Conference Abstracts

ICCS 2020

2020 IEEE 2nd International Conference on Circuits and Systems

Dec. 10–13, 2020 | Chengdu, China

Co-organized by

Technically Sponsored by

Published by

Welcome Message

2020 IEEE 2nd International Conference on Circuits and Systems (ICCS 2020) is strengthening as an event of increasing interest in the areas of Circuits and Systems.

We characterized this event as "a privileged space to discuss current matters related to Circuits and Systems". The aim of ICCS is, in fact, to be a privileged space for face-to-face discussion, in which we speak directly with each other, agreeing or disagreeing, but always in deep mutual respect, while indirectly overcoming educational or cultural differences.

Unfortunately, this year we cannot speak face-to-face due to COVID-19. But this cannot stop conference to be held online and it's great honor to invite two keynote speakers: Prof. Mohamad SAWAN from Westlake University, China (IEEE Fellow) and Prof. Vladimir Terzija from Shandong University, China (IEEE Fellow), sharing latest research progress in circuits and systems. Six invited speakers: Prof. Wang Kang from Beihang University, China, Prof. Jayakumari. J from Mar Baselios College of Engineering and Technology, India, Prof. Xiaohang Wang from South China University of Technology, China, Dr. Yuan Gao from Southern University of Science and Technology, China, Prof. Hui Chen from University of Electronic Science and Technology of China and Dr. Yanlong Zhang from Xi'an Jiaotong University, China will discuss their experience in circuits and systems; two tutorial speakers: Prof. Nan Qi from University of Chinese Academy of Sciences, China and Prof. Maliang Liu from Xidian University, China will share their innovative technical contributions and applications throughout the conference, addressing some of the most complex technologies in the circuits and systems fields.

We must continue to discuss and deepen the solutions, through research and educational changes, so we decided to keep this year's edition of ICCS 2020, even though in an online format.

Le tian Huang

ICCS 2020

Conference Chair

University of Electronic Science and Technology of China

Publications

Conference Proceedings

IEEE

ISBN: 978-1-7281-9122-5
Index: EI Compendex, Scopus

SCI Special Issue

"Special Issue on Circuits and Systems for Internet of Things (IoT)"

Clarivate Analytics
Compendex
Scopus

CiteScore: 2.7
Impact Factor: 1.405
Index: SCI, EI, Scopus

Conference Workshop

"Workshop on Circuits and Systems for Artificial Intelligence (AI)"

Scopus
Inspec
CNKI 中国知网 www.cnki.net

ISSN: 1674-862X
Index: Scopus, Google Scholar

Table of Contents

Conference Program

December 10 THU	December 11 FRI		December 12 SAT		December 13 SUN	
Zoom Link: https://zoom.com.cn/j/65799113155						
10:00-12:00 Test Day	9:30-9:40	Opening Remarks Prof. Letian Huang	9:30-10:00	Invited Speaker 3 Prof. Xiaohang Wang	9:30-11:30	Session 4
	9:40-10:30	Keynote Speaker 1 Prof. Mohamad SAWAN	10:00-10:30	Invited Speaker 4 Dr. Yuan Gao	11:40-12:00	Closing
	10:30-10:40	Break	10:30-10:40	Break		
	10:40-11:10	Invited Speaker 1 Prof. Wang Kang	10:40-12:10	Session 2		
	11:10-11:40	Invited Speaker 2 Prof. Jayakumari. J				
	14:20-15:00	Tutorial 1 Prof. Nan Qi	14:00-14:40	Tutorial 2 Prof. Maliang Liu	14:00-15:00	Replay
	15:00-15:50	Keynote Speaker 2 Prof. Vladimir Terzija	14:40-15:10	Invited Speaker 5 Prof. Hui Chen		
	15:50-16:00	Break	15:10-15:20	Break		
	16:00-17:45	Session 1	15:20-15:50	Invited Speaker 6 Dr. Yanlong Zhang		
			15:50-17:20	Session 3		

- Session 1-Electronics and Circuit System: CS024, CS029, CS025, CS023, CS028, CS037, CS026
- Session 2-Electronic Equipment and Component Development: CS4004, CS021, CS031, CS035, CS041, CS4003
- Session 3-Electronic Engineering and Control System: CS4005, CS036, CS038, CS039, CS042, CS4002
- Session 4-Electronic and Communication Engineering: CS003, CS001, CS022, CS018, CS027, CS034, CS017, CS040

Presentation Guidance

THU, December 10, 2020 — Test	
Zoom Link: https://zoom.com.cn/j/65799113155	
10:00-11:00	CS024, CS029, CS025, CS023, CS028, CS037, CS026 CS4004, CS021, CS031, CS035, CS041, CS4003
11:00-12:00	CS4005, CS036, CS038, CS039, CS042, CS4002 CS003, CS001, CS022, CS018, CS027, CS034, CS017, CS040

Time Zone
Beijing Time (GMT+8)
You're suggested to set up the time on your computer in advance.

Platform
ZOOM

Environment Needed
A quiet place
Stable internet connection
Proper lighting and background

Voice Control Rules
- The host will mute all participants while entering the meeting.
- The host will unmute the speakers' microphone when it is turn for his or her presentation.
- Q&A goes after each speaker, the participant can raise hand for questions, the host will unmute the questioner.
- After Q&A, the host will mute all participants and welcome next speaker.

