classification accuracy of the RFPSO algorithm is higher than that of existing algorithms, and the computational complexity of the algorithm is lower than that of other two feature selection algorithms based on classification learning algorithm.
CT186 **17:00-17:15**	An Image Encryption Algorithm of Scrambling Binary Sequences by Improved Logistic Mapping Liu Bing, Fu Die Dazhou Vocational and Technical College, China Presenter: Liu Bing, Dazhou Vocational and Technical College, China Abstract: Based on improved Logistic chaotic mapping, an image encryption algorithm of scrambling binary sequences is proposed in this paper to deal with the problems of the traditional Logistic chaotic mapping and its general improvement , such as narrow parameter range, more fixed points, single initial value iteration and the smaller key space. By analyzing and comparing, the algorithm proposed in this paper has not only larger key space and better execution efficiency, but also better performance of related evaluation indexes in its relevant chaotic system, which possesses its own application value in the field of confidential storage and communications.
CT327 **17:15-17:30**	A Determination Method of Optimal Decomposition Level in Wavelet Threshold De-noising Algorithm Based on Moving Average Model Lin Jiang, Chuanchuan Wang, Yonghu Zeng, Liandong Wang State Key Laboratory of Complex Electromagnetic Environment Effect on Electronics & Information System, China Presenter: Lin Jiang, State Key Laboratory of Complex Electromagnetic Environment Effect on Electronics & Information System, China Abstract: The wavelet threshold de-noising algorithm is an effective method for removing noise from the noised signal. The decomposition level has a great influence on the wavelet de-noising effect. If the wavelet decomposition level is not properly set, the filtering effect may not be reached, or some useful information may be filtered. Based on the signal to noise ratio of the noised signal under different wavelet decomposition level, a method of determining the wavelet decomposition level based on the moving average model (MA) is proposed. Through the simulation experiment, it is proved that the method can efficiently determine the optimal decomposition level. The research in present paper may be referenced for the application of wavelet threshold de-noising algorithm.
CT351 **17:30-17:45**	A Parametric Elastic Registration Method for Airborne Multispectral Line Scan Imager Chuncheng Zhou, Fanrong Meng, Chuanrong Li, Wenjing He, Wei Li Key Laboratory of Quantitative Remote Sensing Information Technology, Academy of Opto-Electronics, Chinese Academy of Sciences, China Presenter: Chuncheng Zhou, Academy of Opto-Electronics, China Abstract: The multispectral line scan imager is widely used in aerial remote sensing application. However, there is different none-linear warping and local transformation between bands, due to the vibration of the platform and out of synchronizing of bands imaging exposure time. This paper describes a parametric elastic registration method to model the multispectral image registration problem. This approach deeply explores the prior knowledge of the imaging mechanism and the attitude parameters constraint of the stable platform, which is helpful for improve the quality and robustness of the multispectral image registration. We formulate the elastic registration problem of multispectral image as a nonlinear minimization optimization problem. Experimental results of the real flight images shown that the proposed method could well deal with the none-linear warping of airborne multispectral images.
CT433 **17:45-18:00**	Fast Single Image Dehazing Based on Color Cube Constraint Elisée A Kponou, Zhengning Wang, Ping Wei, Min Wu University of Electronic Science and Technology of China, China Presenter: Elisée A Kponou, University of Electronic Science and Technology of China, China Abstract: The outdoor images captured in bad weather are prone to yield low and poor visibility, which is a serious issue for most computer vision applications. The majorities of existing dehazing methods

	rely on the dark channel prior (DCP) assumption and therefore share two mains limitations; the model is invalid when the scene is intrinsically similar to the atmospheric light and the DCP method suffers from high computational cost to refine the transmission map. In this paper, we propose a fast single image dehazing based on color cube constraint based on new haze imaging model to overcome these two limitations. The thickness of the haze can be estimated effectively, and a haze-free image can be recovered by adopting the new method and the new haze imaging model. In this method, we first design a new haze imaging model which enables us to represent the hazy image inside a color cube according to the concentration of the haze. Then, to get an accurate value of the global atmospheric light we took the maximum value of each RGB color channel. Next, we propose a simple but very powerful prior or method called variation of distance prior (VOD), which is a statistic of extensive high resolution outdoor images. Using this prior combined with the designed haze imaging model and improved global atmospheric light, we can directly estimate the transmission map and restore a high quality outdoor haze-free image. The experimental results show that our model is physically valid, and the proposed method outperforms several state-of-the-art single image dehazing methods in terms of effectiveness robustness and speed.
CT520 **18:00-18:15**	Research on Correcting Algorithm of QR Code Image's Distortion Xuan Wang, Peng Cao, Liuping Feng Beijing Institute of Graphic Communication, China Presenter: Xuan Wang, Beijing Institute of Graphic Communication, China Abstract: In order to accurately recognize the QR code information, it is necessary to correct the QR code image precisely. To improve the recognition's accuracy of QR code, this paper presents an algorithm to correct the distortion of QR code image precisely. Based on the traditional geometric correction, the algorithm finds the black and white data block by finding the position where the variance is the smallest in the region, using the variance of the pixel in the fixed region and the degree of gray value. The judged black and white block information is placed in a new matrix, and the QR code binary image is restored accurately. The algorithm can not only correct the general image distortion, but also solve the problem of image cylindrical distortion and QR code information's extraction.
CT539 **18:15-18:30**	Video Dual Watermarking Algorithm Against Geometric Attack Based on ASIFT and Contourlet Transform Shuqin Chen , Zhi Li, Xinyu Cheng, Qi Gao Guizhou University, China Presenter: Shuqin Chen, Guizhou University, China Abstract: This study proposed a video dual watermarking algorithm based on affine-scale invariant feature transform (ASIFT) and contourlet transform. First, the human visual masking model of a 3D motion in video sequence is studied in depth. The human eye visual masking threshold is obtained as the maximum embedding intensity of watermark using various motion characteristics. Second, the high- and low-frequency sub-band coefficients of the contourlet field are obtained by contourlet transform. Chaotic watermarking sequence is embedded into the high-frequency sub-band coefficient with the highest energy to increase imperceptibility. Third, when the low-frequency sub-band coefficients has the stability of its coefficient histogram against geometric attacks such as rotation and scaling, the watermark signal is embedded in a low-frequency sub-band histogram of adjacent coefficients to increase the watermark of an anti-geometric attack. Finally, ASIFT is used as a trigger to determine whether the video frame is subjected to geometric attacks or not. For geometric distortions, ASIFT is used to regulate the geometrically attacked video frame. The low-frequency sub-band coefficients of the regulated video frame are used for the watermarking extraction algorithm. The high-frequency watermarking extraction algorithm is used directly for the non-geometric distortions. Experimental results show that the proposed algorithm could guarantee watermark invisibility and favorably extract the watermark for common geometric and conventional signal attacks. The proposed algorithm is a strong video-dual watermarking algorithm.
CT557 **18:30-18:45**	Dual Watermarking Algorithm Based on Singular Value Decomposition and Compression Sensing Nan Wang, Zhi Li, XinYu Cheng, Yi Chen Guizhou University, China Presenter: Nan Wang, Guizhou University, China Abstract: To protect the integrity of digital image copyright information and to enhance the ability of an

	image to resist tampering and recover from tampering, this study presents a dual watermarking algorithm that connects the robust watermarking algorithm based on singular value decomposition (SVD) with a fragile watermarking algorithm based on compressive sensing (CS). SVD has the invariance of rotation, scaling, and other geometric transformations. Hence, the watermarking algorithm based on SVD can be used to guarantee stability and robustness by using the invariance of SVD. For the single watermarking algorithm, the tampering of the protected image cannot be monitored in any way. Thus, this study proposes a fragile watermarking algorithm based on CS, which can perceive in time when the protected image is tampered and repair the tampered image to a certain extent. Experimental results show that the proposed algorithm can be used for copyright protection and tampering detection of images. Furthermore, the algorithm can correctly extract the watermark signals after conventional geometric and non-geometric attacks, accurately locate the tampering, and restore the image information.

Conference Venue

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Presentation Quick Review - Oral Presentation

SESSION 1

Oct. 28, 2017/13:00–16:00/ Chamber of Mist (West Wing, 2F) /馨雨阁，西楼 2 楼

PP. 26-29

CT032	Improved Non-Uniform Selecting Encoding Algorithm for Fountain Codes with Short Code-Length
CT035	Throughput Analysis of Full-Duplex Network Coding in Two-Way Relay Channel
CT081	Stabile Rateless Codes Design Based on Efficiency-Fairness Principles
CT082	A Rateless Coding Scheme Based on Efficiency-Fairness Principles
CT227	A Low-Complexity Min-Sum Decoding Algorithm For LDPC Codes
CT466	Low-Complexity Decoding Architecture for Rate-Compatible Puncturing Polar Codes
CT468	Iterative Decoder for Coded SEFDM Systems
CT488	Memory Based LT Code with Shifted Degree
CT494	ZERO-FORCING HYBRID PRECODING BASED ON QR-DECOMPOSITION IN MILLIMETER WAVE SYSTEMS
CT502	Concatenations of Polar Codes with outerNonbinary LDPC Codes
CT544	An Efficient Post Processing Scheme to Lower the Error Floor of LDPC Decoders
CT547	A Reduced Complexity Decoding Algorithm for NB-LDPC Codes

SESSION 2

Oct. 28, 2017/13:00–16:00/ Chamber of Osmanthus (West Wing, 2F) /桂香居，西楼 2 楼

PP. 29-32

CT506	A user mode implementation of filtering rule management plane using key-value
CT050	Random Forest Algorithm under Differential Privacy
CT219	Topic mover's distance based document classification
CT229	A Secret Sharing Scheme from Hadamard Matrix
CT230	Continuous Blood Pressure Prediction Using Pulse Features and Elman Neural Networks
CT232	A Novel Document Distance Based on Concept Vector Space
CT271	ICA Based Causality Inference between Variables
CT309	Asterisk Server Performance Under Stress Test
CT335	Android Based Automated Scoring of Multiple-choice Test
CT347	Application Feature Extraction using both Dynamic Binary Tracking and Statistical Learning
CT390	Research on Personalized Recommendation Algorithm Combined with Time Factor
CT438	Improving Learning Algorithm Performance for Spiking Neural Networks

SESSION 3

Oct. 28, 2017/13:00–16:00/ Chamber of Willow (West Wing, 2F) / 舒柳园，西楼 2 楼

PP. 33-36

CT049	Research on network invulnerability based on DWS model considering cascading failure in power data network
CT124	A Novel Temporal-spatial Analysis System for QAR Big Data
CT256	Capacity Enhancement of Hamming+k Data Hiding By Pixel Overlapping Approach
CT275	A Target Detection Algorithm Based on Signal - Data Joint Processing under Blanket Jamming
CT346	Anti-jamming Power Control Game for Data Packets Transmission
CT353	A Clustering Algorithm for Binary Protocol Data Frames based on Principal Component Analysis and Density Peaks Clustering
CT370	A Novel Way to Calculate PDMOL Based on the Coding Parameters and Network Conditions
CT426	A New Design on Degree Distribution of LT Code Based on Poisson and Moved-RSD Distribution
CT461	Instantly Decodable Network Coding for Order-Constrained Applications over Wireless Broadcasting
CT505	Signatures Reconstruction Based on Parametric Scattering Model and the Application in Communication
CT517	Exploring the Impact of Processing Guarantees on Performance of Stream Data Processing
CT529	A Fuzzy Clustering Algorithm Based on Complex Synaptic Neural Network

SESSION 4

Oct. 28, 2017/13:00–16:00/ Chamber of Moon (West Wing, 2F) /霁月室，西楼 2 楼

PP. 36-39

CT362	Performance of SC-FDMA-based Multiuser Massive MIMO System in the Presence of Phase Noise
CT010	High-Order Modulation for Small Cell Networks: A High Level Analysis
CT021	A Dynamic Multiuser Detection Scheme for Uplink SCMA System
CT179	High-Throughput Interleaving Scheme in Free Space Optical Communication System
CT339	Aerostat virtual network and navigation method
CT371	Discrete Phase-Only Hybrid Beamforming Method In MIMO System Based On Genetic Algorithm
CT405	A Research on Anti-jamming Method Based on Compressive Sensing for OFDM Analogous System
CT406	Energy Efficiency Maximization for MIMO-OFDMA Systems with Imperfect CSI
CT442	Encryption at Physical Layer Based on Chaotic System and Three-dimensional Modulation in Massive MIMO Systems
CT480	Personal trajectory based Social-aware D2D communication Networks
CT489	A Dynamic Scheduling Scheme for CoMP in Downlink FD-MIMO Transmission
CT929	Target angle tracking algorithm based on the covariance matrix for bistatic MIMO radar

SESSION 5

Oct. 28, 2017/13:00–16:00/ Chamber of Dew (West Wing, 2F) /浣花轩，西楼 2 楼

PP. 40-43

CT122	Design of Robust Projection Matrix Using Prior Information for Signal Compression
CT047	Analysis on Frequency Diversity and Anti-jamming Characteristic of TDCS Signal

CT089	A Hybrid Algorithm for Fast Parameter Estimation of LFM Signal
CT117	Hybrid Blind Symbol Rate Estimation for Linearly Modulated Signals
CT170	Non-data-aided Frequency Offset Estimation for Binary CPM Signals
CT306	A Modified Unambiguous Acquisition Algorithm for BOC (n, n) Signal
CT325	Low Complexity Max-Log-MAP Demapper for M -PAM Signals with Nonuniform Constellations
CT382	Study on GNSS-based detection technology of bistatic radar reflection signals of smallsatellites
CT392	Signal Characterization for Indoor Close-range Free-space Optical Communications
CT481	Tracking Reference Signal Design for Phase Noise Compensation for SC-FDMA Waveform
CT497	Direct Position Determination for Digital Modulation Signals with Unknown Symbols
CT524	Print anti-replication technology based on AM/FM hybrid halftone

SESSION 6

Oct. 28, 2017/13:00–15:45/
1.2 Four Seasons Hall (West Wing, 1F) / 四季 1.2 厅, 西楼 1 楼
PP. 43-46

CT039	A Cut-Through Scheduling for Delay Optimization in TD-LTE Relay Enhanced Networks
CT036	An improved echo state network based on variational mode decomposition and bat optimization for Internet traffic forecasting
CT060	What to expect in Next Generation RAN Architecture: A survey
CT144	A Hierarchical Divisive Algorithm for Topology Discovery in Multi-subnet Networks
CT358	Influence of Plasma on Antenna and Design of Tunable Matching Network
CT396	Modeling and analysis of Maglev communication system based on colored Petri nets
CT424	Analysis of Area Spectral Efficiency and Energy Efficiency in Heterogeneous Ultra-Dense Networks
CT452	On the Spectral Efficiency of Full-Duplex Massive MIMO Heterogeneous Network with MRC Method
CT500	A cellular NoC architecture based on butterfly network coding (CBNoC)
CT549	Task Scheduling in Fog Enabled Internet of Things for Smart Cities
CT561	Topology Inference for CSMA/CA Wireless Network based on Inter Frame Space

SESSION 7

Oct. 28, 2017/13:00–16:00/
3.4 Four Seasons Hall (West Wing, 1F) / 四季 3.4 厅, 西楼 1 楼
PP. 46-49

CT103	Virtual Network Embedding in Flexi-grid Optical Networks
CT184	Dynamic Analysis of VANET Using Temporal Reachability Graph
CT187	Relay Selection Schemes for Store-Carry and Forward Relaying Based on Optimal Stopping Schemes
CT190	Hybrid Channel Access with CSMA/CA and SOTDMA to Improve the Performance of MANET
CT216	A New Method for Detecting and Early-warning In-Band Interference of the GSM-R Network
CT380	A NLOS Mitigation and Localization Algorithm Based on the Constraint Least Square Optimization