Oral Presentation
- Timing: a maximum of **15 minutes** in total, including 3 minutes for Q&A. Please make sure your presentation is well timed.
- It is suggested that the presenter email a copy of his/her video presentation to the conference email box as a backup in case any technical problem occurs.

***Conference Recording**
- The whole conference will be recorded. We appreciate you proper behavior and appearance.
- The recording will be used for conference program and paper publication requirements. The video recording will be destroyed after the conference and it cannot be distributed to or shared with anyone else, and it shall not be used for commercial nor illegal purpose. It will only be recorded by the staff and presenters have no rights to record.

Conference Committee

Advisory Chair

Vladimir Terzija *Shandong University, China (IEEE Fellow)*

Conference Chairs

Letian Huang *University of Electronic Science and Technology of China*

Esteban Tlelo-Cuautle *National Institute of Astrophysics, Optics and Electronics, INAOE*

Program Chairs

Hideharu Amano *Keio University*

Xiaohang Wang *South China University of Technology*

Wang Kang *Beihang University*

Jayakumari. J *Mar Baselios College of Engineering and Technology*

Local Organization Chair

Qun Zhou *Sichuan University*

Local Organizing Committee

Wei Jiang *University of Electronic Science and Technology of China*

Hai Wang *University of Electronic Science and Technology of China*

Qihong Huang *Chengdu University of Information Technology*

Publication Chair

Zhang Tian *Sichuan University*

Publicity Chairs

Meng Zhang *Southeast University*

Tae Hyoung Kim *Nanyang Technological University*

Tutorial Chair

Yong Chen *University of Macau*

Tutorial Co-Chair

Bo Zhao *Zhejiang University*

Treasure

Huanhuan Liu *Sichuan University*

Technical Committee

Anthony Kong	*Hong Kong Design Institute*
Ce Zhou Zhao	*Xi'an Jiaotong-Liverpool University*
Chi-Seng Lam	*University of Macau*
Chong Li	*University of Glasgow, UK*
D. G. Liu	*Feng Chia University*
Daniel Mueller-Gritschneder	*Technische Universitaet Muenchen*
David Hicks	*Texas A&M University*
Francesco Ponzio	*Polytechnic University of Turin*
Haibing Wang	*Hohai University*
Hailong Jiao	*Peking University Shenzhen Graduate School*
Haiying Yuan	*Beijing University of Technology*
Hao Gao	*Eindhoven University of Technology*
Haruo Kobayashi	*Gunma University*
M. C. Wang	*Minghsin University of Science and Technology*
Mo Huang	*University of Macau*
Paul Zhou	*Analog Devices*
Shagun Bajoria	*Eindhoven university of Technology*
Sijun Du	*Delft University of Technology*
Smitha K. G.	*Nanyang Technological University*
Wei Liu	*Chongqing University of Technology*
Wen-Shiung Lour	*National Cheng Kung University*
Xiangyu Meng	*SUN YAT-SEN University*
Xiaohang Wang	*South China University of Technology*
Xiaozong Huang	*CETC*
Yongbing Hu	*Anhui University*
Zhiguo Yu	*Jiangnan University*

Keynote Speaker

Prof. Mohamad SAWAN
Westlake University, China
IEEE Fellow

Mohamad Sawan received the Ph.D. in electrical engineering from Sherbrooke University, Canada. He was a Professor of Microelectronics and Biomedical Engineering in Polytechnique Montréal (1991-2018), and Founder of Polystim Neurotech Labs, was awarded the Canada Research Chair in Smart Medical Devices (2001-2015) and was leading the Microsystems Strategic Alliance of Quebec (1999-2018). He is Founder of NEWCAS and Co-Founder of BioCAS Conferences. He is Emeritus Professor of Polytechnique Montréal. Currently, he is Chair Professor in Westlake University, China, where he is Founder of the Center for Biomedical Research and INnovation (CenBRAIN). Dr. Sawan was Editor-in-Chief of the IEEE Transactions on Biomedical Circuits and Systems (2016-2019). He published more than 800 peer reviewed papers. He received several awards (Queen Elizabeth II Golden Jubilee Medal, Bombardier, Jacques-Rousseau, Shanghai International Collaboration Award, etc). He is Fellow of the IEEE, of the Canadian Academy of Engineering, and of the Engineering Institutes of Canada, and he is "Officer" of the National Order of Quebec.