CT454	Full-duplex Relay for Enhancing Physical Layer Security in Wireless Sensor Networks: Optimal Power Allocation for Minimizing Secrecy Outage Probability
CT470	Rate Compatible Modulation with Unequal Error Protection Property
CT543	Social-Aware Collaborative Caching for D2D Content Sharing
CT575	Caching Scheme Based on User Clustering and User Requests Prediction in Small Cells
CT905	Spatial Compression Scheme for Improving the Lifetime of Wireless Sensor Networks
CT928	Minimizing Event Delay for Traffic Monitoring Using Mobile Patrol Charging Robot in Wireless Rechargeable Sensor Networks

SESSION 8

Oct. 28, 2017/16:15–18:45/ Chamber of Mist (West Wing, 2F) /馨雨阁，西楼 2 楼

PP. 50-52

CT020	Broadcasting Algorithm Based on Successful Broadcasting Ratio of Neighbor Nodes in Mobile Ad Hoc Networks
CT071	Construction of Compressed Sensing Matrix Based on Complementary Sequence
CT118	Automatic Digital Modulation Recognition based on Stacked Sparse AutoEncoder
CT208	An Encryption Algorithm Based on Multi-connection Transmission
CT249	Research on the Miller loop optimization of SM9 bilinear pairings
CT252	An Influence Factor Based Caching Node Selection Algorithm in D2D Networks
CT373	Interference Cancellation Based on Compressive Sensing Framework for Ultra DenseNetwork
CT522	An Innovative Low-Complexity Detection Algorithm for Spatial Modulation
CT391	Non-Uniform Bandwidth Reservation for Real-Time Streaming Applications Based on Meter Table
CT483	A Low-Complexity Soft Output Detection Algorithm for Spatial Modulation Systems

SESSION 9

Oct. 28, 2017/16:15–18:45/ Chamber of Osmanthus (West Wing, 2F) /桂香居，西楼 2 楼

PP. 53-56

CT403	A Real-Time Traffic Congestion Detection System using On-Line Images
CT073	Pedestrian Detection Based on Visconti2 7502
CT087	Real-Time Accurate Pedestrian Circular Tracking with UAV
CT215	Coding-based Hough Transform for Pedestrian Detection
CT221	An IFF Identity Authentication Scheme of Security and Guarantee System
CT223	The performance of corrected learning network for object recognition
CT235	ECG Beats Classification via Online Sparse Dictionary and Time Pyramid Matching
CT260	A Fast Near-duplicate Keyframe Detection Method Based on Local Features
CT537	Design and Realization of Deep Learning Coprocessor Oriented to Image Recognition
CT538	Driver identification using histogram and neural network from acceleration data

SESSION 10

Oct. 28, 2017/16:15–18:30/ Chamber of Willow (West Wing, 2F) / 舒柳园，西楼 2 楼

PP. 56-58

CT059	Service-Driven Resource Allocation Based on Energy Efficiency in UUDN
CT080	Particle Swarm Optimization Based Power Allocation for D2D underlaying Cellular Networks
CT084	Resource allocation in heterogeneous networks: a modified many-to-one swap matching
CT495	Effective Adaptive Rate Allocation for DP-LDPC Image Transmission System based on Source and Channel Characteristics
CT240	Energy-aware Resource Allocation Scheme for Device-to-Device Communication Based on NOMA Underlaying Cellular Networks
CT421	A Novel Cell Zooming Strategy Towards Energy Efficient based on Load Balancing in Random Heterogeneous Networks
CT458	Resource Allocation for AF-OFDMA System Using Combinatorial Auction
CT467	Uplink Scheduling and Power Allocation with M2M/H2H Co-existence in LTE-A Cellular Networks
CT490	Power Allocation for Energy Efficiency Maximization in Distributed MIMO System overRayleigh Channels

SESSION 11

Oct. 28, 2017/16:15–18:45/ Chamber of Moon (West Wing, 2F) /雾月室，西楼 2 楼

PP. 58-61

CT085	Cyclostationarity Based Spectrum Sensing Method With Uncertain Arrivals of Primary Users
CT160	An Efficient Spectrum Sensing Algorithm Based on Overlap-FFT Architecture
CT188	Robust Energy Efficiency Power Allocation Algorithm for Cognitive Radio Networks with Rate Constraints
CT197	A photonics channelization approach for broadband RF spectrum measurement based on I/Q coherent detection and spectrum stitching technique
CT236	Dynamic Spectrum Access for D2D Networks: A Hypergraph Game Approach
CT245	Context-aware Group Buying in D2D Networks: An Overlapping Coalition Formation Game Approach
CT455	An Optimal estimation algorithm of sampling frequency offsets in NG-DSL Systems
CT491	NC-OFDM RadCom System for Electromagnetic Spectrum Interference
CT507	Low Complexity Trace Based Spectrum Sensing Algorithms: Complex Signal
CT523	A Frequency Estimation Algorithm for PSK-Modulated Carrier Signal Based on Iterative Weighting

SESSION 12

Oct. 28, 2017/16:15–18:45/ Chamber of Dew (West Wing, 2F) /浣花轩，西楼 2 楼

PP. 61-64

CT079	A Distributed Anti-jamming Channel Selection Algorithm for Interference Mitigation-based Wireless Networks
CT115	A channel analysis method for ground-air wireless communication system
CT180	Study on Modeling Method of Leaky Coaxial Cable Network Channel in Underground Coal Mine
CT330	Covert Timing Channel Detection Method Based on Random Forest Algorithm
CT338	Performance Analysis of Improved 64-ary Triangular Quadrature Amplitude Modulation in AWGN Channel
CT366	Saturated Throughput Analysis of Vehicular Ad Hoc Networks over Rayleigh-Fading Channels
CT410	Security-Reliability Tradeoff for Cooperative Multi-relay and Jammer Selection in Nakagami-m Fading Channels

CT451	Security Performance Analysis for Cooperative Communication System Under Nakagami-m Fading Channel
CT530	Channel Reciprocity Improvement of Secret Key Generation with Loop-back Transmissions
CT567	The Influence of the Branch loads on the Chinses Low-Voltage Power Line Communication Channel

SESSION 13

Oct. 28, 2017/16:15–18:45/
1.2 Four Seasons Hall (West Wing, 1F) / 四季 1.2 厅, 西楼 1 楼
PP. 64-67

CT159	Design of a Miniaturized Triple-Frequency Microstrip Antenna
CT174	Analysis and Development of Components of Dipole Linear Antenna Array
CT181	Antenna Selection in Switched Phased Array Architecture for Secure Millimeter Wave Communication
CT257	Theoretical Model for Patterns of VICTS Antenna
CT270	A novel tunable patch antenna using graphene stacks array
CT437	Performance 3-D ISAR Imaging in Compact Antenna Test Range via Compressed Sensing
CT465	Maximum Combination Spatial Modulation
CT504	Transmit Antenna Selection with Precoding for Spatial Modulation MIMO Systems
CT168	Channel Estimation Based on Turbo Equalization in Massive MIMO Systems
CT311	Research on Multi - wavelength Optical Frequency Comb Technology Based on SatelliteSpectrum Sensing

SESSION 14

Oct. 28, 2017/16:15–18:45/
3.4 Four Seasons Hall (West Wing, 1F) / 四季 3.4 厅, 西楼 1 楼
PP. 67-69

CT101	End-to-End Speech Emotion Recognition Based on Neural Network
CT262	A screening scheme based on energy for speech key-frame
CT302	Deep Neural Network Based Monaural Speech Enhancement with Sparse and Low-Rank
CT363	The Influence of leadership styles on Accounting Information Systems Quality and its Impact on Information Quality Survey on State-Owned Enterprise
CT377	Research on User Identification Algorithm Based on Massive Multi-site VPN Log
CT394	Parametric Audio Equalizer Based on Short-Time Fourier Transform
CT413	An Algorithm of Detecting Audio Copy-Move Forgery Based On DCT And SVD
CT509	A Beamforming Method Based on Image Tracking and Positioning in the LOS Scenario
CT545	Chemical Substance Classification using Long Short-Term Memory Recurrent Neural Network
CT548	Service Chain Performance Optimization Based on Middlebox Deployment

SESSION 15

Oct. 29, 2017/13:00–16:00/ Chamber of Osmanthus (West Wing, 2F) /桂香居，西楼 2 楼

PP. 70-73

CT102	Joint Precoder and DC Bias Design for MIMO VLC Systems
CT183	Polar Codes for Cooperative Unmanned Aerial Vehicle Communication Networks
CT224	Applications of Equivalent Cable Bundle Method in Frequency Domain for Emission Problems of the Computer Case Cable Harness
CT225	A High Linearity Wideband Receiver with Large Dynamic Range in 0.18um CMOS
CT284	Research on attenuation model of The Communication Leaky Coaxial Cable
CT321	Reconstruction-based Receiver of FTN Signaling at Fixed Sampling Rate
CT348	Wideband Circular Polarizer Based on Twisted Double-Layer Spiral Planar Structure
CT350	Reconfigurable Continuous Class-F Power Amplifier Using Tunable Output Matching Network
CT357	Feedback Control with Quantized State Using Event-Triggered Communication
CT510	Direction Finding for Non-circular Sources Based on Weighted Unitary Nuclear Norm Minimization
CT527	A Design of Frequency Doubler Based On 0.5um InP HBT Process
CT541	Reduced Complexity List Polar Decoder with an Improved Path Pruning Scheme

SESSION 16

Oct. 29, 2017/13:00–15:30/ Chamber of Dew (West Wing, 2F) /浣花轩，西楼 2 楼

PP. 73-76

CT922	Research on Similarity Metric Distance Algorithm for Indoor and Outdoor Firefighting Personnel Precision Wireless Location System Based on Vague Set on UWB
CT096	Adaptive Blind Nulling without Measurement Biases in GNSS Receivers
CT100	Study on All-Optical Cross-Band Frequency Conversion for Communication Satellite
CT104	Hybrid indoor localization method based on signal subspace fingerprint database
CT239	An Improved Indoor Positioning Algorithm Based on RSSI Filtering
CT267	Research of impact about smoothing range using velocity on high ranging accuracy
CT305	An underwater navigation system based on multi-orthogonal signals and its lake trial
CT443	An Information Fusion Direct Position Determination Method based on Wishart Random Matrix Asymptotic Distribution Theory
CT503	The Blockage Mitigation in the Link of SATCOM-on-the-Move Based on LT Code
CT572	Emitter localization using a single moving observer based on UKF

SESSION 17

Oct. 29, 2017/13:00–15:45/ Chamber of Mist (West Wing, 2F) /馨雨阁，西楼 2 楼

PP. 76-79

CT368	Using Case-based Reasoning Method to Design a Return Merchandise Authorization System for Supply Chain Management in Internet of Thing
CT192	An Integrated Smart Surveillance System for Diseases Monitoring in Tropical Plantation Forests
CT299	The software architecture design of the telecom number service platform
CT319	Real-time Monitoring System for Containers in Highway Freight Based on Cloud Computing and Compressed Sensing

CT326	Microservices Architecture: Case on the Migration of Reservation-based Parking System
CT418	Vehicle Travel distance and time prediction using Virtual Detection Zone and CCTV Data
CT427	A Remote Test Method for Parking Detection System Based on Magnetic Wireless Sensor Network
CT471	The framework of vehicle emotion system
CT526	Flow Watermarking and Random Sampling Based Flow Trajectory Tracking Technology in Software Defined Network
CT534	A Study of Vehicular Desynchronization for Platooning Application
CT920	Design and implementation of constant pressure water supply monitoring system based on STM32

SESSION 18

Oct. 29, 2017/13:00–16:00/ Chamber of Dialogue (West Wing, 2F) / 相语堂，西楼 2 楼

PP. 79-82

CT090	Likelihood-gating SMC-PHD Filter
CT098	A Microstrip Dualband Bandstop Filter with Dualband Bandstop Resonators
CT113	A Miniaturized, Self-Actuated, Energy Selective Spatial Filter
CT218	IIR Digital Filter Design based on Cultural Quantum-inspired Flower Pollination Algorithm
CT222	Design and simulation of an adaptive filter in MIMO-PLC system
CT228	An Explicit Track continuity algorithm for the SMC-PHD Filter
CT277	Design of A Compact Dumbbell-Shape Twist Waveguide with Performance of Band-Pass Filtering
CT332	Research and design of an intelligent monitoring system for HF receiving based on completeness
CT345	A Novel Hybrid Digital-Analog Beamforming Algorithm with Uplink Training for TDD Systems
CT384	A Novel Waveform Design Method Based on Improved Ambiguity Function
CT570	OFDM MIMO Radar Waveform Design with High Range Resolution and Low Sidelobe Level
CT930	A D-band Monolithic Doubler in 70nm GaAs mHEMT process

SESSION 19

Oct. 29, 2017/13:00–15:30/ Chamber of Willow (West Wing, 2F) / 舒柳园，西楼 2 楼

PP. 83-85

CT042	Maximum Diversity Order Of SIMO High Mobility Systems with Imperfect Channel State Information
CT099	Beamspace Channel Estimation for 3D Massive MIMO Cellular System
CT120	Performance Comparison of LS,LMMSE Channel Estimation Method in Frequency and Time Domain for OQAM/OFDM systems
CT559	Channel Estimation for Power Line Communication
CT176	Direction-of-Arival Estimation Based on Differenceof L1 and L2 Minimization
CT402	Wideband FDD Massive MIMO Downlink Channel Estimation with New Pilot Design and Hybrid GAMP Algorithm
CT409	A Novel Low Rank LMMSE Channel Estimation Method in OFDM Systems
CT449	Wideband Massive MIMO OFDM Uplink Channel Estimation with Specific Partial-DFT Transform
CT485	Pilot Design for Channel Estimation in a Long-Tap Faster-than-Nyquist Signaling Transmission

CT508	A Low Complexity Millimeter Wave Multi-path Channel Estimation Algorithm Exploiting Directional Energy Elimination

SESSION 20

Oct. 29, 2017/16:15–19:00/ Chamber of Osmanthus (West Wing, 2F) /桂香居，西楼 2 楼

PP. 86-89

CT056	The Analysis of Measurement Method in the Knowledge System of Network Security Based on Information Entropy
CT070	NODE CACHING FOR CONTENT DISTRIBUTION IN MOBILE DELAY TOLERANT NETWORK
CT086	Physical Layer Security Transmission in Cognitive Radio Network Composed of Multi-Downlinks SU Network
CT333	Modeling Software Defined Security using Multi-level Security Mechanism for SDN Environment
CT355	Rumor Spreading and Monitoring Deployment in Online Social Networks
CT447	Anomaly Detection of Malicious Users' Behaviors for Web Applications Based on Web Logs
CT475	Intrusion Detection Study Based on the Distributed Collaboration Structure
CT486	Security Requirements for Virtual Network Function Isolation and Encryption
CT493	A Physical Layer Security Algorithm Based on Constellation
CT498	A Novel Physical Layer Error Correction and Encryption Method Based on Chaotic Sequence
CT568	Malware Propagation Analysis in Message-recallable Online Social Networks