Bioelectronics for the Diagnostic and Treatment of Neurodegenerative Diseases

Presentation Time: 9:40-10:30, Dec. 11

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—Wearable and implantable Biosystems intended for the diagnostic and treatment of neurodegenerative diseases are promising alternatives to study neural activities underlying cognitive functions and pathologies, and eventually to recover lost neural vital functions. Biosensors and corresponding signal/image processing are a large variety of emerging technologies. However, treatment remains much less developed including drugs, and surgery. This talk covers circuit and system techniques intended to implement smart medical devices, which are System-on-Chip based components dealing with multidimensional design challenges such as power management, low-power high-data rate wireless communication, and reliable harvesting energy methods. Application-specific system architectures, and dedicated building blocks (RF front-end, various load interfaces, active rectifiers, etc) and corresponding experimental results will be demonstrated. Case studies of intracortical neurorecording, and subsequent microstimulation in various regions of the brain for two main applications: 1) the primary visual cortex intended to recover vision for the blind, and 2) Epileptic seizure foci localization, onset detection and treatment, and prediction. In addition, biosensors intended for neurotransmitters and other living cells characterization will be summarized. These devices require wireless power management, packaging, etc, and are built around miniaturized platforms, including various sensing arrays. On the other hand, new generation of devices intended to enhance bladder functions (volume/pressure measurement, urine voiding and/or continence) will be summarized, and an electronic artificial urinary sphincter to manage voiding will be presented.

Keynote Speaker

Prof. Vladimir Terzija
Shandong University, China
IEEE Fellow

Vladimir Terzija was born in Donji Baraci (former Yugoslavia). He received the Dipl-Ing., M.Sc., and Ph.D. degrees in electrical engineering from the University of Belgrade, Belgrade, Serbia, in 1988, 1993, and 1997, respectively. He is Distinguished Professor at the Shandong University, Jinan, China, where he has been since 2013. From 1997 to 1999, he was an Assistant Professor at the University of Belgrade, Belgrade, Serbia. From 2000 to 2006, he was a senior specialist for switchgear and distribution automation with ABB, Ratingen, Germany. From 2006 to 2020 he was the EPSRC Chair Professor in Power System Engineering with the School of Electrical and Electronic Engineering, The University of Manchester, Manchester, U.K. His current research interests include smart grid applications; wide-area monitoring, protection, and control; multi-energy systems; switchgear and transient processes; ICT, data analytics and digital signal processing applications in power systems.

Prof. Terzija is Editor in Chief of the International Journal of Electrical Power and Energy Systems, Alexander von Humboldt Fellow, Fellow of IEEE, as well as a DAAD and Taishan Scholar. He is the recipient of the National Friendship Award, China (2019). Since 2018, he is the National Thousand Talents at the Shandong University, China.

Advanced Monitoring and Control of Future Power Systems

Presentation Time: 15:00-15:50, Dec. 11

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—As a result of high penetration of Converter Interfaced Generation (CIG), also called nonsynchronous generation, converter connected demand and mixed ac-dc transmission and even distribution networks, the nature of operation of modern electrical power systems became a challenge. The nature of the entire system became more complex, expressed in quite a new dynamics, but also a new way how to monitor, protect and control such a new system, the system playing one of the most critical role in progressing modern societies, the system enabling functioning of other critical infrastructures in all countries. On the other hand, availability of modern sensor and ICT technology opened new paradigms for coping with previously described challenges. The presentation is aiming of addressing new approaches of monitoring, protecting and controlling future electrical power systems. In this context, some of typical PMU-based Wide Area Monitoring, Protection and Control applications, also model-free and data driven, will be discussed and presented. Experience gathered from 3 flagship multi-million projects funded by Ofgem (UK) Network Innovation Competition, VISOR, EFCC and FITNESS projects, will be summarized and also discussed from the perspective of their extension to another level: integration of different energy systems and approaches for their operation, fostering flexibility and resilience of particular energy systems. The presentation will also attempt to demonstrate some of results achieved through hardware in the loop testing using Real-time Digital Simulator (RTDS).

Tutorial Speaker

Prof. Nan Qi
University of Chinese Academy of Sciences, China
Member of IEEE SSCS, CAS, OSA

Nan Qi received the M.S. and Ph.D. degree from the Institute of Microelectronics, Tsinghua University in 2008 and 2013 respectively. From 2010 to 2013 he led the GNSS group building high-sensitivity RF receivers. From 2013 to 2015, he was with the department of EECS, Oregon State University, Corvallis, OR, as a research scholar, working on high-speed CMOS driver for optical links. From 2015 to 2017, he was with Hewlett-Packard Labs, Palo Alto, CA, as a post-doc researcher and senior circuit-design engineer on silicon-photonics and electronic-photonic integration. Since 2017, he has been with the Institute of Semiconductors, Chinese Academy of Sciences, Beijing, as a full professor on the high-speed silicon EPIC for high-density optical interconnects. Dr. Qi is a member of IEEE SSCS, CAS and OSA society, and serves as a TPC member for IEEE ICTA.

CMOS ICs and Silicon Photonics Co-design for High-Speed Optical Communications

Presentation Time: 14:20-15:00, Dec. 11

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—The data-center (DC) and high-performance computing (HPC) is asking for an ever-growing interconnect bandwidth. High-speed CMOS integrated circuits play the key role in both O/E and E/O conversions. Recently, Silicon photonics integrates large-scale optical devices with electrical circuits in the CMOS-compatible process, enabling the high-density and power efficient optical interconnects in DC and HPS. This course focuses on the high-speed integrated circuits, especially the CMOS drivers and TIAs codesigned for silicon photonic links.

In this lecture, we start from the special demands raised by new silicon photonics devices. Design challenges in both the system-level and circuit-level will be discussed. After that, we will analyse circuit implementations of the driver, TIA and equalizer, especially for the next generation 400GbE optical interconnects. Finally, we will discuss the E/O co-design techniques for silicon photonic transceivers. Some recent works will be reviewed, including the high-speed CMOS drivers and receivers.

Tutorial Speaker

Prof. Maliang Liu
Xidian University, China
Huashan Scholar Distinguished Professor of Xidian University

MaLiang Liu received the B.S degree in electronic and information engineering and the M.S. degrees in radar signal processing and the Ph.D. degree in microelectronics from Xidian University, Xi'an, China, in 2008, 2011 and 2014. From 2017 to 2019, he was an associate professor with the school of microelectronics, Xidian University, Xi'an, China. Since January 2020, he is one of the Huashan Scholar Distinguished professors, Xidian University, Xi'an, China.

His research interests include ADC/DAC, single-chip mm/RF radar, and 3D-ToF sensor. He has presided more than 10 national projects, with a total funding of more than 20 million yuan. Professor Liu has published more than 40 papers in IEEE TCAS I / II, IEEE TMTT, IEEE Sensors J, IEEE TVLSI, IEEE TI & M, MEJ and other journals. He has authorized more than 10 national patents and applied for more than 30 national patents. The LiDAR and the BioRadar he designed won the gold and bronze medal of the China College Students' 'Internet Plus' Innovation and Entrepreneurship Competition respectively. And he has instructed the graduate students to win two special prizes and one first prize in the CPIPC.

The CMOS 3D-TOF LiDAR based SPAD and Si-PM

Presentation Time: 14:00-14:40, Dec. 12

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—This tutorial investigates D-TOF and I-TOF LiDAR methods for Automotive Advanced Driver Assistance System (ADAS), robots, consumer electronics and focus on LIDAR based on SPAD and Si-PM technology. By the aid of a SPAD FLASH LiDAR and a Si-PM line array LIDAR, we will detail their different architectures complete implementations prototyped in CMOS technology and illustrate how to perform monolithic integration and anti-interference. Finally, the state-of-the-art of the SPAD and Si-PM LiDAR design is summarized and its tendency will be discussed as well.

Invited Speaker

Prof. Wang Kang
Beihang University, China
Senior Member of IEEE

Wang KANG received the joint double Ph.D degrees in physics from University of Paris-Sud, France, and in Microelectronics from Beihang University, China. He is now an Associate Professor in School of Microelectronics at Beihang University. His research interest includes spintronics and its related devices, circuits and architectures. He has co-authored 3 book chapters, 20 Chinese patents and over 80 scientific papers, including Nature Electronics, Proceeding of the IEEE, IEEE Trans. Circ. Syst. I: Reg. Papers, IEEE Trans. Computers, IEEE Trans. Electron Devices, IEEE Electron Devices Lett., Physical Review Applied, DAC, DATE, ASP-DAC, GLSVLSI etc. He has been severing as guest editors of "SPIN" and "Microelectronics Journal". He is a Senior Member of IEEE.

Computing in Memory for Edge Neural Networks

Presentation Time: 10:40-11:10, Dec. 11

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—Utilizing emerging nonvolatile memories, particularly, with the computing-in-memory architecture, to accelerate deep neural networks (DNNs) has been considered as a promising approach to solve the bottleneck of "memory wall" in Von Neumann architecgure. Realization of the unity of computing and memory in the same place has opened up a promising research direction to reduce the data transfer and the related power consumption. According to the principle for MAC operations in DNN, the state-of-the-art techniques can be mainly divided into three routes. The first one is based on the "stateful logic" paradigm, which can realize Boolean logic within one or several memory cells. The second one is a reading-based method. By putting one of the operands into the sensing amplifier, it can also achieve Boolean logic with the content in the memory cell. These two methods are still in a "digital" way, and they realize MAC computing through row-by-row read/write operations. The last one is an "analog-like" method. By transforming the digital input signals into multi-level voltage signals, and applying them to the different rows of the memory array, the MAC results can be obtained in different columns with analog to digital converter (ADC). In this talk, we will review the main research status and challenges of DNN accelerators with computing in memory architecture.

Invited Speaker

Prof. Jayakumari.J
Mar Baselios College of Engineering and Technology, India
Senior Member of IEEE

Jayakumari. J is presently working as Professor, Department of Electronics and Communication Engineering, Mar Baselios College of Engineering and Technology, Nalanchira, Thiruvananthapuram, Kerala. She obtained her B.E (ECE) from M.S. University, Tirunelveli in 1994, M.Tech (Applied Electronics and Instrumentation) in 1998 and PhD (ECE) in 2009 from Kerala University. She have teaching experience of more than 23 years and research experience of 15 years . Her major areas of research interests include Wireless communication, coding techniques, brain signal and Image processing. She has published more than 75 papers in International Journals and Conferences. She is a senior member of IEEE, Fellow of IETE, IE (I) and CET (I), Chartered Engineer of IE (I) and Member, The Society of Digital Information and Wireless Communications (SDIWC). She is also an Academic Council member of the Council of Engineering and Technology (India).