SESSION 21

Oct. 29, 2017/16:15–19:00/ Chamber of Dew (West Wing, 2F) /浣花轩，西楼 2 楼

PP. 89-92

CT022	Optimal power splitting in wireless powered communication network with two-way relay
CT097	On Minimizing Average Packets Decoding Delay based on B-DLNC for Wireless Broadcasting
CT107	A Printed Quadrifilar-Helical Antenna for Ku-Band Mobile Satellite Communication Terminal
CT108	Game Theoretical Approach of Downlink Resource Allocation in 5G Wireless Fusion Networks
CT154	A coherent parameter calibration method for distributed array radar
CT217	Efficiency Improvement using Adaptive MCFS Scheme for future 5G Wireless Network
CT244	The Technology of Deviation Compensation for Radar Phantom Tracks
CT258	Low-Complexity RMS Delay Spread Estimation for Wireless OFDM Systems
CT281	Digital Automatic Gain Control Design with Large Dynamic Range in Wireless Communication Receivers
CT416	A D-S Evidence Theory Fault Diagnosis Method based on Mapreduce for SF6 High Voltage Switchgear
CT554	A Synchronization Acquisition Algorithm for Wireless Communication System in High Dynamic Environment

SESSION 22

Oct. 29, 2017/16:15–18:30/ Chamber of Mist (West Wing, 2F) /馨雨阁，西楼 2 楼

PP. 92-94

CT425	A 9-bit 10MSps SAR ADC with Double InputRange for Supply Voltage
CT025	Zone Coordinates: A New Coordinate System

CT119	Local Voltage Control in Distribution Networks: Game and Variational Inequalities
CT214	A position sensing device's application on TianMa Radio Telescope
CT261	Software Design of Bridge Health Monitoring System Based on Java-EE and Android
CT389	Research of Home Environment Surveillance System based on Wireless Sensor Network
CT404	A 24 to 52 GHz Broadband Power Amplifier in 65 nm CMOS Technology
CT478	Electromagnetic Scattering Modeling from Gaussian Rough Surface Based on SPM
CT519	Noise-reduced and Gain-Boosted 160GHz LNA in 65nm CMOS

SESSION 23

Oct. 29, 2017/16:15–18:30/ Chamber of Dialogue (West Wing, 2F) / 相语堂，西楼 2 楼

PP. 94-97

CT040	A routing recovery method based on structure properties and centralized control for inter domain routing system
CT093	A Method for Calibrating Standard Propagation Model in LTE system
CT106	Energy, Delay and Hop Count Multi-Constraints QoS Routing Algorithm for Wireless Ad-Hoc Networks
CT158	Performance Criteria of Optimal Sensing Algorithm for Time-varying Spectrum
CT304	An Asynchronous, Distributed Protocol for DC Power Management in a Smart Building
CT352	Security Improvement on a Biometrics-based Authentication Protocol for Multi-server Environment
CT361	SRR: A Lightweight Routing Protocol for Opportunistic Networks
CT445	A Collision-Predicted TDMA MAC Protocol in Centralized Vehicular Network
CT924	Design and Implementation of Multi - hops Wireless Sensor Network Routing Protocol Based on HEED

SESSION 24

Oct. 29, 2017/16:15–18:45/ Chamber of Willow (West Wing, 2F) / 舒柳园，西楼 2 楼

PP. 97-100

CT569	A Color Image Encryption Algorithm Using a New 1-D Chaotic Map
CT138	Influence of the Stop-and-hop Assumption on Synthetic Aperture Sonar Imagery
CT182	An Efficient Feature Selection Method for Network Video Traffic Classification
CT186	An Image Encryption Algorithm of Scrambling Binary Sequences by Improved Logistic Mapping
CT327	A Determination Method of Optimal Decomposition Level in Wavelet Threshold De-noising Algorithm Based on Moving Average Model
CT351	A Parametric Elastic Registration Method for Airborne Multispectral Line Scan Imager
CT433	Fast Single Image Dehazing Based on Color Cube Constraint
CT520	Research on Correcting Algorithm of QR Code Image's Distortion
CT539	Video Dual Watermarking Algorithm Against Geometric Attack Based on ASIFT and Contourlet Transform
CT557	Dual Watermarking Algorithm Based on Singular Value Decomposition and Compression Sensing

Poster Presentation

SESSION 1

< Mobile Communication and Network Technology>

Oct. 28, 2017/16:00–16:30/ Outside Jinjiang Hall

CT009	Research on Multi-target Resolution Process with the Same Beam of Monopulse Radar
CT055	Radio Resource Allocation Based on Dynamic User Division in OFDMA Cellular Relay Networks
CT065	Research on Hot Carrier Reliability of n-MOSFET in Deep Submicron Technology
CT072	Secrecy Cpacity of Artificial Noise Aided Rician/Rayleigh MIMO Channels
CT091	Interference Fair and Multi-Dimensional Cooperation Aware Virtual Cell Forming Algorithm for Ultra Dense Network
CT111	Research and Implementation of Reliable Dynamic Access Based on Cognitive Radio
CT145	Simultaneous Generation and Transmission of Ultra-Wideband Wireless Signals and Baseband Wired Signals
CT195	Adaptive Coded Modulation Based on Partial Channel Information for Mobile Satellite Systems
CT196	The Research of Influence of Erection to High-Elevation Radiant Characteristic of The Three-Wire Antenna
CT198	A Wideband Circularly Polarized Antenna with an AMC Reflector for Navigation Satellite Systems
CT201	Dual Frequency Band and Polarization Reconfigurable Antenna for Mobile Devices
CT226	A Survey of Routing Protocols for Highly Dynamic Mobile Ad Hoc Networks
CT247	A Checkerboard Metasurface for Ultra-wideband Radar Cross Section Reduction
CT253	UAV Path Planning Under Obstacle-avoidance Constraints Based on Ant Colony Optimization Algorithm
CT273	Filtered-OFDM System Performance Research Based On Nuttall's Blackman-Harris Window
CT287	A novel algorithm for peak-to-average power ratio reduction in FBMC-OQAM system
CT297	Energy-efficient Microcell Base Station Power Control in Heterogeneous Cellular Network
CT314	Cooperative Relay MAC Protocol for Ad Hoc Networks
CT329	Research on Spectral Reconstruction Technology Based on Fourier Transform
CT359	A Novel GPP-Based Buffer Management Method for IP data in Baseband Process of C-RAN
CT365	DFT-Based Channel Estimation with Training-Based Selection of CIR Samples for OFDM Systems
CT411	A Service Migration Strategy Based on Multiple Attribute Decision in Mobile EdgeComputing
CT431	Optimization and Verification of OpenVPX-based 10Gbps Interconnection
CT484	Physical Layer Security in Wireless-Powered Networks with Untrusted Relays
CT532	A Secure Positioning Algorithm Against Sybil Attack in Wireless Sensor Networks Based on Number Allocating