Development of Portable Brain Computer Interface for Medical Applications

Presentation Time: 11:10-11:40, Dec. 11

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—However, conventional BCIs rely on expensive commercial amplifier arrays and bulky computers. These factors inevitably drive up the cost, complexity, and setup time of BCI systems, while reducing their portability. Elderly people suffering from diseases like Parkinson's disease will have difficulty in movement. For such patients, to analyze their conditions, doctors may need their brain waves. The human brain function represents the status of whole body, our central nervous system (CNS) consists of neurons. The neuron transmits information on response to simulate, which is called as action potential, whose voltage is in-between -60 mv to 20 mv and the action potential remains for 5 to 10 Mill seconds. An Electroencephalogram (EEG) is a measurement of brain signal using scalp electrodes, the study of EEG waves are used in diagnosis neurological disorders and abnormalities in human body. EEG based brain-computer interfaces (BCI) have been studied since the 1970s.

Brain computer interface technology represents a highly growing field of research with diverse application systems. Currently, the main focus of BCI research lies on the clinical use, which aims to provide a new communication channel to patients with motor disabilities to improve their quality of life. Its contributions in medical fields range from prevention to neuronal rehabilitation for serious injuries. Mind reading and remote communication have their unique fingerprint in numerous fields such as educational, self-regulation, production, marketing, security as well as games and entertainment. It creates a mutual understanding between users and the surrounding systems. It is expected that BCI will become a routine clinical, assistive, and commercial tool for advanced EEG monitoring. Current BCI systems are not practical for use outside research laboratories due to their complicated setup/operation, prohibitive costs, and lack of portability. This talk aims to present the techniques for the development of low-cost portable BCI system which can be carried anywhere.

Invited Speaker

Prof. Xiaohang Wang
South China University of Technology, China

Xiaohang Wang is an associate professor at South China University of Technology. His research interests include many-core chip architecture, hardware security, networks-on-chip. He served as the co-chair of NoCArc, special session chair of NoCS 2018, and session chair of APCCAS 2018.

On Countermeasures against the Thermal Covert Channel Attacks in Many-core Systems

Presentation Time: 9:30-10:00, Dec. 12

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—In this talk, I will briefly introduce our recently proposed countermeasure against thermal covert channel attack, which leaks sensitive data in a many-core chip. The countermeasure includes detection based on signal frequency scanning, positioning affected cores, and blocking based on Dynamic Voltage Frequency Scaling (DVFS) technique. Our experiments have confirmed that on average 98% of the TCC attacks can be detected, and with the proposed defence, the bit error rate of a TCC attack can soar to 92%, literally shutting down the attack in practical terms. The performance penalty caused by the inclusion of the proposed countermeasures is only 3% for an 8×8 system

Invited Speaker

Dr. Yuan Gao
Southern University of Science and Technology, China

Yuan Gao received the B.Eng. and M.Eng. degrees from Xi'an Jiaotong University in 2009 and 2012, respectively, and the Ph.D. degree from the Hong Kong University of Science and Technology (HKUST) in 2017. From 2017 to 2019, he was a Post-Doctoral Fellow with HKUST. Since November 2019, he serves as an Assistant Professor at School of Microelectronics, Southern University of Science and Technology. His research interests include power and analog integrated circuit design, and he has published more than 20 international journals and conferences in this field, including IEEE JSSC, IEEE ISSCC and IEEE VLSIC. He also serves in the review boards of multiple international journals and conferences.

Design of LED Driver ICs for High-Performance Miniaturized Lighting Systems

Presentation Time: 10:00-10:30, Dec. 12

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—The breakthrough of high-brightness light-emitting diodes (LEDs) and the continuous decrease of the production and packaging cost over the past decade has led LED lamps to overwhelmingly dominate the lighting market. Because LED shows distinct electrical characteristics from its conventional counterparts, driver circuits are needed to connect the LEDs and the AC mains. A good LED driver should not only be efficient and have little impact on the lighting quality of LEDs but also be with minimized hardware complexity and cost. Therefore, it is always desired to miniaturize the lighting system by reducing the sizes, the form factor, or even ruling out the off-chip components from the drivers.

In this speech, design considerations and developed on-chip techniques for LED system miniaturization will be discussed and two examples will be introduced. In the first design, the main focus is to integrate the efficient and harmful-flicker-free illumination and data transmission capability into a single AC-powered inductor-less LED driver. Compared to the conventional switching-converter-based driving solutions for visible light communication, the proposed driver has less power conversion stages and does not have passive components speed limitation. In the second design, a high-efficient hybrid driver will be introduced and discussed. By combining the merits of conventional switching-converter-based and inductor-less driving solutions, the proposed driver fully utilizes the input power from the AC mains without causing significant switching loss or excessive voltage stress.

Invited Speaker

Prof. Hui Chen
University of Electronic Science and Technology of China
Member of IEEE

Hui Chen (M'09) received the Ph.D degree from University of Electronic Science and Technology of China (UESTC) in 2013. From November 2011 to May 2013, she was a visiting scholar at Columbia University, NY, USA. Since January 2014, she has been with the School of Information and Communication Engineering, UESTC, where she is currently an Associate Professor. Her research interests include array signal processing, wireless communications, artificial intelligence and so on. She has published more than 50 academic papers, including more than 30 SCI papers. She is a member of The Institute of Electrical and Electronics Engineers (IEEE), and permanent member of Precision Measurement Radar System Technology Key Laboratory of Sichuan Province. She is also a peer reviewer of IEEE Transactions on Industrial Electronics, Signal Procesing, IEEE Access, IEEE Signal Processing Letters, IET Signal Processing, IET Radar Sonar and Navigation, and other academic journals.