SESSION 2

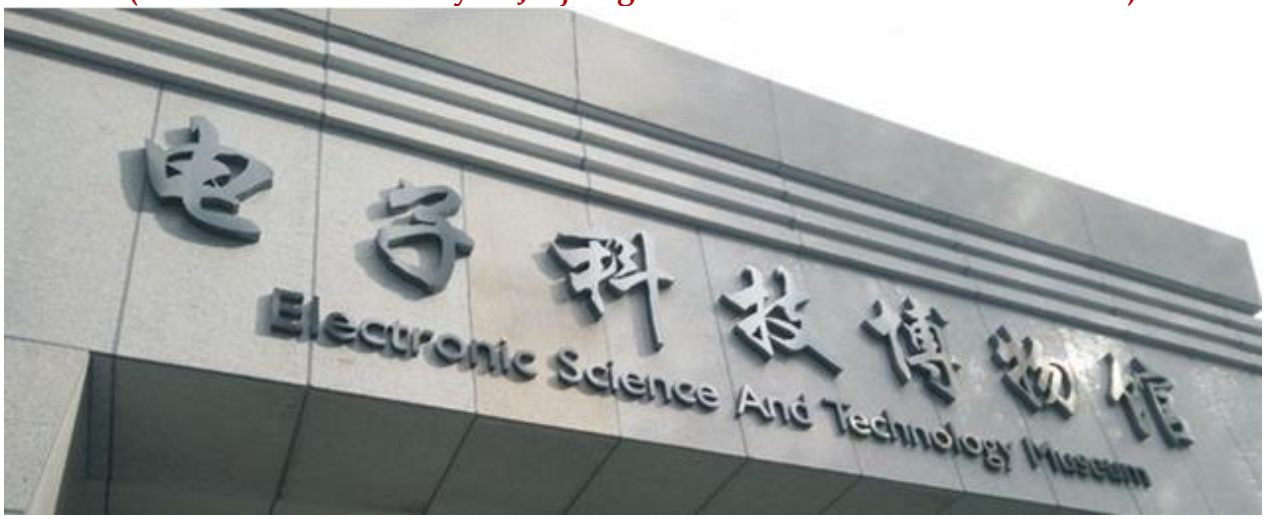
<Computer Science and Image Processing>

Oct. 29, 2017/16:00–16:30/ Outside Jinjiang Hall

CT077	A Three-dimensional HT-TBD Algorithm Based on Dynamic Bias Compensation Under Ambiguity of Range and Velocity
CT114	Design of a broadband circuit analog absorber based on double rings structure
CT132	Sensitivity Analysis of Ring Oscillator Based Hardware Trojan Detection
CT134	Design of Security Positioning and Remote Network Server Monitoring Terminal
CT143	Adaptive Optimal Kernel Time Frequency Transform for Fast Moving Targets
CT250	A two-level reasoning method based on SVM_RETE algorithm in industrial environments
CT266	CCD Imagers MTF Enhanced Filter Design
CT294	Satisfying Link Perturbation and k-out anonymous in social network privacy protection
CT298	A stable algorithm for parameter identification in heat conduction equations
CT312	A Differentiated DBN Model Based on CRBM for Time Series Forecasting
CT320	Web Content Information Extraction Based on DOM Tree and Statistical Information
CT512	Anti-Clutter High Resolution Two Dimensional Imaging Method in Measurement Fields based on SAR and ISAR
CT516	Image Processing Based Proposed Drone for Detecting and Controlling Street Crimes
CT552	Adaptive Small Target Detection Based on Least Squares and Human Visual System
CT908	An Efficient RFID Tag Cardinality Estimation Protocol based on Bit Detection

Brief Introduction of Electronic Science and Technology Museum in UESTC (Oct. 27, 13:30-17:00)

(Gather at South Lobby of Jinjiang Hotel at 13:15 and Set out at 13:30)



Electronic Science and Technology Museum is the first comprehensive museum about electronic science and technology in China, which aims at recording important characters and events that promoted the development of electronic science and technology, especially in China, by using representative devices in the history of the development of electronic science and technology. It was proposed in April, 2015 and established in September, 2016.

Next to the lake which is in the west of campus and located the Academic lecture hall 1F, the Museum covers an area of about 2,000 square meters in the Qingshuihe Campus of UESTC. It consists of 6 units, including communication, radar, radio & television, electronic measuring instruments, electronic components and computers.

Adopting the method of displaying, museum combines online and offline with indoor and outdoor, which fully plays a role in Professional education, scientific research, cultural inheritance, and serving teachers and students in schools, alumni, profession and the whole society.

中文名称	English
第一单元：通信展厅	Part I: Communication Hall
1. 电报	Telegraphy
2. 电话与交换设备	Telephone and switch equipment
3. 无线与移动通信	Wireless and mobile communication
4. 卫星通信	Satellite communication
5. 光通信	Optical communication

中文名称	English
第二单元：雷达展厅	Part II: Radars Hall
军用雷达	Military radar
民用雷达	Civil radar

中文名称	English
第三单元：广播电视展厅	Part III: Radios and Televisions Hall
广播	Radio
电视	Television

中文名称	English
第四单元：电子测量仪器展厅	Part IV: Electronic Measuring Instruments Hall
模拟时代	Analog machine era
数字时代	Digital machine era
智能时代	Intelligent machine era
虚拟时代	Virtual machine era

中文名称	English
第五单元：电子元器件展厅	Part V: Electronic Components Hall
第六单元：计算机单元	Computers Hall
展望未来	Future Prospect
序厅	Preface Hall

展品中文名	Exhibits	Description of Exhibits
通信单元 Communication		
西藏 450MHz 通信系统“好易通”基站	450MHz "Haoyitong" Communication Base Station	The communication base station in the highest elevation in the world when it was built. It once served Zhaxigang Village next to Qomolangma.
华为 C&C08 数字程控交换机	Huawei C&C08 Digital and Program-Controlled Switch	
BD055 型电传打字机	BD055 Teletypewriter	The first self-developed teletypewriter in China in 1960s
马可尼收讯机和发射机	Marconi Receivers and Transmitters	
雷达单元 Radar		
X 波段大天线阵列成像雷达实验系统	X-Band Imaging Radar Experimental System	The system was first developed by professors in UESTC in 1991, making breakthrough in imaging radar of China.
大功率速调管	High-Power Klystron	The components in 7010 radar, which is the first-generation pre-warning radar in 1970s
860 炮瞄雷达	860 Gun-Pointing Radar Vehicle	The only radar vehicle that could work in all meteorological conditions during Vietnam War. It shot down more than 600 military airplanes at that time.

广播电视单元 Radio & Television		
北京牌 825-2 型电子管黑白电视机	Beijing-Brand 825-2 Vacuum Tube Monochrome Television	The television was produced by State-Operated Radio Factory in Tianjin in 1960s
钢丝录音机	Wire Recorder	
上海牌 104-5 型电子管黑白电视机	Shanghai-Brand 104-5 Vacuum Tube Monochrome Television	In 1960s, 14-inch monochrome televisions made of vacuum tube in Type 104 Series were the televisions produced by Shanghai Broadcast Equipment Factory, which lasted the longest time, from July in 1964 to November in 1977. These televisions were the dominant products in the market at that time.
美国珍妮诗落地式收音机	Zenith Console Radio	The FM radio in the first generation in 1941
电子测量仪器 Electronic Measuring Instrument		
优利德 UTD2000 数字存储示波器	UTD2000 Digital Storage Oscilloscope	The Oscilloscope exploited was developed together by UESTC and Uni-Trend, and it is the electronic measuring instrument exported at the earliest time
万用表	Multimeter	The AVO 8 MKII Multimeter was most advanced in Britain in 1950s
无人飞机低空遥感系统	Unmanned Aerial Low-altitude Remote Sensing System	The system was used for photographing of barrier lakes in the Earthquake happening in Wenchuan on May 12th, 2008. It collected the information of remote sensing images of all barrier lakes in major disaster area.
电子元器件 Electronic Component		
信芯	Hiview	The first digital video processing chip with proprietary intellectual property rights of China
太赫兹回旋管	Terahertz Gyrotron	Chinese first 220GHz terahertz gyrotron developed independently by UESTC.
负阻磁控管	Negative-Resistance Magnetron	The component produced in the United State in 1930s~1940s.
波导元件	Waveguide Component	It was produced by UESTC according to the Soviet Union's expert Lebedev's drawings in 1958.
计算机 Computer		
DJS 131 小型数字计算机	DJS 131 Small-Sized Digital Computer	The small-sized digital computer was produced by Chinese independently in 1970s.

龙芯	Chips of Godson Series	The first general-purposed CPU exploited independently by China
银河壹号巨型计算机	Galaxy-I Super Computer	The first super computer in China with the operation speed exceeding 100 million times per second was produced by Computer Research Institute in National University of Defense and Technology in Changsha city in 1983.
Apple-II 个人电脑	Apple-II PC	

Charming Chengdu SHOW (Jinjiang Hall, 19:00, Oct. 28)

Charming Chengdu Show consists of Dancing Show, Folk Music, Acrobatic Show, Changing Faces, Fire Spitting.

Brief Introduction of Changing Faces:

Changing Faces is one of highlights of Sichuan Opera. Face changing is not simply changing one's facial makeup in a casual way, but a special technique in the performance of Sichuan Opera. It refers to the changing of masks in quick succession to show different emotions and feelings of the character in the play.