Ambient Backscatter Communication with Frequency Diverse

Presentation Time: 14:40-15:10, Dec. 12

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—Ambient backscatter communication (AmBC), whose passive tags transmit information to readers through radio frequency (RF) signals in the air, has attracted much attention due to its promising prospects in green internet of things (IoTs). However, AmBC detection has faced a new challenge at the reader because the received signal is mainly a hybrid signal from direct link and backscatter link, which makes it difficult to detect symbols of the backscatter tag. To address this problem, frequency diverse array (FDA) is utilized to transmit ambient signal, we first propose an AmBC model with FDA, and analyze its channel capacity and detection performance. Closed form expressions for the mutual information between the receiver and the tag, the closed morphological expression and bit error rate (BER) of the AmBC using the FDA RF signal source are derived. Numerical results show that the proposed AmBC using FDA signal source enhances the channel capacity and improves the BER performance, while compared with traditional phased-array (PA) AmBC communication. Then, to further improve the detection performance, we propose an adaptive dual-threshold detector by employing the time-variant characteristic of FDA RF signal, which is based on the position of the boundary backscatter tag defined. Specifically, the closed form expressions for maximum likelihood (ML) threshold and adaptive thresholds are derived, respectively, together with their computational complexities are analyzed. Finally, numerical results are presented to show that the proposed adaptive dual-threshold detector achieves better bit error rate (BER) performance than conventional ML detector.

Invited Speaker

Dr. Yanlong Zhang
Xi'an Jiaotong University, China

Yanlong Zhang received the B.S. and Ph.D. degrees from the School of Microelectronics, Xidian University, Xi'an, China, in 2011 and 2018, respectively. From October 2015 to November 2017, he was a joint Ph.D. student with the Department of Electrical and Computer Engineering, The University of Texas at Austin, Austin, TX, USA. He is currently an Assistant Professor with the School of Microelectronics, Xi'an Jiaotong University, Xi'an, China. His research interests include analog, mixed-signal, and RF-integrated circuit design. Currently, he is working on the design of low-power and low-noise frequency synthesizers and clock generators. Dr. Zhang was a recipient of the Chinese National Scholarship in 2014 and the China Scholarship Council (CSC) Scholarship in 2015.

Noise Reduction for Fractional-N Phase-Locked Loops

Presentation Time: 15:20-15:50, Dec. 12

Zoom Link: https://zoom.com.cn/j/65799113155

Abstract—Phase-locked loops (PLLs) are widely used in modern electronic systems. Based on the ratios of output frequencies and the input reference frequency, PLLs are sorted into two categories, integer-N PLLs and fractional-N PLLs. Compared with integer-N PLLs, fractional-N PLLs have finer frequency resolution, wider bandwidth, and faster settling time. However, due to that a standard frequency divider can only divide by an integer, fractional-N PLLs suffer from the quantization noise, which limits the performance of fractional-N PLLs. To overcome the quantization noise issue in fractional-N PLLs, a space-time averaging (STA) technique, which is a highly digital, PVT-robust, and calibration-free, is presented to reduce the quantization noise over the entire frequency range. Therein, the spatial averaging is realized by using an array of dividers, phase/frequency detectors (PFDs), and charge pumps (CPs). If the divider array is considered as a whole, an instantaneous fractional frequency division is realized. In this way, the quantization step of the modulator (DSM) in fractional-N PLLs can be a truly fractional number, rather than an integer in a conventional fractional-N PLLs, which leads to a much smaller quantization error. To overcome the high power dissipation of the original STA technique, a method that requires only one divider is proposed, leading to substantially reduced power and hardware cost compared. To verify the concept, a prototype 2.4-GHz fractional-N PLL is implemented in a 40-nm CMOS process. Measurement results show that the in-band and out-of-band phase noise is reduced by 10 and 21 dB, respectively, and the integrated rms jitter is reduced by 7.29 ps, which is almost the same as the case when the PLL runs in the integer-N mode. These results clearly prove the effectiveness of the proposed STA technique. In addition to the aforementioned merits, the proposed STA technique is compatible with other quantization noise reduction techniques.

Session 1- Electronics and Circuit System

16:00-17:45, Dec. 11 | Zoom Link: https://zoom.com.cn/j/65799113155

CS024
16:00-16:15

Magnetic Field Shielding Optimization Based on Wireless Charging
Mr. Liu Xuguang, Kechen Wu, Rui Wang, Zhengwei Pan, Erxian Yao
NARI-GEIRI Power Semiconductor Co., Ltd, China

CS029
16:15-16:30

Research on Fast Quering Approach of User Demand Response Resource in Large Scale Resource Address Pool
Wei Yinwu, Zhihan Xie, Tieyi Chen, Li Xue, Kai Liu, Songsong Chen, Jindou Yuan
Grid Zhejiang Electric Power Co., Ltd, China, China

CS025
16:30-16:45

Do We Really Need Complicated Solar Energy Harvesting Circuits for Low Cost Sensor Nodes?
Assoc. Prof. Wei Liu, Wenzhuo Yin, Jian Xie, Rong Luo, Shunren Hu
Chongqing University of Technology, China

CS023
16:45-17:00

Analysis of Multi Chips Turn on Consistency in High Voltage and High Current IGBT Module
Mr. Erxian Yao, Rui Wang, Xuguang Liu
Nari-Geiri Semiconductor, China

CS028
17:00-17:15

Research on the Implementation Architecture and Demand Response Controlling Strategy for Adjustable Load
Wei Yinwu, Zhihan Xie, Tieyi Chen, Li Xue, Kai Liu, Songsong Chen, Jindou Yuan
Grid Zhejiang Electric Power Co., Ltd, China

CS037
17:15-17:30

Research on Coordination Solution Strategy of Power System Transient Stability and Short Circuit Current Based on External Penalty Function Method
Mr. Shuai Yang, Zhongwei He, Wentao Huang, Jun He, Zhijun Yuan, Jinman Yu
Hubei University of Technology, China

CS026
17:30-17:45

Construction and Application of Electro-Thermal Co-simulation Platform
Mrs. Zhengwei Pan, Jian Luo, Changcheng Dong, Xuguang Liu, Rui Wang, Erxian Yao
NARI-GEIRI Power Semiconductor Co.,Ltd, China

Session 2- Electronic Equipment and Component Development

10:40-12:10, Dec. 12 | Zoom Link: https://zoom.com.cn/j/65799113155

CS4004
10:40-10:55

Design Space Exploration for Hererogenous SoC Intergrated with Matrix Accelerator
Prof. Jinghe Wei, Ling Zhang, ZongGuang Yu
China Electronics Technology Group Corporation No.58 Research Institute, China

CS021
10:55-11:10

A wideband True Time Delay in GaAs pHMET MMIC
Mr. Dongning Hao, Wei Zhang
Tianjin University, China

CS031
11:10-11:25

A tetra-Band Microstrip Branch-Line Coupler Using Equivalent Quarter-Wavelength Transmission Lines
Assoc. Prof. Rongcang Han, Ruying Sun, Qinghu Chen, Zhongliang Lu
Linyi University, China

CS035
11:25-11:40

Design of a Wideband Compact CMOS Integrated Attenuator with Low Insertion Loss and High Accuracy
Mr. Sun Yunzhao, Chen-Chen Yang, Tong Li, Na Yan, Hongtao Xu
Fudan University, China

CS041
11:40-11:55

Codesign of a broadband Doherty Power Amplifier with Microstrip Bandpass Filters
Mr. Yiming Lyu, Zhiqin Zhao
University of Electronic Science and Technology of China

CS4003
11:55-12:10

Evaluation of on-Chip Accelerator Performance based on RocketChip
Prof. Jinghe Wei, ZongGuang Yu
China Electronics Technology Group Corporation No.58 Research Institute, China

Session 3- Electronic Engineering and Control System

15:50-17:20, Dec. 12 | Zoom Link: https://zoom.com.cn/j/65799113155

CS4005
15:50-16:05

Research of Control Strategy of Power System Stabilizer based on Reinforcement Learning
Mr. Xingyu Zhu, Tao Jin
Fuzhou University, China

CS036
16:05-16:20

Machine Learning Based Device Simulation Using Multi-Variable Non-Linear Regression to Assess the Impact of Device Parameter Variability on Threshold Voltage of Double Gate-All-Around (DGAA) MOSFET
Assist. Prof. Sandeep Moparthi, Chandan Yadav, Gopi Krishna Saramekala, Pramod Kumar Tiwari
National Institute of Technology Calicut, India

CS038
16:20-16:35

Research on Layout of Energy Storage Stations Connected to Grid Based on Optimal Grid Impact
Deshu Gan, Huajun Guo, Changhong Deng, Guihui Lin, Haixiong Wu,
Mr. Minghui Deng, Wentao Huang
Hubei University of Technology, China

CS039
16:35-16:50

Low Cost IoT Based Weather Station for Real-time Monitoring
Mr. Md. Jahirul Alam, Shoyeb Ahmed Rafi, Ali Adnan Badhan, Md. Najmul Islam, Saiful Islam Shuvo, Ahmed Mortuza Saleque
American International University, Bangladesh

CS042
16:50-17:05

Raspberry Pi Based Handheld Through-wall Radar Detection System
Mr. Binge Yan, Li Jiang, Yong Jia
Chengdu University of Technology, China