Face-changing techniques generally fall into three categories, "wiping", "blowing" and "pulling".

"Wiping" is to spread the paint over the face while performing. The paint is put on a certain part of the face in advance. "Blowing" is only employed when powder cosmetics are used. On the stage, a tiny box with powder cosmetics in it is placed before hand. A movement of prostration near the box will enable the performer to blow the powder onto his face. When one is going to use the "pulling" technique he has to draw facial masks on fine pieces of silk cloth, cut them into the right size, tie a thin thread to each mask and stick them onto his face before the performance. The threads are fastened to somewhere hidden in his costumes. Many performers prefer to tie them onto their waistbands. When performing, the artist would pull the mask off one after another under the cover of various dancing movements.

Recommended Attractions

Chengdu Research Base for Giant Panda Breeding（成都大熊猫繁育研究基地）

Located just 6 miles (10km) from downtown Chengdu, this is the most convenient place for visitors to see the giant pandas at a close range.
It opened to the public in 1988 and now consists of a research center, an open research laboratory, a veterinary hospital, an enclosure, and a playground for giant pandas. It is regarded as the most important panda sanctuary in the world dedicated to the protection of the giant pandas and other endangered species.

Jinsha Relics Museum（金沙遗址）

The Jinsha Relics are the relics of the Jinsha Villiage, Supo Town, northwestern Chengdu, dating back to the Shang (1600-1046 B.C.) and Zhou dynasties (1046-225B.C.). The place used to be the capital of the Ancient Shu Kingdom, a center of ancient civilization along the upper reaches of the Yangtze River during the 12th to 7th centuries B.C.

The 300,000-square-meters museum is used to preserve and display the Jinsha relics and other archaeological finds. A large number of ivory, gold and jade pieces are on show now. Retrieved in 2001, the relics are regarded "the most significant archaeological discovery of the 21st century in China."

Du Fu's Thatched Cottage Museum （杜甫草堂）

The Du Fu's Thatched Cottage Museum in the western end of downtown Chengdu is a park and museum in honor of Du Fu (712 - 770), the greatest realistic poet in the Tang Dynasty (618 - 907). Adjacent to the Huanhuaxi Park and Sichuan Museum, the thatched cottage was Du Fu's residence where he lived for four years and wrote about 240 poems. Having undergone extensive renovations and having been brought under national protection, the park has become a national cultural heritage site and one of the most famous historical attractions in Chengdu. Covering an area totaling 200,000 square meters, the park features serene and poetic ambience, lush greenery and tranquil walking paths.

Wuhou Shrine Museum（武侯祠）

Located in the south of Chengdu's city center, the Wuhou Shrine (Temple of Marquis Wu) is the most influential museum of the Three Kingdoms (220AD - 280AD) culture in China. Integrated with tombs of Liu Bei (161AD - 223AD), the king of Shu, and Zhuge Liang (181AD - 234AD), a great military and political strategist and Prime Minister of the Shu, the shrine was built in the Western Jin Period (265AD - 316AD).

Kuan & Zhai Alley （宽窄巷子）

Being in the list of Chengdu Historical and Cultural Protection Project, Kuan & Zhai Alley historical & cultural district consists of Kuan Lane, Zhai Lane and Jing Lane, which are in parallel arrays running from east to west with a group of quadrangles. It is one of the three major historical & cultural conservation areas in Chengdu, it is not only the last relic of the city pattern of "thousand-year-old young city" and the one-hundred-year original architectural structure of old Chengdu, but also the only existing copy in southern China from the lane (Hutong) culture and architectural style of northern China. According to the plan, the control area is 479mu (1mu=1/15 hectare), in which the kernel conservation area covers 108mu.

At present, the ancient walls, aged bricks and old gates here are much stronger than before after the reconstruction. Moreover, the combination of business and culture has become the most leisurely, fashionable and unique courtyard consumption experiencing area.

Jinli Acient Street （锦里）

Right next to the Wuhou Shrine is Jinli Promenade, a rebuilt trading and folk art street imitating the ancient-style buildings in West Sichuan. "Jinli" is the name of an old street in Han-dynasty Chengdu, meaning "make perfection still more perfect and hide the universe in the universe". The ancient Jinli was one of the oldest and the most commercialized streets in the history of West Shu and had been well-known throughout the country in Qin, Han, and Three Kingdoms Periods.

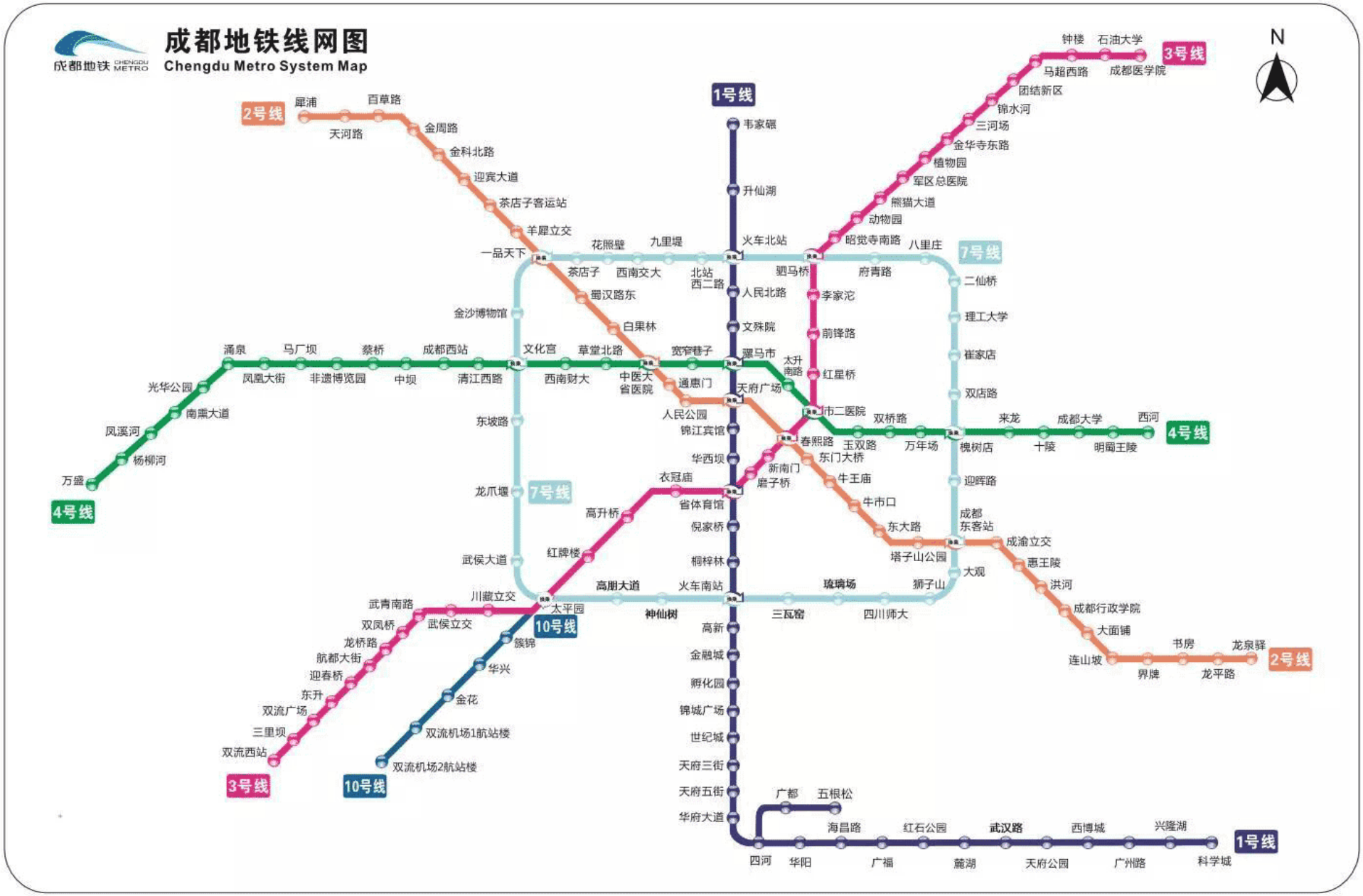
Wenshu Monastery（文殊院）

The Wenshu Monastery is the largest well-preserved Buddhist temple in downtown Chengdu. It was built in the Tang Dynasty (618 - 907) and is dedicated to Wenshu (Manjushri, the God of Wisdom). It is famous for abundant precious cultural relics, paintings and calligraphic works. Over 500 pieces of paintings and calligraphies by celebrities, including Zhang Daqian, Zheng Banqiao and Feng Zikai, etc. , have been stored here since the Tang and Song dynasties.