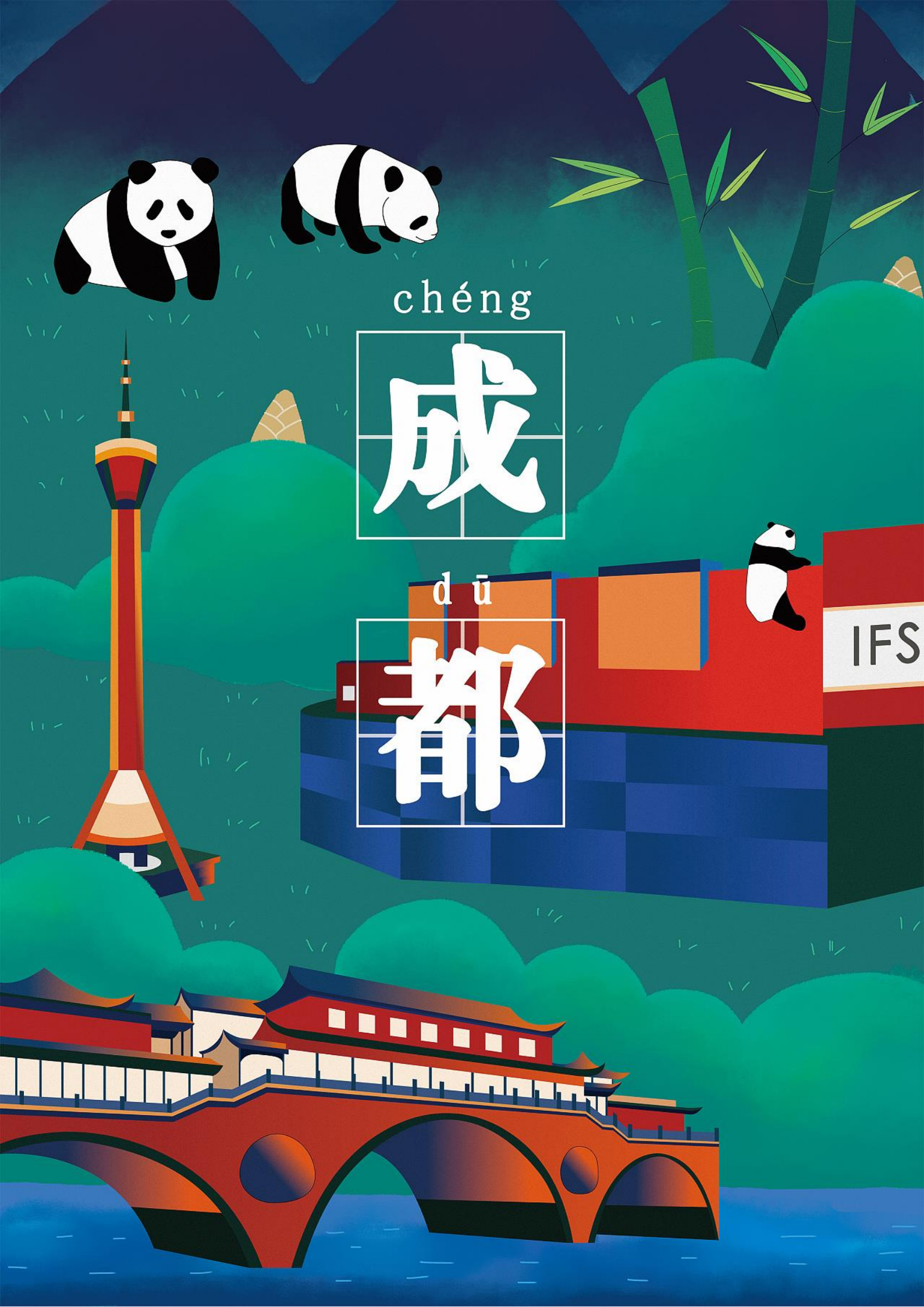
CS4002
17:05-17:20

Flight Simulator Architecture and Computer System Design and Research
Mr. Guozhu Zhao, Hu Zhehao
Civil Aviation Flight University of China, China

Session 4- Electronic and Communication Engineering

9:30-11:30, Dec. 13 | Zoom Link: https://zoom.com.cn/j/65799113155

CS003 9:30-9:45	Design of Low-noise X-band Frequency Source Based on DDS-PLL **Mr. Peidong Yao**, Leijun Xu, Zhenhua Sun Jiangsu University, China
CS001 9:45-10:00	Design of High Performance RNN Accelerator Based on Network Compression **Mr. Wentao Zhu**, Yuhao Sun, Zeyu Shen, Haichuan Yang, Yu Gong, Bo Liu Southeast University, China
CS022 10:00-10:15	GaN High Frequency Small Switching Power Module **Mr. Jian-Hua Wu**, Wei He, Jian Li, Xin-Ke Liu Shenzhen University, China
CS018 10:15-10:30	A 120GHz Frequency Tripler with Improved Output Power in 40nm CMOS **Mr. Han Cui**, Leijun Xu Jiangsu University, China
CS027 10:30-10:45	A 50 Gb/s Linear Driver in 0.13 μm SiGe BICMOS Technology for Mach-Zehnder Modulators **Mr. Fangyuan Ren**, Dezhi Xing, Shuai Tang, Jun Huang, Yao Wang United Microelectronic Center
CS034 10:45-11:00	Ringing Test for Second-Order Sallen-Key Low-Pass Filters **Mr. Tri Tran**, Anna Kuwana, Haruo Kobayashi Gunma University, China
CS017 11:00-11:15	A 146-173GHz Wideband Push-Push VCO in 40nm CMOS **Mr. Shao-wei Meng**, Lei-jun Xu, and Zhen-hua Sun Jiangsu University, China
CS040 11:15-11:30	Estimate of Information Pervasion Based on Turbulence Model **Dr. Yang Liu** University of South China, China


chéng
成
dū
都
IFS