Dujiangyan Irrigation System（都江堰）

Dujiangyan is an irrigation infrastructure built by Governor Li Bing of the Qin State in 256 B.C., during China's Warring States Period (476-221 B.C.). It is situated on the Min River in Sichuan Province, near its capital Chengdu.

Dujiangyan is the only existing ancient hydro-power project, featuring diversions without a dam, in the world. It is widely regarded as the "ancestor" of the world's modern hydro-power culture, with a history dating back over 2,200 years. It also functions as a means to prevent floods and facilitate plain shipping. It is still in use today, irrigating over 5,300 square kilometers (530,000 hectares) of the region's land.


成都地铁 CHENGDU METRO
成都地铁线网图
Chengdu Metro System Map
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1号线
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7号线
10号线
犀浦
百草路
天河路
金周路
金科北路
迎宾大道
茶店子客运站
羊犀立交
一品天下
花照壁
九里堤
火车北站
韦家碾
升仙湖
北站西二路
人民北路
文殊院
骡马市
天府广场
人民公园
锦江宾馆
华西坝
龙爪堰
东坡路
金沙博物馆
蜀汉路东
白果林
茶店子
西南交大
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草堂北路
宽窄巷子
通惠门
中医大省医院
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光华公园
南熏大道
凤溪河
杨柳河
万盛
钟楼
石油大学
马超西路
成都医学院
团结新区
锦水河
三河场
金华寺东路
植物园
军区总医院
熊猫大道
动物园
昭觉寺南路
八里庄
驷马桥
府青路
李家沱
前锋路
红星桥
太升南路
市二医院
双桥路
春熙路
东门大桥
新南门
磨子桥
牛王庙
牛市口
东大路
塔子山公园
成都东客站
成渝立交
惠王陵
洪河
成都行政学院
大面铺
连山坡
界牌
龙平路
书房
龙泉驿
二仙桥
理工大学
崔家店
双店路
迎晖路
大观
狮子山
来龙
成都大学
十陵
明蜀王陵
西河
槐树店
玉双路
万年场
衣冠庙
省体育馆
倪家桥
桐梓林
高升桥
红牌楼
武侯大道
川藏立交
太平园
高朋大道
神仙树
火车南站
琉璃场
三瓦窑
四川师大
武侯立交
武青南路
双凤桥
龙桥路
航都大街
迎春桥
东升
双流广场
三里坝
双流西站
簇锦
华兴
金花
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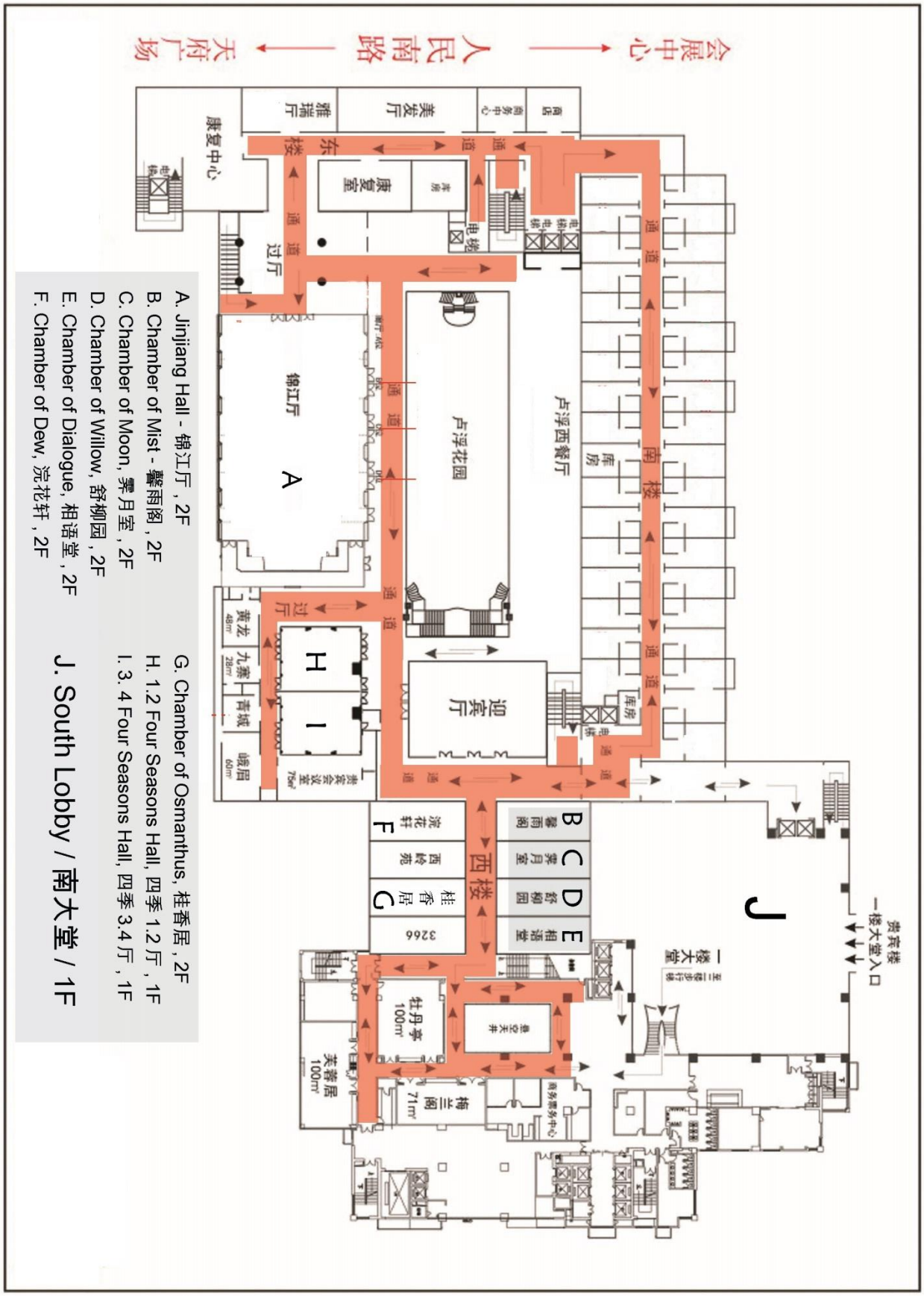
双流机场2航站楼
高新
金融城
孵化园
锦城广场
世纪城
天府三街
天府五街
华府大道
广都
五根松
四河
华阳
海昌路
广福
红石公园
麓湖
武汉路
天府公园
西博城
广州路
兴隆湖
科学城

Layout



A. Jinjiang Hall - 锦江厅 , 2F
B. Chamber of Mist - 馨雨阁 , 2F
C. Chamber of Moon, 霁月室 , 2F
D. Chamber of Willow, 舒柳园 , 2F
E. Chamber of Dialogue, 相语堂 , 2F
F. Chamber of Dew, 浣花轩 , 2F
G. Chamber of Osmanthus, 桂香居 , 2F
H. 1.2 Four Seasons Hall, 四季 1.2 厅 , 1F
I. 3. 4 Four Seasons Hall, 四季 3.4 厅 , 1F

J. South Lobby / 南大堂 / 1F

Note